



# **Town of Garner**

# **Hazard Mitigation Plan**

**Town of Garner Hazard Mitigation Plan  
2009 Update**

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## I. Introduction/Planning Process

### A. Statement of the Problem

In the last 5 years the Town of Garner has not experienced any natural hazards beyond the categories listed below; therefore the same list and narratives from 2004 apply. From the items in the list, Garner and the surrounding region has experienced prolonged periods without substantial rainfall and winter storms.

Natural hazards are a part of the world in which we live. Floods, hurricanes, tornadoes, winter storms, wildfires, and other hazardous events are natural phenomena. Natural hazards are inevitable and there is little humans can do to control force and intensity. However, how the natural and the built environments interact with hazards is quite different.

The natural environment is amazingly recuperative from the forces of wind, rain, fire and earth and can regenerate with resiliency, restoring habitat and ecosystems in time for the next generation of plant and animal life to begin anew. The built environment, however, is not as resilient. Natural disasters occur when human activity in the form of buildings, infrastructure, agriculture and other land uses are located in the path of the destructive forces of nature.<sup>1-1</sup> Since the built environment is more susceptible to natural hazards and cannot recuperate like the natural environment, communities impacted by a natural hazard often recover only over a long period of time and at great social and economic cost.

In recent years, the frequency and impact of natural disasters has increased not because natural hazards occur more frequently but because more people are choosing to live and work in locations that put them and their property at risk. "By the year 2010 the number of people residing in the most hurricane-prone counties throughout the nation will have doubled. Likewise, while floods have caused a greater loss of life and property and have disrupted more families and communities than all other natural hazards combined, the rate of development in flood-prone areas continues to escalate, putting more people and property in danger."<sup>1-2</sup>

While natural hazards cannot be prevented, local communities can use various means to reduce the vulnerability of people and property to damage. Communities can reduce exposure to future natural hazards by managing the location and characteristics of both the existing and future built environment. By utilizing location and construction techniques, a community can mitigate negative impacts and reduce future damage to both human lives and property.

Preparing for natural hazards involves establishing a comprehensive emergency management system consisting of the following four component activities:

1. Preparedness activities undertaken to improve a community's ability to respond immediately after a disaster. Preparedness activities include the development of response procedures, design and installation of warning systems, exercises to test emergency operational procedures, and training of emergency personnel.
2. Response activities designed to meet the urgent needs of disaster victims. Response activities occur during the disaster and include rescue operations, evacuation, emergency medical care, and shelter programs.
3. Recovery activities designed to rebuild after a disaster. These activities include repairs to damaged public facilities such as roads and bridges, restoration of public services such as power and water, and other activities that help restore normal services to a community.

4. Hazard mitigation activities designed to reduce or eliminate damages from future hazardous events. These activities can occur before, during, and after a disaster and overlap all phases of emergency management.

Hazard mitigation is defined as “any action taken to eliminate or reduce the long-term risk to human life and property from natural and technological hazards.”<sup>1-3</sup> Mitigation activities are ongoing and overlap all phases of emergency management.

Hazard mitigation includes three types of activities:

1. Structural mitigation – constructing dam and levee projects to protect against flooding, constructing disaster-resistant structures, and retrofitting existing structures to withstand future hazardous events;
2. Non-structural mitigation - development of land use plans, zoning ordinances, subdivision regulations, and tax incentives and disincentives to discourage development in high-hazard risk areas; and
3. Educational programs – educating the public about potential natural hazards, the importance of mitigation, and how to prepare to withstand a disaster.

“A fundamental premise of mitigation strategy is that current dollars invested in mitigation activities will significantly reduce the demand for future dollars by reducing the amount needed for emergency recovery, repair, and reconstruction following a disaster. Mitigation also calls for conservation of natural and ecologically sensitive areas (such as wetlands, floodplains, and dunes) which enables the environment to absorb some of the impact of hazard events. In this manner, mitigation programs help communities attain a level of sustainability, ensuring long-term economic vitality and environmental health for the community as a whole.”<sup>1-4</sup>

The concept of sustainable development has emerged in recent years as a means to emphasize the need to regain a balance between the built and natural environment. Sustainable development is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.<sup>1-5</sup> Sustainable development centers on the type of development rather than quantity and is not intended to be a no-growth or slow-growth initiative.

“Sustainable development through mitigation is not an impediment to growth. By building a community that is resilient to natural hazards, citizens strengthen the local economy. A locality that reduces its vulnerability will experience less restoration time, shortened business downtime, and less social disruption following a disaster, freeing resources that would otherwise be devoted to response and recovery, and more quickly improving citizens’ lives.”<sup>1-6</sup>

## **B. Purpose of the Plan**

The purpose of the Plan is:

1. To demonstrate local commitment to hazard mitigation planning principles;
2. To reduce natural hazard vulnerability by reducing the potential for future damages and economic losses;
3. To speed recovery and redevelopment following future natural hazard events;
4. To comply with both State and Federal legislative requirements for local hazard mitigation planning; and
5. To qualify for additional grant funding, in both pre-disaster and post-disaster situations.

### **C. Authority**

Once the draft plan is approved by NC Emergency Management, the Garner Hazard Mitigation Plan (a single jurisdiction plan) will be adopted by the Town Council under the authority and general police powers granted to municipalities of the State of North Carolina by North Carolina General Statutes (N.C.G.S., Chapter 160A).

The Plan has been developed in accordance with current criteria governing the development of local hazard mitigation plans including 1) Chapter 166A: North Carolina Emergency Management Act as amended by Senate Bill 300: An Act to Amend the Laws Regarding Emergency Management as Recommended by the Legislative Disaster Response and Recovery Commission (2001) and 2) the Disaster Mitigation Act of 2000 (Public Law 106-390, October 30, 2000) that amended the Robert T. Stafford Relief and Emergency Assistance Act.

### **D. Description of the Initial Planning Process**

The Town of Garner first started the hazard mitigation planning process in the spring of 2002 as part of the greater countywide effort that included Wake County and all twelve incorporated municipalities in a regional approach to hazard mitigation planning. Shortly after the countywide process began, however, the State requested that local governments wait until the final FEMA/NCEM planning criteria were issued before proceeding. The draft criteria were issued in June 2003.

In the fall of 2003, the Town hired The Wooten Company to serve as consulting planner for the development of the plan. The consulting planner served as the planning process facilitator by organizing meetings, drafting plan sections for Town review, making plan revisions based on review comments, and compiling the full draft plan for final review.

The Town re-convened the hazard mitigation planning (HMP) team with the assistant to the town manager acting as committee chair. The HMP Team and the consulting planner worked together to draft and review the various plan sections over the fall and winter of 2003 and the spring of 2004.

The planning process was organized to ensure that individual mitigation projects and initiatives undertaken by the Town are carried out in a cooperative manner such that all local initiatives work together and no single action or project detracts from the overall goal of creating a safer environment for all citizens of the Town. The planning process also played an important part in generating community understanding of and support for hazard mitigation by creating a forum for discussion and publicizing the need for hazard mitigation planning.

### **Public Input**

#### **1<sup>st</sup> Public Meeting**

On January 14, 2004 the Town of Garner gave public notice of the start of the hazard mitigation planning process at a regularly scheduled Council meeting. The meeting date and subject was announced to the public via Garner News (January 27, 2004). The start of the hazard mitigation planning process was also announced on the Town website. The announcement included an invitation for the general public to be involved in the planning process.

At the Town Board meeting, a presentation was made describing the purpose of the hazard mitigation planning process and the schedule for plan development. The draft section of the



Plan on hazard identification and analysis was presented. No public comments were received at the meeting.

Public announcement of the meeting also provided a contact phone number for persons who were unable to attend the meeting but who wanted to receive more information about the planning process. During the planning process, drafts of the plan were also available for public review at the Garner Town Hall.

**2<sup>nd</sup> Public Meeting**

The Town held a public hearing once the Plan was approved by NC Emergency Management. No sooner than two weeks following the official public hearing, the Town Council took action to adopt the Plan.

**HMP Team Meetings/ Presentations**

The Hazard Mitigation Planning (HMP) Team met as a whole with the consulting planner three times during the winter and spring of 2003-2004. Meeting times and a brief description of meeting topics are outlined in Table I-2.

**Table I-2: Plan Meeting Schedule**

Meeting Date	Group	Topic
December 9, 2003	HMP Team	Discussed project schedule, planning team members, report procedures, data needs. Reviewed first draft of Appendix A Hazard Identification and Analysis.
January 27, 2004	Council	1st public meeting. Presentation on purpose of the hazard mitigation planning process; schedule for plan development. Draft of Appendix A Hazard Identification and Analysis presented. No public comments received.
March 2, 2004	HMP Team	Reviewed list of critical facilities; reviewed first draft of Appendix B Community Vulnerability and Appendix C Community Capability; reviewed draft community goals and objectives and discussed mitigation action categories.
May 12, 2004	HMP Team	Reviewed the Hazard Mitigation Plan as a whole for the purpose of making final corrections before submittal to the NCEM.
To Be Determined	Council	Public hearing.
September 21, 2004	Council	Plan adoption.

The HMP Team generally followed the planning steps as outlined in “Keeping Natural Hazards from Becoming Disasters – A Mitigation Planning Guidebook for Local Governments”, NC Division of Emergency Management:

Process for 2009 Plan Update:

**Description of the Planning Process:**

The update process was overseen by the Garner Hazard Mitigation Planning Team, which met regularly during the planning process. The Team included Town staff and the Planning Commission; the effort was lead by the Assistant Town Manager. The Town of Garner conducted two public meetings on October 12, 2009 and October 27, 2009. The meetings were

advertised in the local newspaper and on the Town’s website to invite or to give members of the public, neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties an opportunity to be involved in the planning process. The details of the items discussed in these meetings are outlined below. The Planning Team members were selected by the Assistant Town Manager because of their expertise in certain areas pertaining to hazard mitigation. Nearly all of the participants were involved in the drafting of the original plan from 2004. No one from the public attended the meeting; therefore, no comments were received from the public or other parties.

The Transportation Plan was reviewed as a part of the Hazard Mitigation Plan update process. None of the information from the Transportation Plan was used because it was not relevant to hazard mitigation. The Town of Garner Planning Department decided to include some of the information from the Hazard Mitigation Plan in the Transportation Plan (see Appendix C, page 7). No other technical information was reviewed because it was not considered relevant.

All the sections were reviewed but only the following sections of the plan were updated in the planning process:

- I. Hazard Identification and Analysis
- II. Community Vulnerability Assessment
- III. Community Capabilities Assessment
- IV. Mitigation Strategies /Actions
- V. Assessment of Vulnerability

**Table I-3: Town of Garner HMP 5 Year Update Team Members**

Town Staff	Name	Position	Primary Contribution to Plan Update
Administration	Rodney Dickerson	Assistant Town Manager	Plan coordinator, Presenter at public meetings
Engineering	Frank Powell	Town Engineer	Update and review of engineering data and input on mitigation action plan
Engineering	Tony Chalk	Assistant Town Engineer	Update of floodplain data
Engineering	Jacyln Sumner	Stormwater Engineer	Attended planning seminar
Inspections	Sandy Teal	Director	Update of Building Inspections information and forest fire occurrence update
Planning	Brad Bass	Director	Update of mitigation action tables and effects on long range planning documents
Planning	David Bamford	Long Range/GIS Planner	Map updates and estimated property values
Public Works	Paul Cox	Director	Update of hazard occurrence tables
<b>Public Representatives</b>			
Planning Commission		Citizen Volunteers	Review and feedback

## **Public Input**

The following information was presented by Rodney Dickerson, Assistant Town Manager, at each of the public meetings:

### ***Town of Garner Hazard Mitigation Plan (HMP) 2009 Update***

#### ***Introduction to Hazard Mitigation Planning Process***

##### ***Introduction***

*In the next few months, the Town will be updating its Hazard Mitigation Plan (HMP). The original plan was approved by FEMA and adopted by the Town Council in 2004.*

*The Town has formed a Hazard Mitigation Update Team consisting of town staff. However, the planning and updating process must involve public input from community stakeholders. The Planning Commission served as a forum for public input for the original plan and provided valuable input. It is recommended that the update process follow close to the same procedure.*

*Tonight's meeting is the first opportunity for the general public to hear about why the plan is being developed and how they can be involved in the process. A second public meeting will be held at Town Council when the updated plan draft is complete and ready for submittal to the NC Division of Emergency Management (NCEM) for review and approval. A final public hearing will be held once the draft plan has been approved by NCEM and is ready for adoption by the Town Council.*

##### ***Plan Purpose***

*The US Congress and the State of North Carolina both passed legislation requiring that every county and municipality develop, adopt, and implement a Hazard Mitigation Plan in order to be eligible for post-disaster public assistance funds following a future disaster. Legislation required that the plan be in effect no later than November 1, 2004. It also required the plan to be evaluated periodically and updated at least every 5 years.*

*Unlike an Emergency Operations Plan that serves as a response plan for when a disaster occurs, the HMP helps communities develop ways to reduce future hazard vulnerability before a disaster strikes. For example, our community can reduce vulnerability to flood hazards by further discouraging development in 100-year floodplain areas by reviewing and revising, as appropriate, local land use regulations. Once completed, the HMP will serve as a blueprint for the Town to follow to help reduce property damage and save lives from the effects of future disasters in the community.*

##### ***Steps in Hazard Mitigation Plan Update Process***

- 1. Identify and Analyze Natural Hazards*
- 2. Assess Hazard Vulnerability*
- 3. Assess Community Mitigation Capability*
- 4. Form Interim Conclusions*
- 5. Establish Values and Goals*

6. *Formulate Mitigation Policies*
7. *Establish Procedures for Monitoring, Evaluating and Reporting Progress*
8. *Establish Procedures for Revisions and Updates of the Plan*
9. *Submit Draft Updated Plan to NCEM for review and FEMA approval.*
10. *Plan Adoption.*

### **Natural Hazards**

*The Federal Emergency Management Agency (FEMA) and the State of North Carolina require that the twelve natural hazards listed below be considered in planning for local hazard mitigation. The threat of each hazard in Wake County is unique in terms of potential impact, frequency of occurrence, likelihood of occurrence, and combined hazard index for potential harm to persons or property.*

1. *Dam and Levee Failures*
2. *Droughts and Heat Waves*
3. *Earthquakes*
4. *Floods*
5. *Hurricanes and High Winds*
6. *Severe Storms and Tornadoes*
7. *Wildfires*
8. *Winter Storms and Freezes*

First Public Meeting was held on October 12, 2009 at the Town of Garner Planning Commission monthly meeting. The aforementioned information was presented.

Mr. Dickerson stated that the purpose of the Hazard Mitigation Plan is to have an action plan to protect from loss due to natural disasters by being proactive with implementing a plan for development involving multiple departments and agencies. Mr. Dickerson stated that with input from the community and the Town the plan will be updated accordingly. Mr. Dickerson stated that the update to the Hazard Mitigation Plan will first be submitted to the State for approval and then to FEMA for final approval and adoption.

There were no comments from the public.

Second Public Meeting was held on October 27, 2009 at the Town of Garner Town Council meeting. The aforementioned information was presented. A Council Member asked about the process for updating the current Hazard Mitigation Plan. I explained that it would be completed by Town staff by reviewing and editing it section by section. A Council Member asked how this plan differed from an Emergency Response Plan. I explained that the purpose of the Hazard Mitigation Plan is to lessen the impact of hazards on the built environment; Emergency Response Plan outlines the operations after a disaster has occurred. The Council Member also asked if the Town had a plan for continuity of operations if a disaster affected our municipal facilities. I stated that the Town did an emergency operations plan about a year ago.

Third Public Meeting will be held prior to adoption by the Town Council. The purpose of the second public meeting is to receive comments from the public on the draft approved by State and Federal officials.

## HMP Team Meetings/ Presentations

The Hazard Mitigation Planning (HMP) Team

**Table I-4: Plan Update Meeting Schedule**

Meeting Date	Group	Topic
September 2, 2009	HMP Team	Discussed project schedule, planning team members, report procedures, data needs. Reviewed current Hazard Mitigation Plan
October 12, 2009	Planning Commission	Public meeting to provide overview of Hazard Mitigation Plan and to seek public input. The Planning Commission is a Council appointed advisory board that provides technical review of planning, zoning and development matters. Addressed questions from the Commission members.
October 21, 2009	Town Staff	Stormwater Engineer attended hazard mitigation plan training in Hickory, NC
October 27, 2009	Council	Public meeting to provide overview of Hazard Mitigation Plan and outline requirement for 5 year update. Addressed questions from the Council and the public in attendance.
October 29, 2009		Stormwater Engineer met Asst. Town Manager to give an overview of the training and plan update requirements
July 13, 2010	Asst. Town Mgr.	Met NCEM at their office to discuss plan update
	HMP Team	Met to discuss criteria and format of plan update
December 2, 2010	Asst. Town Mgr.	NCEM met at my office to discuss plan update and to offer assistance
December 30, 2010	HMP Team	Asst. Town Manager discussed NFIP participation and flood zone maps with Assistant Town Engineer
March 25, 2011	Asst. Town Mgr.	Met NCEM at their office to discuss crosswalk comments
June 20, 2011	HMP Team	Met NCEM at my office to discuss second crosswalk comments
To be Determined	Council	Public hearing.
To Be Determined	Council	Plan adoption.

### Step 1. Hazard Identification and Analysis

This step involved describing and analyzing the twelve natural hazards to which Wake County and the Town of Garner could be susceptible. Appendix A, which represents the results of this planning step, includes historical data on past hazard events and establishes an individual hazard profile and risk index for each hazard based upon frequency, magnitude, and impact. The summary risk assessment at the end of Appendix A serves as the foundation for concentrating and prioritizing local mitigation efforts.

### Step 2. Community Vulnerability Assessment

This step involved research and mapping, using best available data, to determine and assess current conditions within the community. Appendix B, which contains the results of this planning step, includes a description of community characteristics, an assessment of current conditions, a list of critical facilities, projections for future growth and summary conclusions including an assessment of both current (2010) and projected (2020) future conditions. Appendix B also contains two summary maps that depict 1) multi-hazards (floodplains and past hazard events that lend themselves to mapping, e.g., tornado touchdowns); and 2) critical facilities (those facilities without which the Town could not continue to function for long).

### **Step 3. Community Capabilities Assessment**

The step included a comprehensive examination and evaluation of Town capacity to implement mitigation strategies, a review of local government authority for hazard mitigation planning, a description of local government organization and staff, a review of technical and fiscal capabilities, and a summary statement of local commitment to hazard mitigation planning. The purpose of this step, represented in Appendix C, was to identify any gaps or weaknesses in local programs or regulations, to determine if any existing programs/regulations had the effect of hindering hazard mitigation, and to identify programs/regulations that could be revised or amended to strengthen local hazard mitigation efforts.

### **Step 4. Form Interim Conclusions**

At the conclusion of Steps 1 – 3, the HMP Team developed summary conclusions regarding community vulnerability to natural hazards and local capability for dealing with hazards.

### **Step 5. Community Goals and Objectives**

Steps 1 through 4 also established the foundation for moving forward with developing a mitigation action program. The HMP Team worked together to formulate and agree upon general goals and objectives for hazard mitigation before moving forward with developing specific mitigation strategies.

### **Step 6. Mitigation Strategies/Actions**

Next the Team cooperated in formulating a comprehensive list of mitigation actions to be undertaken by the Town. This step also included assigning responsibility and establishing a timeline for implementation of each action.

### **Step 7. Procedures for Monitoring, Evaluating and Reporting Progress**

The HMP Team developed a procedure for an annual review and progress report on the Plan. The review process provides for the HMP Team and the general public to have input on plan review.

### **Step 8. Procedures for Revisions and Updates**

The HMP Team developed a procedure for a comprehensive review and update of the Plan on a 5-year schedule. The procedure provides for the inclusion of the public.

### **Step 9. Adoption.**

The Town of Garner will hold a public hearing and adopt the updated Plan when approved by NCEM and FEMA.

## **F. Resolution of Adoption**

A draft resolution of adoption for the Town of Garner is included on the following pages. The final approved resolution will be inserted when the Plan is adopted (after NCEM approval).



**DRAFT**

**RESOLUTION OF ADOPTION**

**Town of Garner  
Hazard Mitigation Plan**

WHEREAS, the citizens and property within Town of Garner are subject to the effects of natural hazards and man-made hazard events that pose threats to lives and cause damages to property, and with the knowledge and experience that certain areas, i.e., flood hazard areas, are particularly susceptible to flood hazard events; and

WHEREAS, the Town desires to seek ways to mitigate situations that may aggravate such circumstances; and

WHEREAS, the Legislature of the State of North Carolina has in Part 6, Article 21 of Chapter 143; Parts 3, 5, and 8 of Article 19 of Chapter 160A; and Article 8 of Chapter 160A of the North Carolina General Statutes, delegated to local governmental units the responsibility to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry; and

WHEREAS, the Legislature of the State of North Carolina has in Section 1 Part 166A of the North Carolina General Statutes (adopted in Session Law 2001-214—Senate Bill 300 effective July 1, 2001), states in Item (a) (2) “For a state of disaster proclaimed pursuant to G.S. 166A-6(a) after November 1, 2004, the eligible entity shall have a hazard mitigation plan approved pursuant to the Stafford Act”; and

WEREAS, Section 322 of the Federal Disaster Mitigation Act of 2000 states that local government must develop an All-Hazards Mitigation Plan in order to receive future Hazard Mitigation Grant Program Funds, and

WHEREAS, it is the intent of the Council of Town of Garner to fulfill this obligation in order that the Town will be eligible for state assistance in the event that a state of disaster is declared for a hazard event affecting the Town;

NOW, therefore, be it resolved that the Council of the Town of Garner hereby:

1. Adopts the Town of Garner Hazard Mitigation Plan; and
2. Vests the Town Manager with the responsibility, authority, and the means to:
  - (a) Inform all concerned parties of this action.

- (b) Cooperate with Federal, State and local agencies and private firms which undertake to study, survey, map, and identify floodplain or flood-related erosion areas, and cooperate with neighboring communities with respect to management of adjoining floodplain and/or flood-related erosion areas in order to prevent aggravation of existing hazards.
  - (c) Adjust the boundaries of the municipal planning jurisdiction whenever a municipal annexation or extraterritorial jurisdiction revision results in a change whereby the municipality assumes or relinquishes the authority to adopt and enforce floodplain management regulations for a particular area in order that all Flood Hazard Boundary Maps (FHBMs) and Flood Insurance Rate Maps (FIRMs) accurately represent current planning jurisdiction boundaries. Provide notification of boundary revisions along with a map suitable for reproduction, clearly delineating municipal corporate limits and extraterritorial jurisdiction boundaries to all concerned parties.
3. Appoints the Town Manager to assure that the Hazard Mitigation Plan is reviewed annually and in greater detail at least once every five years to assure that the Plan is in compliance with all State and Federal regulations and that any needed revisions or amendments to the Plan are developed and presented to the Town of Garner Council for consideration.
4. Agrees to take such other official action as may be reasonably necessary to carry out the objectives of the Hazard Mitigation Plan.

Adopted on \_\_\_\_\_

\_\_\_\_\_  
Ronnie Williams, Mayor

Attest:

\_\_\_\_\_  
Judy White, CMC, Town Clerk

SEAL

**DRAFT**

**RESOLUTION OF ADOPTION**

**Town of Garner  
Hazard Mitigation Plan  
2009 Update**

WHEREAS, the citizens and property within the Town of Garner are subject to the effects of natural hazards and man-made hazard events that pose threats to lives and cause damages to property, and with the knowledge and experience that certain areas, i.e., flood hazard areas, are particularly susceptible to flood hazard events; and

WHEREAS, the Town desires to seek ways to mitigate situations that may aggravate such circumstances; and

WHEREAS, the Legislature of the State of North Carolina has in Part 6, Article 21 of Chapter 143; Parts 3, 5, and 8 of Article 19 of Chapter 160A; and Article 8 of Chapter 160A of the North Carolina General Statutes, delegated to local governmental units the responsibility to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry; and

WHEREAS, the Legislature of the State of North Carolina has in Section 1 Part 166A of the North Carolina General Statutes (adopted in Session Law 2001-214—Senate Bill 300 effective July 1, 2001), states in Item (a) (2) “For a state of disaster proclaimed pursuant to G.S. 166A-6(a) after November 1, 2004, the eligible entity shall have a hazard mitigation plan approved pursuant to the Stafford Act”; and

WEREAS, Section 322 of the Federal Disaster Mitigation Act of 2000 states that local government must develop an All-Hazards Mitigation Plan in order to receive future Hazard Mitigation Grant Program Funds, and

WHEREAS, it is the intent of the Council of Town of Garner to fulfill this obligation in order that the Town will be eligible for state assistance in the event that a state of disaster is declared for a hazard event affecting the Town;

NOW, therefore, be it resolved that the Council of the Town of Garner hereby:

1. Adopts the Town of Garner Hazard Mitigation Plan Update; and
2. Vests the Town Manager with the responsibility, authority, and the means to:
  - (d) Inform all concerned parties of this action.

- (e) Cooperate with Federal, State and local agencies and private firms which undertake to study, survey, map, and identify floodplain or flood-related erosion areas, and cooperate with neighboring communities with respect to management of adjoining floodplain and/or flood-related erosion areas in order to prevent aggravation of existing hazards.
  - (f) Adjust the boundaries of the municipal planning jurisdiction whenever a municipal annexation or extraterritorial jurisdiction revision results in a change whereby the municipality assumes or relinquishes the authority to adopt and enforce floodplain management regulations for a particular area in order that all Flood Hazard Boundary Maps (FHBMs) and Flood Insurance Rate Maps (FIRMs) accurately represent current planning jurisdiction boundaries. Provide notification of boundary revisions along with a map suitable for reproduction, clearly delineating municipal corporate limits and extraterritorial jurisdiction boundaries to all concerned parties.
3. Appoints the Town Manager to assure that the Hazard Mitigation Plan is reviewed annually and in greater detail at least once every five years to assure that the Plan is in compliance with all State and Federal regulations and that any needed revisions or amendments to the Plan are developed and presented to the Town of Garner Council for consideration.
4. Agrees to take such other official action as may be reasonably necessary to carry out the objectives of the Hazard Mitigation Plan.

Adopted on \_\_\_\_\_

\_\_\_\_\_  
Ronnie Williams, Mayor

Attest:

\_\_\_\_\_  
Judy Bass, CMC, Town Clerk

SEAL

## **Footnotes**

- <sup>1-1</sup> Keeping Natural Hazards from Becoming Disasters - A Mitigation Planning guidebook for Local Governments, North Carolina Division of Emergency Management, May 2003, p. 1.
- <sup>1-2</sup> Local Hazard Mitigation Planning Manual, North Carolina Division of Emergency Management, November 1998, p.1.
- <sup>1-3</sup> Post-Disaster Hazard Mitigation Planning Guidance for State and Local Governments, Federal Emergency Management Agency, 1990, p. 4.
- <sup>1-4</sup> Local Hazard Mitigation Planning Manual, p. 4.
- <sup>1-5</sup> Our Common Future, United Nation's World Commission on Environment and Development, 1987, as quoted in Local Hazard Mitigation Planning Manual, p. 4.
- <sup>1-6</sup> Preventing Disasters through Hazard Mitigation, Ana K. Schwab, Popular Government, Spring 2000, p. 12.

## **II. Mitigation Action Plan**

This section of the Plan summarizes study conclusions, outlines community goals and objectives, and describes the action plan to reduce Town of Garner vulnerability to the effects of natural hazards. Mitigation objectives are designed to support community goals while further defining the parameters for development of mitigation actions. Mitigation actions describe specific steps that are to be undertaken to achieve the stated objectives. Mitigation actions are intended to serve as benchmarks for evaluating progress on plan implementation.

### **A. Study Conclusions**

With limited financial and staff resources to dedicate to hazard mitigation, it is essential that those hazards with the highest likelihood of occurrence and the greatest potential impact receive the highest investment of Town resources. Through hazard identification and analysis and vulnerability assessment, it has been determined that the Town of Garner is susceptible to the impact of certain natural hazards as summarized at the conclusion of Appendix A Hazard Identification and Analysis.

The Town is not at risk for coastal erosion, tsunamis, riverine erosion, levee failures, earthquakes, landslides/sinkholes or volcanoes---these hazards were not addressed. Six hazards were rated either “moderate” or “high” risk - droughts and heat waves; floods; hurricanes and high winds; severe storms and tornadoes; wildfires; and winter storms and freezes. Dam failures were rated as “low” risk.

### **Moderate and High Hazard Threats**

#### **Floods**

Flooding is often associated with hurricanes and coastal storms (most often general flooding) as well as with severe summer storms (typically flash flooding). Floods are the easiest hazard to quantify and isolate as flooding occurs only in known locations. The severity of a flood is generally dependent upon the amount of rainfall and prior soil conditions (including ground cover). Flood hazard vulnerability can be decreased through adoption and enforcement of local land use regulations and through cooperative, regional efforts to ensure that upstream jurisdictions are not contributing to downstream flooding problems.

The Town of Garner has participated in the National Flood Insurance Program (NFIP) since 1974. The Engineering Department keeps floodplain maps on file for public review. Building and development permits are reviewed for compliance with floodplain management regulations. As a general rule, encroachments into the floodway are prohibited.

#### **Severe Storms/Tornadoes and Hurricanes/High Winds)**

Severe storms/ tornadoes as well as hurricanes/high winds present high wind hazards. This hazard is mainly combated through building codes and construction. Enforcement of the current State building code and enhancement of the code in regards to wind resistance will prove the most beneficial in addressing high winds.

#### **Droughts and Heat Waves**

In general, communities can have little influence or impact on mitigating the impact of droughts/heat waves on the local government level except through ensuring adequate water supplies for normal circumstances and through implementation of water conservation

measures when drought conditions are imminent. Similarly, heat waves have wide ranging effects that are almost impossible to combat on a local government level. Communities, therefore, depend upon State and Federal agencies for assistance.

### **Wildfires**

Fortunately, wildfires in North Carolina, although frequent, are not normally a serious threat to large areas as is the case in western states where dry weather conditions and large expanses of timber increase the likelihood and extent of the impact of a wildfire. The North Carolina Division of Forest Resources has the responsibility for protecting state and privately owned forest land from wildfires. The program is managed on a cooperative basis with all one hundred counties in the State. The State fire program emphasizes fire prevention efforts; pre-suppression activities (including extensive training of personnel); aggressive suppression efforts on all wildfires; and law enforcement follow-up.

### **Winter Storms and Freezes**

Local governments also look to the State and to private utility companies for leadership in dealing with winter storms/freezes. The typical effects of snow and ice accumulation - loss of electrical power, phone, and cable service and treacherous road conditions - can be only minimally addressed at the local level. (The exceptions would be larger cities which have more snow/ice removal equipment and manpower and governments that own the local electrical distribution system.)

### **Dam Failure**

The threat of dam failure in Garner is low and would not have a significant impact on life and property. The dams are earthen dams around small bodies of water. There is the potential to wash out nearby roads which would necessitate the roads being barricaded temporarily.

## **Statement of Commitment to Mitigating Impacts of Natural Hazards**

Through the act of developing and adopting a Hazard Mitigation Plan, the Town of Garner is committing to develop and engage in programs, activities and practices that can be implemented at the local government level to help to mitigate the impacts of future natural hazards. The Town will place primary emphasis on and dedicate resources, as available, to mitigating the effects of flooding. Secondary emphasis will be placed, as practicable at the local level, on mitigating the effects of high winds, droughts and heat waves, wildfires, and winter storms and freezes.

## **B. Community Goals**

The primary goal of all local governments is to promote the public health, safety, and welfare of the citizens of the community. In keeping with this standard, the Town of Garner has developed four goal statements for local hazard mitigation planning. Each goal, purposefully broad in nature, serves to establish parameters that were used in developing more specific objectives and mitigation actions. Consistent implementation of objectives and actions will over time ensure that community goals are achieved. The following goals and objectives have been reviewed as part of the 2009 Hazard Mitigation Plan update and it was concluded that they meet the needs of the Town; therefore, they are all current and active.

**Goal #1** Protect the public health, safety and welfare by increasing public awareness of hazards and by encouraging collective and individual responsibility for mitigating hazard risks.

**Goal #2** Improve technical capability to respond to hazards and to improve the effectiveness of hazard mitigation actions.

**Goal #3** Enhance existing or create new policies and ordinances that will help reduce the damaging effects of natural hazards.

**Goal #4** Protect the most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation actions.

### **C. Mitigation Objectives**

Mitigation objectives are designed to support community goals while further defining parameters for development of mitigation actions. Objectives are numbered to correspond with the goal that each supports.

**Objective 1.1** The Town will engage in activities and practices that will help mitigate the impacts of natural hazards.

**Objective 1.2** The Town will, in cooperation with Wake County, implement a public awareness campaign to educate citizens of the possible hazards associated with locating in floodplains and of measures that can be taken to lessen impacts of future floods.

**Objective 1.3** The Town will work to ensure that emergency services are adequate to protect public health and safety.

**Objective 2.1** The Town will work to keep infrastructure extensions out of hazardous areas in order not to actively encourage development to occur in known hazardous areas.

**Objective 2.2** The Town will regularly monitor hazard mitigation efforts to ensure that adequate progress is being made towards stated goals.

**Objective 3.1** The Town will work to ensure future development occurs in such a way as to protect wetlands, floodplains, and other natural features that serve to reduce flood hazard susceptibility.

**Objective 3.2** The Town will seek to further increase control over development in the floodplain to help prevent increases in flood velocities and levels that endanger both people and property.

**Objective 4.1** The Town will work to develop in such a way that the built environment does not occur in any known or predictable pathways of a natural hazard. If this is unavoidable, as in the case of hurricane force winds, the Town will ensure that new structures are as resilient as possible to the impacts of a natural hazard.

**Objective 4.2** The Town will work to limit development in areas that may cause emergency workers to put lives at risk to rescue someone from a structure knowingly built in a hazardous area.



## **D. Mitigation Actions**

The Town of Garner developed the mitigation actions described in Table II-1. Many proposed actions will have a positive effect on mitigating potential damages from most if not all natural hazards. The listed actions do, however, primarily focus on ways the Town can act to lessen and, ideally, eventually prevent future flood losses from inappropriate new development. Mitigation actions include a number of ongoing programs and descriptions of twenty new or expanded programs that the Town will undertake to ensure further reductions in community vulnerability during the 5-year implementation period.

Mitigation actions were developed and prioritized by the departmental staff responsible for implementation of the specific action. Each department categorized actions as low, moderate or high priority based on assessment of the need for the specific action, the projected cost of implementation, the potential beneficial effects from implementation of the action, and available funding sources. The implementation years – between 2004 and 2009 – were also determined by the responsible departments using projected resources (personnel, vehicles, etc.) and operating funds. As discussed under Study Conclusions, the planning team determined that some potential actions were more appropriately addressed at the State level due to long established priorities and responsibilities assumed by the State of North Carolina and local governments.

Mitigation actions were prioritized using a number of criteria including feasibility and environmental impact. However, the primary factor considered by the Hazard Mitigation Planning Committee was cost-effectiveness of each action in the plan. To determine cost-effectiveness for each action, a cost-benefit review process was implemented by the HMP committee using local knowledge of the probable cause of each action. Actions were given priority of High, Moderate, or Low based on this assessment. Actions considered a High priority are those that should be addressed first and which will receive a majority of the funding and effort from the local jurisdiction. Conversely, Low priority actions are those that will receive the least amount of time and effort from the local jurisdiction. Moderate priority actions fall in between High and Low priority in terms of resources and effort.

Individual staff departments were responsible for determining:

1. Cost effectiveness, i.e., do returns or savings produced by implementation of the action outweigh the cost of implementation?
2. Environmental impact, i.e., are actions designed to protect environmentally fragile areas as natural stormwater storage areas? and
3. Technically feasibility, i.e., can the action be undertaken by the Town using current staff and local funds, State, or Federal funds, or do other funding sources need to be identified?

In developing actions, the Town relied on the following six mitigation policy categories provided by FEMA:

1. Prevention (P) Measures  
Preventive measures are intended to keep hazard problems from getting worse. They are particularly effective in reducing a community's future vulnerability, especially in areas where development has not occurred or where capital improvements have not been substantial. Examples of prevention measures include:
  - (a) Comprehensive land use planning
  - (b) Zoning regulations
  - (c) Subdivision regulations

- (d) Open space preservation
  - (e) Building code
  - (f) Floodplain development regulations
  - (g) Stormwater management
2. Property Protection (PP) Measures  
 Property protection measures protect existing structures by modifying the building to withstand hazardous events, or removing structures from hazardous locations. Examples of property protection measures include:
    - (a) Building relocation
    - (b) Acquisition and clearance
    - (c) Building elevation
    - (d) Barrier installation
    - (e) Building retrofit
  3. Natural Resource (NR) Protection  
 Natural resource protection activities reduce the impact of natural hazards by preserving or restoring natural areas and their mitigative functions. Such areas include floodplains, wetlands, and dunes. Parks, recreation or conservation agencies and organizations often implement these measures. Examples include:
    - (a) Wetland protection
    - (b) Habitat protection
    - (c) Erosion and sedimentation control
    - (d) Best management practices (BMPs)
    - (e) Stream dumping
    - (f) Forestry practices
  4. Emergency Services (ES) Measures  
 Although not typically considered a mitigation technique, emergency service measures do minimize the impact of a hazard event on people and property. These commonly are actions taken immediately prior to, during, or in response to a hazard event. Examples include:
    - (a) Hazard warning system
    - (b) Emergency response plan
    - (c) Critical facilities protection
    - (d) Health and safety maintenance
    - (e) Post-disaster mitigation
  5. Structural Projects (S)  
 Structural mitigation projects are intended to lessen the impact of a hazard by modifying the environmental natural progression of the hazard event. The projects are usually designed by engineers and managed or maintained by public works staff. Examples include:
    - (a) Reservoirs, retention and detention basins
    - (b) Levees and floodwalls
    - (c) Channel modifications
    - (d) Channel maintenance
  6. Public Information Activities (PI) Activities  
 Public information and awareness activities are used to advise residents, business owners, potential property buyers, and visitors about hazards, hazardous areas, and

mitigation techniques that the public can use to protect themselves and their property. Examples of measures to educate and inform the public include:

- (a) Map information
- (b) Outreach projects
- (c) Library
- (d) Technical Assistance
- (e) Real estate disclosure
- (f) Environmental education

## **Table II-1 Mitigation Action Plan**

### **Explanation of Columns**

#### **Action #**

Action # corresponds to FEMA mitigation policy categories listed above.

#### **Action**

A description of the specific action to be undertaken.

#### **Hazard**

Hazard which the action addresses.

#### **Objective(s) Addressed**

Reference to the numbered objective which the action supports.

#### **Relative Priority**

Low, moderate or high priority for funding and implementation.

#### **Funding Sources**

State and Federal sources of funds are noted, where applicable.

#### **Responsible Party**

Staff department responsible for undertaking the action. Note: The Town Board of Aldermen has ultimate authority to approve any policy, program or regulation revisions.

#### **Target Completion Date**

Date by which the action should be completed.

### **Abbreviations used in Table II-1:**

#### **Town Departments**

ADMIN	Administration Department
ALL	All Town of Garner Departments
BOARD	Board of Aldermen
CIS	Computer Information Services
ENG	Engineering Department
FIRE	Volunteer Fire Department
INSP	Inspections Department
OSAC	Open Space Advisory Committee
PLAN	Planning Department

POL Police Department  
PR Parks and Recreation Department  
PW Public Works Department

**Other Agencies**

EMS Wake County Emergency Management Services  
NCDENR NC Department of Environment and Natural Resources  
RAL City of Raleigh  
WAKE Wake County

**Table II-1: Town of Garner Mitigation Action Plan**

Action #	Action	Hazard	Objective(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Status/ Target Completion Date
<b>Preventive (P)</b>							
P-1	Institute NPDES Phase II Stormwater Program.	Flood Drought	1,1 3.1	High	Local	ENG	Unchanged Ongoing
P2	Evaluate the need for regulations to encourage use of low impact development site planning principles to help control stormwater volume impacts.	Flood, Dam	1.1 3.1	Moderate	Local	ENG PLAN	Unchanged Ongoing
P-3	Enforce zoning ordinance standards that help minimize impervious surface coverage in priority and healthy watersheds.	Flood	1.1 3.1	Moderate	Local	ENG PLAN	Unchanged Ongoing
P-4	Continue to ensure good site planning by carefully reviewing development plans, meeting with developers and making site inspections to ensure existing soil erosion and sedimentation control regulations are being implemented properly.	Flood	1.1 3.1	High	Local	ENG WAKE	Unchanged Ongoing
P-5	Establish an open space prioritization and acquisition program to ensure maximum success with limited funds.	Flood	1.1 3.1	High	Local Regional State Federal	BOARD PR	Completed 2006-2007
	<ul style="list-style-type: none"> <li>▪ Since the Town of Garner recently developed a 96 acre passive park this is no longer at the top of the priority list.</li> </ul>						Deferred
P-6	Partner with Wake County and other interested parties to jointly identify and acquire open space lands.	Flood	1.1 3.1	High	Local Private State Federal	BOARD WAKE OSAC	Unchanged Ongoing
P-7	Adopt Comprehensive Land Use Plan that will provide a 20-year plan for town growth and include goals and policies for public safety and hazard mitigation.	Flood, Hurricane and High winds, Tornado,	1.1	High	Local	PLAN	Adopted 2006

Action #	Action	Hazard	Objective(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Status/Target Completion Date
		Winter Storm, Wildfire, Dam					
P-8	UDO: Continue to provide stream and creek buffers, and floodplain and wetland protection.	Flood	3.1	High	Local	PLAN	Unchanged Ongoing
P-9	UDO: Subdivision Standards – Continue to provide protection for residential areas by not allowing residential lots in the floodplain.	Flood	3.2	High	Local	PLAN	Unchanged Ongoing
P-10	UDO: Watershed Protection Overlay District – Ensure riparian buffers are provided for perennial and intermittent streams, lakes, and ponds.	Flood	3.1 3.2	High	Local	PLAN PW	Unchanged Ongoing
P-11	Provide adequate water supply through storage and interconnection with other public water systems.	Drought	1.1	Moderate	Local	RAL ENG	Unchanged Ongoing
P-12	Provide backup power for all critical public facilities (Police, Public Works, and other critical public buildings).	Flood, Hurricane and High winds, Tornado, Winter	1.1	Moderate	Local NCEM	ADMIN	Unchanged Ongoing
P-13	Maintain major town transportation routes through snow and ice removal including experimenting with brine in 2004.	Severe Winter Storms	1.1 2.2	Moderate	Local	PW	Unchanged Ongoing
P-14	On a regular basis, continue to back-up information pertaining to Town government in case of an emergency.	Flood, Hurricane and High winds, Tornado, Winter, Dam	1.1 1.3 2.2	Moderate	Local	CIS	Unchanged Ongoing
P-15	Garner Transportation Plan – Continue to address disaster preparedness (evacuation) through road interconnectivity, paved roads, and widening of roads.	Flood, Hurricane and High winds, Tornado, Winter	1.1	Moderate	Local	PLAN PW	Unchanged Ongoing
P-17	Evaluate ways to amend landscape ordinance requirements regarding the maintenance of pervious	Flood	3.2	Moderate	Local	PLAN	Completed June 2007

*Town of Garner Hazard Mitigation Plan  
II. Mitigation Action Plan – June 24, 2004 (2006 Update)(2009 update)*

Action #	Action	Hazard	Objective(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Status/ Target Completion Date
	surface areas for natural stormwater water detention.						
	<ul style="list-style-type: none"> <li>There has been an informal practice to require this during site approval, particularly as it related to landscaping in BMP's</li> </ul>						Unchanged Ongoing
P-18	Incorporate Greenway Plan into Open Space Plan.	Flood	1.1	Moderate	Local	PLAN PR	Adopted April 2006
P-19	Incorporate requirement for open space set aside in residential and multi-family projects.	Flood	3.1	Moderate	Local	PLAN	Completed 2003
P-20	Develop for public dissemination building inspections brochures regarding high winds, water damage prevention, and tie downs for accessory structures.	Flood, Hurricane and High winds, Tornado, Winter	1.2	Moderate	Local	INSP	Completed August 2007
	The Town website was recently redesigned and this information was not included.						
P-21	Building Code - The Town administers a program upholding the 2002 International Building Code with North Carolina Amendments. These regulations provide guidance for design criteria for flood, roof snow load, winter design, wind speed, seismic design, weathering, frost line depth, termite infestation, and decay.	Flood, Hurricane and High winds, Tornado, Winter	1.1 2.1 4.1 5.1	High	Local	INSP	Unchanged Ongoing
P-22	Comprehensive Growth Plan - The Town has an existing Comprehensive Plan which includes Land Use, Parks and Recreation, Public Safety, Housing, Economic Development, Transportation, Public Utilities and Environment. This plan includes past and current conditions and sets goals for future needs of the Town.	Flood, Hurricane and High winds, Tornado, Winter, Wildfire, Dam	1.1 2.1 3.1 4.1	Moderate	Local	ALL	Adopted 2006
P-23	Land Use Plan - An existing tool which guides development based on proposed future land use designations, available services, and existing site features to ensure that future development is meeting	Flood, Hurricane and High winds,	1.1 2.1 3.1 4.1	High	Local	PLAN	Unchanged Ongoing

Action #	Action	Hazard	Objective(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Status/ Target Completion Date
	the overall vision of the Town while ensuring the safety of citizens.	Tornado, Winter, Wildfire, Dam					
P-24	Floodplain Development Regulations – Ordinance to minimize public and private losses due to flood conditions.	Flood	1.1 2.1 3.1 4.1	High	Local	ENG	Adopted April 2006
P-25	Floodplain Development Regulations - Town is a participating member of the National Flood Insurance Program and is considering actively participating in the Community Rating System to help monitor hazard mitigation efforts and to improve the affordability of flood insurance for citizens.	Flood	1.1 2.1 3.1 4.1	High	Local	ENG	Unchanged Ongoing
P-26	Open Space Preservation - The Town has an existing Open Space Master Plan which identifies and evaluates various land and open space resources throughout the ETJ and Urban Service areas of the Town. The Plan has been used to develop a prioritization system that is used by all Town departments to identify properties to acquire or require as open space.	Flood	1.1 2.1 3.1 4.1	High	Local State	PR	Unchanged Ongoing
P-27	Unified Development Ordinance (UDO) – Existing UDO regulates development to ensure safety from fire, panic and other dangers. The UDO provides for orderly growth and development within the Town and ETJ by determining appropriate land use and development standards.	Flood, Hurricane and High winds, Tornado, Winter, Wildfire, Dam	1.1 2.1 3.1 4.1 4.2	High	Local	PLAN	Unchanged Ongoing
P-28	The Town will inventory all its structures located within or immediately adjacent to known flood hazard areas.	Flood	1.1	Moderate	Local	PLAN ENG	Completed 2007
	<ul style="list-style-type: none"> <li>▪ The Town evaluated properties in 2008 and purchased flood insurance for those in flood prone areas</li> </ul>						
P-29	The Town will seek opportunities to use Federal grant resources to assist private property owners in elevating existing structures located within flood hazard zones.	Flood	1.2 2.1	Moderate	Local Federal	PLAN ENG	2007-09



Action #	Action	Hazard	Objective(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Status/Target Completion Date
	<ul style="list-style-type: none"> <li>Town pursued this but does not have a history of repetitive loss property</li> </ul>						Deferred
<b>Property Protection (PP)</b>							
PP-1	The Town has an ongoing service to respond to requests and questions from citizens regarding actions they may take to improve drainage, halt erosion, and to relocate, renovate or retrofit structures being flooded.	Flood	1.1 1.2	Moderate	Local Private	ENG	Unchanged Ongoing
PP-2	Minimum Housing Standards Ordinance - The Town has a program which inspects existing structures to ensure that they meet the minimum housing standards. Owners of structures that do not meet these requirements will be ordered to bring the structure up to minimum standards or have the structure demolished or removed.	Flood, Hurricane and High winds, Tornado, Winter	1.1 2.2	High	Local	INSP	Unchanged Ongoing
PP-3	Building Retrofit - The Town is willing to develop a plan to utilize Federal grant resources to assist private property owners in renovating and retrofitting existing structures.	Wind	1.1	Low	Local Federal	INSP	2008-2010
	<ul style="list-style-type: none"> <li>Thus far, have not had property owners to request this resource.</li> </ul>						Deferred
PP-4	Purchase of Open Space, Parks and Greenways - The Town works with Wake County and other agencies to find other funding for open space acquisition. Once funds are obtained the Town will acquire land consistent with Land Use and Master Open Space Plans.	Flood	2.1 3.1 3.2	Moderate	Local	PR	Completed 2007-2008
PP-5	Engineering Department will actively respond to flooding concerns from property owners after heavy rain events	Flood	1.2	Moderate	Local	ENG	Ongoing
PP-6	When feasible, Town of Garner will alleviate flooding into habitable space due to storm water, as consistent with Town Drainage Policy	Flood	1.2	Moderate	Local	ENG, TOWN COUNCIL	Ongoing

Action #	Action	Hazard	Objective(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Status/Target Completion Date
PP-7	Maintain a record of approved Letters of Map Change to continue compliance with NFIP	Flood	1.2	Moderate	Local	ENG	Ongoing
<b>Natural Resources (NR) Protection</b>							
NR-1	The Town has adopted cluster subdivision regulations and a recreation land dedication ordinance to enhance conservation efforts.	Flood, Hurricane and High winds, Tornado, Wildfire, Winter	1.1 3.1	High	Local	PLAN	Completed 1988
NR-2	Develop and adopt a conservation subdivision ordinance to help preserve significant natural features.	Flood, Hurricane and High winds, Tornado, Winter	3.1 4.1	Moderate	Local	PLAN	Completed 2007
	<ul style="list-style-type: none"> <li>▪ This will become a long term goal. The Cluster Subdivision meets a majority of the criteria.</li> </ul>						Deferred Long Term
NR-3	UDO 6.1.12 – Continue to require engineered stormwater controls including stream and wetland protection.	Flood, Dam	2.2 3.1 3.2	Moderate	Local	ENG, PLAN	Unchanged Ongoing
NR-4	Continue to work with the U.S. Army Corps of Engineers on wetland protection.	Flood	1.1 4.1	Moderate	Local	ENG, PLAN	Unchanged Ongoing
NR-5	Use Open Space Ordinance to protect wildlife habitat.	Flood, Hurricane and High winds, Tornado, Wildfire, Winter	1.1	Moderate	Local	PLAN	Unchanged Ongoing

Action #	Action	Hazard	Objective(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Status/ Target Completion Date
NR-6	Continue to utilize Wake County Erosion and Sedimentation Control to ensure proper erosion control procedures are followed before and during construction.	Flood, Dam	3.1	Moderate	Local	ENG, PLAN	Unchanged Ongoing
NR-7	Notify Wake County of any stream dumping instances.	Flood	3.1	Moderate	Local	ENG	Unchanged Ongoing
NR-8	Incorporate regulations for illicit discharge control in Phase II Stormwater Management Plan.	Flood	1.1	Moderate	Local	ENG	Completed July 2005
NR-9	Develop standards for tree protection and regulations governing clear cutting.	Flood, Wildfire	1.1 3.1	High	Local	PLAN	Completed 2003
NR-10	Best Management Practices (BMPs) - The Town will include in the stormwater management plan (being developed with the Town NPDES Phase II Program) BMPs that will address both water quality and water quantity management on sites.	Flood, Dam	2.1 3.1 3.2	Moderate	Local	ENG	June 2005
	<ul style="list-style-type: none"> <li>▪ Typical process for site plan approval</li> </ul>						Unchanged Ongoing
NR-11	Stream Dumping – In developing the NPDES Phase II Stormwater program, the Town will design and implement an illicit discharge program which will establish regulations against stream dumping.	Flood	1.1	Low	Local	ENG	Unchanged Ongoing
NR-12	Wetlands Protection - The Town has existing Riparian Buffer, Open Space, and Flood Damage Prevention ordinances that restrict development along streams and in the floodplain thus restricting development in much of the Town's wetland areas. Engineering Design Standards require that all impacts to wetlands be permitted by the U.S. Army Corps of Engineers and the NCDENR Division of Water Quality prior to issuance of a Land Disturbance Permit. The Town also has an existing program that ensures that structures, through review of the Building Permit application, are not constructed in the wetlands unless permitted by the appropriate Federal and State Agencies.	Flood	2.1 3.1 3.2	Moderate	Local	ENG PR INSP	Unchanged Ongoing

Action #	Action	Hazard	Objective(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Status/Target Completion Date
<b>Emergency Services (ES) Measures</b>							
ES-1	Identify priority Town facilities and provide access to one main entrance. Restore life safety and building systems as needed.	Flood, Hurricane and High winds, Tornado, Winter	1.1	High	Local FEMA	PW	2007
	<ul style="list-style-type: none"> <li>Town crews on standby during and after storms to clear roads and crucial Town facilities. Also, Town Hall and Police Station have standby generator for power outages</li> </ul>						Unchanged Ongoing
ES-2	Develop a Business Continuity Plan that is the primary document housing all disaster related plans and procedures including Hazard Mitigation Plan, Debris Management Plan, Multi-Hazard Plan as well as disaster response plans for all Town departments.	Flood, Hurricane and High winds, Tornado, Winter	1.1 1.3	High	Local	POL PW	June 2007
	<ul style="list-style-type: none"> <li>Formal disaster debris plan has not been completed. The challenge is securing a temporary debris storage site. Continue to discuss ways the Town can partner with Wake County.</li> </ul>						Deferred
ES-3	Emergency Operations Command Post Center – established when natural hazard imminent. Center coordinates evacuations, sheltering, staging areas for equipment, manpower, and needed supplies. Equipment includes internet access, telephone, wireless communications, radio and backup supplied by emergency batteries and/or generators.	Flood, Hurricane and High winds, Tornado, Winter, Wildfire	1.1 2.2	High	Local	POL	Unchanged Ongoing
ES-4	Health and safety maintenance – provide assistance with security and post storm clean-up.	Flood, Hurricane and High winds, Tornado, Winter	1.3	High	Local	POL PW EMS	Unchanged Ongoing

Action #	Action	Hazard	Objective(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Status/Target Completion Date
ES-5	Post disaster response – building inspections. Inspector team does post disaster damage assessment using FEMA guidelines.	Flood, Hurricane and High winds, Tornado, Winter	1.3	Moderate	Local	INSP	Unchanged Ongoing
ES-7	Continue to evaluate and improve response and recovery methods following each hazard event.	Flood, Hurricane and High winds, Tornado, Winter Storm, Wildfire	1.3 2.2	High	Local	POL	Unchanged Ongoing
ES-8	Tracking of Known Drainage, Erosion and Flooding Problems - The Town has a current program to track drainage complaints, flooding and erosion problems within the town limits and ETJ.	Flood	2.2	Moderate	Local	ENG	Unchanged Ongoing
ES-9	Mobile Command Post - Available 24 hours a day and equipped to communicate with all agencies in the Triangle including Emergency Management, State agencies, fire departments, etc. The Town will be upgrading this service.	Flood, Hurricane and High winds, Tornado, Winter, Wildfire	1.1 1.3 2.1	High	Local State	POL	Unchanged Ongoing
<b>Structural (S) Projects</b>							
S-1	The Town will continue to actively pursue stream restoration projects and will look for ways to expand the program through partnerships with various entities.	Flood	1.1 1.3	High	Local Regional State Federal	ENG	Unchanged Ongoing
S-2	Incorporate on-site retention/detention requirements for Phase II Stormwater Management Plan.	Flood	3.2	High	Local	ENG	June 2005
	<ul style="list-style-type: none"> <li>Phase II plan approved by NC Department of Environment and Natural Resources in November 2010. Waiting for comment period to end.</li> </ul>						Updates Ongoing

Action #	Action	Hazard	Objective(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Status/Target Completion Date
<b>Public Information (PI) Activities</b>							
PI-1	Stormwater staff provides flood information through call-in or e-mail program to any inquirer. County requires that flood zone information be shown on all plats recorded within the Town planning jurisdiction.	Flood	1.2 4.2	High	Local	ENG	Unchanged Ongoing
PI-2	Town website will be updated to answer citizen questions about flood hazards, flood safety, availability of flood insurance, stormwater regulations, and other information.	Flood	1.2	Moderate	Local	ENG	July 2007 Deferred to July 2011
	<ul style="list-style-type: none"> <li>Engineering department will add storm water and floodplain information to the website</li> </ul>						Deferred December 2011
PI-3	Town website will be updated with public access to information pertaining to evacuation routes, emergency contact numbers, and detailed weather reports in case of emergency.	Flood, Hurricane and High winds, Tornado, Winter, Wildfire	1.1 1.3	Moderate	Local	CIS	July 2007
	<ul style="list-style-type: none"> <li>Since this activity is headed by Wake County Emergency Management, the Town will include a link on its website.</li> </ul>						July 2007- Deferred 2011
PI-4	Continue to update flood hazard maps to reflect new subdivisions, changes in corporate limits, and any new DFIRM data as provided by the County	Flood	1.1 3.2	Moderate	Local	ENG, PLAN	Completed 2004
	<ul style="list-style-type: none"> <li>Flood plain maps updated. Garner saw little to no change in base flood elevations.</li> </ul>						
PI-5	Planned park land purchase – nature park to include trails and environmental education center.	Flood	1.2	High	Local Wake Co	PR POSE	July 2008
	<ul style="list-style-type: none"> <li>Town completed development of White Deer Park in October 2009. It has a LEED certified Nature Center that focuses on environmental education. It preserves open space and has several BMP's for water quality and quantity.</li> </ul>				Local State Grant	PR	Completed October 2009

Action #	Action	Hazard	Objective(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Status/Target Completion Date
PI-6	Maintain floodplain maps for public use and produce other maps as needed.	Flood	1.2	Moderate	Local	ENG	Unchanged Ongoing
PI-7	Develop and maintain a hazard mitigation section on the Town website.	Flood, Hurricane and High winds, Tornado, Winter, Wildfire, Dam	1.2	Moderate	Local	ADMIN CIS	Completed June 2005
	<ul style="list-style-type: none"> <li>The Town website was recently redesigned and a hazard mitigation section was not included. However, the Hazard Mitigation Plan has been posted on the Town website. A separate section will be created and information added.</li> </ul>					ENG	Deferred December 2011
PI-8	Collect educational materials on disaster preparedness and display at public library and local government offices.	Flood, Hurricane and High winds, Tornado, Winter, Dam	1.2	High	Local	ADMIN	June 2005
	<ul style="list-style-type: none"> <li>The Town posts the "Ready Wake" brochures created by Wake County in Town Hall buildings during hurricane season</li> </ul>					ADMIN	Unchanged Ongoing
PI-9	Map Information - The Town maintains current FIRM maps/studies for Town limits and ETJ. Town also maintains current land use, structure, and development maps. All maps are available for public use.	Flood, Wildfire	4.1	High	Local	ENG PLAN	Unchanged Ongoing
PI-10	Website - The Town maintains its own website which is able to provide up to date information for the public. Town continuously updates the site with additional resources.	Flood, Hurricane and High winds, Tornado, Winter, Wildfire, Dam	1.2	High	Local	COUNCIL CIS ALL DEPTS.	Unchanged Ongoing

Action #	Action	Hazard	Objective(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Status/Target Completion Date
PI-11	Website- Create link to Wake County Hazard Mitigation Plan.	Flood, Hurricane and High winds, Tornado, Winter, Wildfire, Dam	1.2	Moderate	Local	CIS	2006
	<ul style="list-style-type: none"> <li>▪ Link will be created when 2009 Town of Garner Hazard Mitigation Update is approved</li> </ul>						Deferred December 2011



## **III. Plan Implementation**

### **A. Process**

The Town of Garner Hazard Mitigation Plan will be implemented through the delegation of assignments as specified in section II. Mitigation Action Plan. Each implementation action includes the assignment of responsibility to specific Town departments along with the establishment of a target date for completion for each activity.

It will be the responsibility of Town Manager to ensure that these strategies are addressed by the target completion dates unless reasonable circumstances, e.g., lack of funding, prevent timely implementation. In the case where a target date is not met, the reason for such failure to complete the activity in a timely manner will be noted in the annual progress report.

### **B. Funding Sources**

Although in the long term hazard mitigation actions will save money by avoiding the loss of lives or property damages, in the short term each action will have an associated cost. The Town of Garner will rely heavily on local funding sources to fulfill most Plan obligations; however, the Town will also seek funds from interested State and Federal agencies for both pre- and post-disaster activities. A short description of major disaster assistance programs is included below. More detail on organizations and programs providing funding is included in Appendix D Federal and State Resources.

#### **Federal Programs**

##### **Pre-Disaster Mitigation Program – Federal Emergency Management Agency**

The Disaster Mitigation Act of 2000 created a national program to provide a funding mechanism that is not dependent on a Presidential disaster declaration. The Pre-Disaster Mitigation (PDM) Program provides funding to states and communities for cost-effective hazard mitigation activities that complement a comprehensive mitigation program and reduce injuries, loss of life, and damage of property.

The funding is based on a 75% Federal share plus a 25% non-Federal share of costs. The non-Federal match can be fully in-kind or cash or a combination of the two. Special accommodations are made for small and impoverished communities who are eligible for 90% Federal share plus 10% non-Federal.

##### **Flood Mitigation Assistance Program – Federal Emergency Management Agency**

The Flood Mitigation Assistance Program (FMAP) was established by the National Flood Insurance Reform Act of 1994. This program provides grants for cost effective measures to reduce or eliminate the long-term risk of flood damage to existing structures, with an emphasis on sites that historically have been subject to repetitive losses under the National Flood Insurance Program (NFIP). These grants are also available for planning assistance to identify flood risks and actions to reduce that risk, to provide a process for approving flood mitigation plans, and to provide grants to implement measures to decrease flood losses.

Examples of projects that are eligible for grants under this program include elevating or flood proofing pre-FIRM structures, i.e., structures that were brought into the regulatory floodplain by a revision of the Flood Insurance Rate Maps, to acquire land or structures in flood hazard areas, to relocate or demolish existing structures, to construct detention or retention ponds to aid in the control of flood waters, to flood proof sewer systems, to modify drainage culverts and to obtain technical assistance, (e.g., hiring a professional consultant).

### **Hazard Mitigation Grant Program (HMGP) - Federal Emergency Management Agency**

The Hazard Mitigation Grant Program (HMGP) provides funding for mitigation measures following a Presidential disaster declaration. The HMGP is funded in most part by the Federal government and administered by state governments. FEMA can fund up to 75% of project costs and the State or local share can be cash or in-kind services.

HMGP funds can be used for projects such as acquisition or relocation of structures from hazard prone areas, retrofitting of existing structures to protect them from future damages, and development of state or local mitigation standards designed to protect buildings from future damages, comprehensive state and local mitigation plans, structural hazard control, and the purchase of equipment to improve preparedness and response.

### **Public Assistance (Infrastructure) Program – Federal Emergency Management Agency (Section 406)**

The Public Assistance (PA) Program provides funding to local governments following a Presidential disaster declaration. Funds may be used for mitigation activities in conjunction with the repair of damaged public facilities and infrastructure. Mitigation activities must be related to eligible disaster-related damages and must directly reduce the potential of future disaster damages.

Projects are evaluated for cost effectiveness, technical feasibility, and compliance with statutory, regulatory and executive order requirements. The evaluation must ensure that the mitigation measures do not negatively impact facility operation or risk from another hazard.

### **Small Business Administration Disaster Assistance Program - U.S. Small Business Administration**

The Small Business Administration (SBA) Disaster Assistance Program provides low-interest loans to businesses following a Presidential disaster declaration. The loans target businesses with repair and replacement of uninsured property damages including real estate, machinery and equipment, inventory, and supplies. Businesses and non-profit organizations are eligible.

### **Community Development Block Grants - U.S. Department of Housing and Urban Development**

The Community Development Block Grant (CDBG) program assists communities in rehabilitating substandard dwelling structures and in expanding economic opportunities, primarily for low-to-moderate-income families. However, as a result of a Presidential disaster declaration, CDBG funds may be used for long-term needs such as acquisition, reconstruction, and redevelopment of disaster-affected areas.

## **State Programs**

### **Statewide Floodplain Mapping Initiative**

The State of North Carolina, through the Federal Emergency Management Agency's Cooperating Technical Community partnership initiative, has been designated as a Cooperating Technical State (CTS). As a CTS, the State will assume primary ownership and responsibility for Flood Insurance Rate Maps (FIRMs) for all North Carolina communities. The Statewide Floodplain Mapping Initiative project will include conducting flood hazard analysis and producing updated, digital FIRMs (DFIRMs).

The State began acquiring raw elevation data for the Cape Fear, Lumber, Neuse, Pasquotank, Tar-Pamlico, and White Oak river basins in December 2000. This first phase of mapping will address these six river basins, which were the basins most impacted by Hurricane Floyd. These six river basins account for approximately one-half of the area of the State, impact 48 counties and 334 incorporated municipalities, and encompass over 21,000 miles of streams and rivers.

The data being collected will be used to develop Digital Elevation Models (DEMs) and updated flood hazard data and to produce draft DFIRMs for the affected counties and communities. Draft DFIRMS for the Neuse and Tar-Pamlico River basins were provided in March 2003, and are scheduled for adoption in September 2003.

This updated flood hazard data will provide current, accurate information for communities and property owners to make sound locating and design decisions when building new structures and infrastructure and when retrofitting existing structures. If consistently used by communities for floodplain management, this information should help to dramatically reduce future flood losses in North Carolina.

### **Water and Sewer Grant Programs - NC Rural Economic Development Center, Inc.**

The Rural Center administers three programs that assist rural communities with development of public water and sewer systems needed to support local economic growth and to ensure a reliable supply of clean water. The programs are funded by appropriations from the NC General Assembly and through proceeds from Clean Water Bonds approved by voters in November 1998.

1. The Supplemental Grants Program enables local governments and qualified non-profit organizations to improve local public water and sewer systems. Projects may address public health, environmental and/or economic development critical needs. Rural Center funds must be used to match other project funds from local or other sources. The maximum grant amount is \$400,000.
2. The Capacity Building Grants Program provides funding for local governments to undertake planning efforts that support strategic investments in public water and sewer facilities. Funds typically are used to prepare preliminary engineering reports, master water and sewer plans, capital improvement plans, water and sewer feasibility studies, rate studies and grant applications. The maximum grant amount is \$40,000.

3. The Unsewered Communities Grants Program provides funding for the planning and construction of new publicly owned sewer systems. Qualified communities must be unserved by wastewater collection or treatment systems. Unsewered communities grants are designed to cover 90% of the total project costs, but grants can not exceed \$3 million.

#### **Clean Water Management Trust Fund - CWMTF Board of Trustees**

The Clean Water Management Trust Fund was created in 1996 for the purpose of making grants to local governments, state agencies, and conservation non-profit organizations to help finance projects that address water pollution. CWMTF will fund projects that 1) enhance or restore degraded waters; 2) protect unpolluted waters; and/or 3) contribute toward a network of riparian buffers and greenways for environmental, educational, and recreational benefits.

The program is funded annually through a portion of unreserved credit balance in the NC General Fund for a minimum of \$30 million per year. The CWMTF Board of Trustees, an independent body of 18 members, has responsibility for allocation of fund revenues.

#### **CAMA Local Planning and Management Grants Program - NC Department of Environment and Natural Resources, Division of Coastal Management**

The NC Division of Coastal Management assists local governments within the designated 20 coastal counties with local land use planning and management projects through the CAMA Local Planning and Management Grants Program. Eligible projects include new or updated CAMA land use plans, implementation projects, land use ordinances, beach or waterfront access plans, stormwater management plans, hazard mitigation plans, and capital facilities plans.

#### **Water Resources Development Grant Program - NC Department of Environment and Natural Resources, Division of Water Resources**

The Water Resources Development Grant Program funds can be used as the non-Federal share of water resources development projects. Eligible projects include 1) general navigation projects; 2) recreational navigation projects; 3) flood control and water drainage projects; 4) stream restoration; 5) protection of privately owned beaches with public access; 6) land acquisition and facility development for water-based recreation; and 7) aquatic weed control projects.

#### **Natural Heritage Trust Fund**

The Natural Heritage Trust Fund was established in 1987 and is funded by 25% of the annual state deed excise stamp tax revenues and a portion of personalized license plate sales. The fund is managed by the Board of Trustees and the Natural Heritage Program in the Division of Parks & Recreation (DPR) in the Department of Environment & Natural Resources (DENR). Since 1987, 332 applications have requested \$176 million. \$80.6 million has been awarded for 1 project to help protect 145,000 acres of land. (<http://ils.unc.edu/parkproject/heritage/nhtf.html>).

### **NC Parks and Recreation Trust Fund (NCPARTF)**

The NC Parks and Recreation Trust Fund was established in 1993 and is funded by 75% of the annual state deed excise stamp tax revenues. State parks receive 65%; local parks, 30%; beaches & waterfronts, 5%; and administration, 3%. Approximately \$22 million is available each year. The program is managed by the Board of the Parks & Recreation Authority and the Division of Parks & Recreation (DPR) in DENR.

Since 1995, local governments have submitted 549 applications requesting over \$76 million for capital improvements and land acquisition. The Parks & Recreation Authority has approved 226 projects for a total of \$33.7 million. Over 1400 acres have been added to local parks. The Authority has approved 140 state park land acquisition and facility projects for a total of \$71.7 million. PARTF has funded the addition of 8,466 acres to the State Park System. (<http://ils.unc.edu/parkproject/partfund>).

### **Land and Water Conservation Fund (LWCF)**

The Land and Water Conservation Fund was established in 1964 to provide for funding for federal land acquisition and to provide matching grants for state and local governments to acquire parkland. The federal government allocated \$2.9 million to North Carolina for this program in fiscal year 2002-03 with 60% being reserved for local governments and the remaining 40% for State government.

### **National Recreation Trails Program**

The National Recreation Trails Program provides funds to federal, state and local governments and for non-profit organizations for the acquisition of land for trails, and for the development and maintenance of a trail system. The State of North Carolina was allocated \$1.1 million in fiscal year 2002-03 from this program which is managed by the US Department of Transportation.

### **Million Acres Initiative**

When the Million Acre Initiative began in January 1999, approximately 2.8 million acres — 9% of the state — were permanently protected in North Carolina. At least 112,000 additional acres were permanently protected during the initiative's first two years. Upon reaching the million acre goal in 2009, North Carolina will contain at least 3.8 million acres of land that are permanently protected through the federal, state and local governments, and private, nonprofit groups. One of the stated objectives of protecting open space is to “reduce the risk to people and (property) from flooding”.

### **Conservation Income Tax Credit**

Established in 1983, the Conservation Income Tax Credit provides a 25% income tax credit for donations of land or easements for conservation purposes. The donor's tax filing must be accompanied by a Certificate of Conservation Benefit from the Department of Environment & Natural Resources (DENR). As of August 2001, approximately 400 individual and corporate property owners had donated 82,000 acres of land or conservation easements worth an estimated \$165 million at a cost to the State of \$26 million (<http://ncctc.enr.state.nc.us/>).

### **North Carolina Farmland Preservation Program**

The NC Farmland Preservation Program was established in 1986 and is funded by appropriates from the NC General Assembly. The program is managed by the NC Department of Agriculture and Consumer Services and contracted to the Conservation Trust for N.C (CTNC). The General Assembly has appropriated \$2.45 million to the program since 1998. The 2001 appropriation of \$200,000 was expended on nine grants awarded to help local land trusts and counties with farmland protection programs work with farm families to arrange permanent conservation easements on over 4,270 acres and large parts of 30 farms. These grants have leveraged over \$20 million from other private and public funding sources and donations of development rights from farm owners. ([www.info@ctnc.org](mailto:www.info@ctnc.org) or [www.ctnc.org](http://www.ctnc.org) ).

### **Conservation Grants Fund**

The Conservation Grants Fund program was created in 1997 for the purpose of providing subsidies to non-profit land trusts to aid in transaction costs related to the donation of land, and to provide for staff and volunteer training. This program has never been funded.

### **Local Sources**

Local governments (counties and municipalities) depend upon local property taxes as their primary source of revenue. Property taxes are typically used to finance services that must be available and delivered on a routine basis to the general public, e.g., counties – social services, schools, etc.; municipalities – water, sewer, solid waste management. If local budgets allow, these funds can also be used for other purposes in the general public interest which would include programs to further hazard mitigation planning. Local funds are most effective when used as local match for Federal and State grant programs.

### **Non-Governmental Sources**

Another potential but typically less available source of funds for implementing local hazard mitigation projects are monetary contributions from non-governmental organizations such as private sector companies, churches, charities, community relief funds, the Red Cross, hospitals, land trusts and other non-profit organizations interested in the environment or the plight of persons affected by disasters.

## IV. Plan Review and Update

Periodic monitoring and reporting of progress is required to ensure that Plan goals and objectives are kept current and that local mitigation efforts are being accomplished. The Town of Garner Hazard Mitigation Plan shall be reviewed annually or more often as the local situation may require following a disaster declaration to ensure that progress is being made on achieving stated goals and objectives. The Plan will also undergo periodic evaluation and update as required by FEMA and the State.

### **A. Annual Review/Progress Report**

The Town Manager or designee shall take responsibility for conducting the annual review. The annual review shall include the solicitation of comments from affected Town departments through re-initiation of the hazard mitigation team planning process utilized during development of the Plan. Other interested parties and the general public will be notified through a variety of media, including but not limited to, local newspapers, the Town of Garner website ([www.garnernc.gov](http://www.garnernc.gov)), and mailed or emailed notices, of the review process and the opportunity to comment on the Plan report.

The annual review shall ensure:

1. That the Town Council receives an annual report and/or presentation on the progress of Plan implementation. The report will include a status report on the implementation of mitigation actions.
2. That the Town of Garner Council receives an annual report and/or presentation on the progress of Plan implementation along with a recommendation from the Council regarding on-going implementation of the Plan.
3. The annual report will include an evaluation of the effectiveness and appropriateness of the mitigation actions included in the Plan. Specifically, the report will attend to the following questions:
  - a. Do Plan goals and objectives continue to address current and expected conditions?
  - b. Has the nature or magnitude of risks changed?
  - c. Are current resources sufficient and appropriate for Plan implementation?
  - d. Are there any implementation problems, i.e., technical, political, legal or coordination issues with other agencies?
  - e. Are implementation outcomes as expected?
  - f. Have other agencies and partners participated as proposed?
4. The annual report will recommend, as appropriate, any necessary revisions or amendments to the Plan.

If the Town Board determines that the recommendations warrant amendment of the Plan, the Board may initiate an amendment through the process described below.

## **B. Plan Review and Update**

Periodic evaluation and revision of the Plan will help ensure that local mitigation efforts include the latest and most effective mitigation techniques. These periodic revisions may also be necessary to keep the Plan in compliance with Federal and State statutes and regulations. The Plan will need to be updated to reflect changes, such as new development in the area, implementation of mitigation efforts, revisions of the mitigation processes, and changes in Federal and State statutes and regulations.

In the context of a Federal disaster declaration, State and local governments are allowed to update or expand an existing plan to reflect circumstances arising out of the disaster. An updated plan in this circumstance might include a re-evaluation of the hazards and the jurisdiction's exposure to them, a re-assessment of existing mitigation capabilities, and new or additional mitigation recommendations.

The Plan shall be reviewed at a minimum every five (5) years to determine if there have been any significant changes that would affect the Plan. Increased development, increased exposure to certain hazards, the development of new mitigation capabilities or techniques, and changes to Federal or State legislation may affect the appropriateness of the Plan.

### **Review of the Plan**

The procedure for reviewing and updating the Plan shall begin with a report prepared by the Town Manager or other staff member in charge. This report shall include a summary of progress on implementation of hazard mitigation actions and a recommendation, as appropriate, for any changes or amendments to the Plan.

The review shall include an evaluation of the effectiveness and appropriateness of the Plan. Specifically, the evaluation shall involve a review of the consistency of day-to-day land use decisions to determine if the hazard mitigation policies are being implemented. The review shall recommend if plan amendments are warranted and if any revisions to regulatory tools (zoning, subdivision regulation, etc.) are necessary to assist in implementing the policies of the Plan.

If the Town Council determines that such a report raises issues that warrant modification of the Plan, the Council may initiate an amendment as delineated below, or may direct the Town Manager to undertake a complete update of the Plan.

### **Procedure for Amending the Plan**

An amendment to the Plan shall be initiated by the Town Council either at its own initiative or upon the recommendation of the Town Manager or any other person or agency who demonstrates that an amendment should be considered.

Upon initiation of a text or map amendment, the Town Manager or staff member in charge shall re-convene the Hazard Mitigation Planning Team. The team shall include representatives of all affected Town departments. Other interested parties as identified through public announcements via newspapers and the Town website ([www.garnernc.gov](http://www.garnernc.gov)), shall also be invited to be a part of the review process. The team will consider and reach consensus on any proposed amendment(s). The proposed amendment/update of the plan shall be forwarded to all affected parties, including, but not limited to, Town departments and other interested agencies such as Wake County and the North Carolina Division of Emergency Management for a forty-five (45)-day review and comment period.



At the end of the comment period, the proposed amendment shall be forwarded along with all review comments to the Town Council for consideration. If no comments are received from the reviewing department or agency within the specified review period, such shall be noted in the report to the Council.

#### **Town Council Review**

The Town Council shall review the proposed amendment, the report and recommendation, and any comments received from other departments and agencies. In deciding whether to hold a public hearing prior to approving or denying the amendment request, the Town Council shall consider whether or not the proposed amendment is necessary based upon one or more of the following factors:

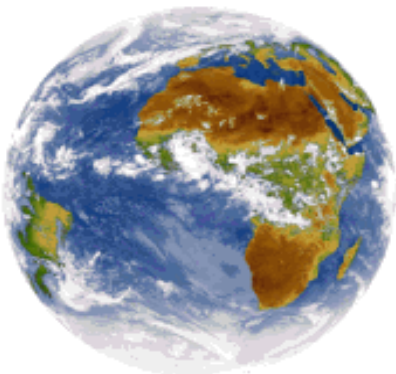
- a) There are errors or omissions made in the identification of issues or needs during the preparation of the original Plan;
- b) New issues or needs have been identified which were not adequately addressed in the original Plan;
- c) There has been a change in projections or assumptions from those on which the original Plan was based.

#### **Town Council Approval**

The Council shall hold a public hearing to receive oral and written comments from the general public. No sooner than two weeks following the public hearing, the Council shall take one of the following actions:

- a) Adopt the proposed amendment as presented or with modifications.
- b) Deny the proposed amendment.
- c) Refer the amendment request back to the Town Manager for further consideration.
- d) Defer the amendment request for further consideration and/or hearing.

## Appendix A: Hazard Identification and Analysis



### A. Introduction

The development of a hazard mitigation plan consists of five steps – 1) identification and analysis of natural hazards that could impact the community, 2) assessment of the community's vulnerability to natural hazards, 3) assessment of the community's capability to respond to a natural disaster, 4) assessment of the community's current policies and ordinances that affect hazard mitigation, and 5) development of hazard mitigation strategies that can be implemented to reduce future vulnerability. (Source: Natural Hazard Center, Pennsylvania State University)

This section includes a description and history of natural hazard events that are known to have specifically affected the Town of Garner. Where specific data on hazard events in Garner were not available, the Wake County hazard history was included for hazards that typically have a countywide impact, e.g., hurricanes/high winds, severe winter weather, etc. Primary data sources are two national databases - the National Climatic Data Center (NCDC - <http://www4.ncdc.noaa.gov/cgi-win/wwcqi.dll?wwEvent~Storms>) and the Spatial Hazard Events and Losses Database for the United States (SHELDUS\* - [http://go2.cla.sc.edu/hazard/db\\_registration](http://go2.cla.sc.edu/hazard/db_registration)). All historical data searches were conducted for the period as early as 1950 to as late as 2010. Where no information on injuries and deaths or property and crop damages is included, the information was not available from these resources.

\*Note: SHELDUS information concerning certain hazards causing fatalities and injuries are in decimal form. Casualties and damages are often listed without specific spatial reference, for instance severe thunderstorms affected Central NC. In order to assign the damage amount to a specific county, SHELDUS divides the total number of fatalities or injuries by the number of counties affected. For example, if a severe thunderstorm affected Chatham, Durham, Wake, and Johnston counties and resulted in 1 fatality, each county would receive a 0.25 rating.

As required by FEMA, all twelve potential hazards that could affect the Town of Garner are profiled in this section of the Plan. The Town of Garner Composite Hazard Index Table (Table A-25) includes those hazards that were categorized as either "moderate" or "high" risk based on a review of all seven hazard histories.

1. Dam Failures
2. Droughts and Heat Waves
3. Floods
4. Hurricanes and High Winds
5. Severe Storms and Tornadoes
6. Wildfires
7. Winter Storms and Freezes

### B. Hazard Analysis - Evaluation Method

The purpose of the hazard analysis is to evaluate the likelihood of experiencing each specific natural hazard in the future, and an estimation of likely intensity and probable level of impact. Each natural hazard was evaluated for three characteristics:

1. Likelihood of Occurrence, i.e., expected frequency;
2. Likely Range of Impact, i.e., predictable size and location of impact; and
3. Probable Level of Impact, i.e., estimated strength and damage potential.

**Likelihood of Occurrence**

The likelihood, or frequency, of occurrence of a particular hazard within a specific jurisdiction will be classified in one of four categories. These four categories are explained in Table A - 1.

**Table A-1: Explanation of Hazard Likelihood of Occurrence**

<b>Likelihood</b>	<b>Frequency of Occurrence</b>
Highly Likely	Near 100% probability in the next year.
Likely	Between 10% and 100% probability in the next year or at least one chance within the next ten years.
Possible	Between 1% and 10% probability in the next year, or at least one chance in the next 100 years.
Unlikely	Less than 1% probability in the next year, or less than one chance in the next 100 years.

*Source: "Keeping Natural Hazards from Becoming Disasters", NC Division of Emergency Management, November 2001, p. 11.*

**Likely Range of Impact**

The Town of Garner is equally affected by each of the identified hazards, with the exception of Floods, Wildfires, and Dam Failure. The areas at risk of Floods, and Dam Failure are identified in Map A-1 Multi-Hazard in Appendix F. The floodway and floodplain are designated on the map. The areas designated as farm, agriculture or vacant on Map B-2 Land Use, Appendix F are at higher risk for wildfires. The likely range of impact, or predictable size and location, of a particular hazard within a specific jurisdiction will be classified in one of three categories. These three categories are described in Table A-2.

**Table A-2: Description of Likely Range of Impact**

<b>Size of Area</b>	<b>Description</b>
Small	10% or less of the total jurisdictional area
Medium	10% to 40% of the total jurisdictional area
Large	40% to 100% of the total jurisdictional area

*Source: "Keeping Natural Hazards from Becoming Disasters", NC Division of Emergency Management, November 2001, p. 11.*

### **Probable Level of Impact**

The probable level of impact, or estimated strength and damage potential, of a particular hazard within a specific jurisdiction will be classified in one of four categories as described in Table A-3.

**Table A-3: Description of Hazard Probable Level of Impact**

<b>Level</b>	<b>Area Affected</b>	<b>Impact<sup>1</sup></b>
Catastrophic	More than 50%	<ul style="list-style-type: none"><li>• Multiple deaths.</li><li>• Complete shutdown of facilities for 30 days or more.</li><li>• More than 50% of property is severely damaged.</li></ul>
Critical	25 to 50%	<ul style="list-style-type: none"><li>• Multiple severe injuries.</li><li>• Complete shutdown of critical facilities for at least 2 weeks.</li><li>• More than 25% of property is severely damaged.</li></ul>
Limited	10 to 25%	<ul style="list-style-type: none"><li>• Some injuries.</li><li>• Complete shutdown of critical facilities for more than 1 week.</li><li>• More than 10% of property is severely damaged.</li></ul>
Negligible	Less than 10%	<ul style="list-style-type: none"><li>• Minor injuries.</li><li>• Minimal quality of life impact.</li><li>• Shutdown of critical facilities and services for 24 hours or less.</li><li>• Less than 10% of property is severely damaged.</li></ul>

Source: "Keeping Natural Hazards from Becoming Disasters", NC Division of Emergency Management, November 2001, p. 12.

<sup>1</sup> The impact of a natural hazard is a combination of the severity of the occurrence, the magnitude of the event, and the density of human activity in the affected area.

**Composite Hazard Index**

These three sets of classification categories - likelihood of occurrence, likely range of impact, and probable level of impact – have been combined to create a composite hazard index for each natural hazard. The combined hazard index describes vulnerability in general terms of “low”, “moderate” or “high” hazard susceptibility. An individual hazard index is developed at the end of each of the twelve hazard sections. Table A-25 at the end of Appendix A is a composite of the twelve hazard index scores.

**Table A-4: Composite Hazard Index Rating<sup>1</sup>**

Size of area	Small (1)	Medium (2)	Large (3)	Small (1)	Medium (2)	Large (3)	Small (1)	Medium (2)	Large (3)	Small (1)	Medium (2)	Large (3)
Likelihood of Occurrence / Impact	Catastrophic (4)			Critical (3)			Limited (2)			Negligible (1)		
Highly Likely (4)	9 High	10 High	11 High	8 Moderate	9 High	10 High	7 Moderate	8 Moderate	9 High	6 Moderate	7 Moderate	8 Moderate
Likely (3)	8 Moderate	9 High	10 High	7 Moderate	8 Moderate	9 High	6 Moderate	7 Moderate	8 Moderate	5 Low	6 Moderate	7 Moderate
Possible (2)	7 Moderate	8 Moderate	9 High	6 Moderate	7 Moderate	8 Moderate	5 Low	6 Moderate	7 Moderate	4 Low	5 Low	6 Moderate
Unlikely (1)	6 Moderate	7 Moderate	8 Moderate	5 Low	6 Moderate	7 Moderate	4 Low	5 Low	6 Moderate	3 Low	4 Low	5 Low

<sup>1</sup> Each variable was assigned a number from 1 (lowest) to 3 or 4 (highest) rating. A score from 9 to 11 is a “high hazard risk”; from 6 to 8 “moderate hazard risk”; and from 3 to 5 “low hazard risk”.

## **C. Natural Hazards Identification and Analysis**



*(Dam failure following Hurricane Floyd, Fall 1999.  
Source: NC Division of Pollution Prevention and  
Environmental Assistance)*

### **1. Dam Failures**

#### **1.1 Dams**

There are approximately 80,000 dams listed in the National Inventory of Dams. This number includes impoundment structures greater than or equal to 25 feet in height or impounding 50 acre-feet (an acre-foot equals water 1 foot deep across one acre of land) or more of water, or structures above 6 feet in height whose failure would potentially cause damage downstream. Nine thousand dams nationwide have been designated as high hazard dams. For purposes of this report, dams meeting these criteria, shall be termed regulated dams.

The high hazard designation does not indicate the inherent stability or instability of a dam but instead measures the potential threat posed to downstream populations in the event of a dam failure.

#### **Background Information on Dams**

Dams provide a life-sustaining resource to people in all regions of the United States. Unlike most infrastructure, dam owners are solely responsible for the safety and the liability of the dam and for financing upkeep, upgrade and repair. While most infrastructure facilities (roads, bridges, sewer systems, etc.) are owned by public entities, the majority of dams in the United States are privately owned. Across the nation, about 58% of dams are privately owned, 16% are owned by local governments, 4% by states, and the rest by the federal government and public utilities.

Manmade dams are classified according to the type of construction material used, the methods used in construction, the slope or cross-section of the dam, the way the dam resists the forces of water pressure, the means used for controlling seepage and, occasionally, according to the purpose of the dam.

The materials used for construction of dams include earth, rock, tailings from mining or milling, concrete, masonry, steel, timber, miscellaneous materials (such as plastic or rubber) and any combination of these materials. Embankment dams, the most common type of dam, are usually constructed of natural soil or rock or waste materials obtained from mining or milling operations. An embankment dam is termed an “earthfill” or “rockfill” dam depending on whether it is comprised of compacted earth or mostly compacted rock. The ability of an embankment dam to resist water

pressure is primarily a result of the mass, weight, type and strength of the materials from which the dam is made.

Overtopping of an embankment dam is very undesirable since embankment materials may be eroded away. Water normally passes through the main spillway or outlet works; it should pass over an auxiliary spillway only during periods of high reservoir levels and high water inflow. All embankment and most concrete dams have some seepage; however, it is important to control the seepage to prevent internal erosion and instability. Proper dam construction, maintenance, and monitoring of seepage provide this control.

Intentional release of water is confined to water releases through outlet works and spillways. A dam typically has a principal or mechanical spillway and a drawdown facility. Additionally, some dams are equipped with auxiliary spillways to manage extreme floods. Spillways ensure that the reservoir does not overtop the dam. Outlet works may be provided so that water can be drawn continuously, or as needed, from the reservoir. Outlets also provide a way to draw down the reservoir for repair or safety concerns. Water withdrawn may be discharged into the river below the dam, run through generators to provide hydroelectric power, or used for irrigation. Dam outlets usually consist of pipes, box culverts or tunnels with intake inverts near minimum reservoir level. Such outlets are provided with gates or valves to regulate the flow rate.

**Dam Classifications**

Dams are classified in one of three categories:

**Table A-5: Dam Hazard Classification**

Hazard Classification	Description of Potential Damage	Quantitative Guidelines
Low	Interruption of road service, low volume roads	Less than 25 vehicles/day
	<b>Economic damage</b>	<b>&lt; \$30,000</b>
Intermediate	Damage to highways, interruption of service	25 to less than 250 vehicles/day
	<b>Economic damage</b>	<b>\$30,000 &lt; \$200,000</b>
High	Loss of human life*	Probable loss of 1 or more human lives
	<b>Economic damage</b>	<b>&gt;\$200,000</b>
	*Probable loss of human life due to breached roadway or bridge on or below the dam.	250 vehicles/day at 1000 feet visibility 100 vehicles/day at 500 feet visibility 25 vehicles/day at 200 feet visibility

*Source: Dam Safety Program, NC Division of Land Resources.*

Note: Cost of dam repair and loss of services should be included in economic loss estimate if the dam is a publicly owned utility, such as a municipal water supply dam.

### **National Dam Safety Program**

The National Dam Safety Program Act, enacted in 1996, was established to improve dam safety by:

1. providing assistance grants to state dam safety agencies to improve regulatory programs;
2. funding research to enhance technical expertise as dams are built and rehabilitated;
3. establishing training programs for dam safety inspectors; and
4. creating a National Inventory of Dams.

The Act also requires FEMA to provide education to the public, to dam owners and to others about the need for strong dam safety programs, nationally and locally, and to coordinate partnerships among all players within the dam safety community to enhance dam safety.

### **North Carolina Dam Safety Program**

The NC Dam Safety Program conducts the following:

1. Inspect high hazard dams at least every two years; intermediate and low hazards at least every five years.
2. Notify dam owners of deficiencies found in the dams and needed maintenance or engineering and repairs.
3. Enforcement action if needed.
4. Review plans for construction of new dams, and repairs, modifications and decommissioning of existing dams.
5. Inspect during construction activities as resources permit.
6. Inspect prior to impoundment once construction is completed.
7. Inspect during and after extreme events such as floods.
8. Maintain databases and records of dams under state jurisdiction.

The U.S. Army Corps of Engineers is responsible for dams under federal jurisdiction, (e.g., Falls Lake Reservoir and Jordan Lake Reservoir) and for hydroelectric dams or cooling water dams for power plants.

### **Potential of Dam Failure**

Early in the 20<sup>th</sup> century, it was recognized that some form of regulation was needed after a number of dams failed due to lack of proper engineering and maintenance. Federal agencies, such as the Army Corps of Engineers and the Department of Interior, Bureau of Reclamation built many dams during the early part of the twentieth century and established safety standards during this time. It was not until a string of significant dam failures in the 1970s that awareness was raised to a new level among the states and the federal government.

Driving every other issue and all activities within the dam safety community is the risk of dam failure. Although the majority of dams in the U.S. have responsible owners and are properly maintained, many dams still fail every year. In the past several years, there have been hundreds of documented failures across the nation (this includes 250 after the Georgia Flood of 1994). Dam and downstream repair costs resulting from failures in 23 states reporting in one recent year totaled \$54.3 million.



Dam failures are most likely to happen for one of the following reasons:

- Structural failure of materials used in dam construction
- Cracking caused by movements like the natural settling of a dam
- Piping—when seepage through a dam is not properly filtered and soil particles continue to progress and form sink holes in the dam.

Property owners downstream often know nothing about the potential that an upstream dam has to cause devastation should it fail. Even if citizens understand and are aware of dams, they still can be overly confident in the infallibility of these manmade structures. Living in dam-break flood-prone areas is a risk. Many dam owners do not realize their responsibility and liability toward the downstream public and environment. Adequate understanding of proper dam maintenance and upgrade techniques is a typical problem among many owners across the United States.

### **History of Dam and Levee Failures in North Carolina**

The North Carolina Dam Safety Program has made use of National Dam Safety Program funds to create and implement the North Carolina Emergency Action Plan. The Plan was activated in 1999 during and after Hurricane Floyd and was instrumental in reducing response time in closing roads and evacuating persons from high-risk areas. Following Hurricane Floyd, no injuries were reported despite the failure of 36 dams (14 high hazard, 5 intermediate, and 12 low or unclassified dams). In the days and months following Hurricane Floyd, North Carolina dam safety personnel worked to ensure the safety of over fifty dams damaged by the hurricane. Dam owners, safety inspectors and local emergency management personnel monitored these dams asking owners to lower water levels and/or complete emergency repairs.

### **High Hazard Dams** (Map A-1: Garner Multi-Hazards Map; Appendix F)

There are five (5) high hazard dams within the Town of Garner’s planning jurisdiction (Table A-6). There is no record of dam failure in the Town of Garner. These dams are rated “high hazard” meaning that if a failure were to occur there is a probable loss of one or more human lives and property damage would probably exceed \$200,000.

**Table A-6: High Hazard Dams**

State ID	Name	Quadrangle	River Basin
Wake-034	Lake Benson	Garner	Neuse
Wake-305	Weston #1	Garner	Neuse
Wake-306	Weston #2	Garner	Neuse
Wake-342	Garner WW Lagoon #1	Garner	Neuse
Wake-343	Garner WW Lagoon #2	Garner	Neuse

Source: NCDENR Dam Inventory.

## **Hazard Analysis – Dam Failure**

### **Likelihood of Occurrence for Dam Failure**

Failure of a high hazard dam due to high rain precipitation or other hazardous events could result in significant damage to downstream properties and the possible loss of human life. The likelihood of a significant high hazard dam failure can be classified as “possible”.

### **Likely Range of Impact for Dam Failure**

The potential for serious dam failure is confined to a very limited area, thus the range of impact can be classified as “small”.

### **Probable Level of Impact for Dam Failure**

With limited possibility of occurrence and small exposure, the probable level of impact of dam failure in the Town of Garner can be categorized as “negligible”.

### **Town of Garner Hazard Index for Dam Failure**

The composite hazard index for dam failure for the Town of Garner is categorized as “low” based on a rating of “possible” occurrence, “small” range of impact, and “negligible” level of impact. This hazard index of “low” indicates that dam failure, especially given the regulation and inspection programs of the NC Dam Safety Program, poses a relatively low threat. Hazard mitigation efforts should continue to rely primarily on the State Dam Safety Program to discover and correct any potential failure problems and local efforts should be focused on higher risk hazards.

There have been no high hazard dam failures in the Town of Garner since the last update.



*(Source: National Drought Mitigation Center, University of Nebraska)*

## **2. Droughts and Heat Waves**

### **2.1 Droughts**

Droughts are not rare or random events but normal, recurrent features of climate. Droughts occur in virtually all climatic zones, but drought characteristics vary significantly from one region to another.

Drought is a temporary aberration and differs from aridity which is restricted to low rainfall regions and is a permanent feature of climate. Drought originates from a deficiency

of precipitation over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group, or environmental sector.

Drought should be considered relative to some long-term average condition of balance between precipitation and evapotranspiration (i.e.- evaporation + transpiration) in a particular area, a condition often perceived as “normal”. It is also related to the timing (i.e.- principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness (i.e.- rainfall intensity, number of rainfall events) of rain events. Other climatic factors such as high temperature, high wind, and low relative humidity are often associated with drought and can significantly aggravate drought severity.

The more recent understanding that a deficit of precipitation has different impacts on groundwater, reservoir storage, soil moisture, snowpack, and streamflow led to the development of the Standardized Precipitation Index (SPI) in 1993. The SPI was designed to quantify the precipitation deficit for multiple time scales. These time scales reflect the impact of drought on the availability of the different water resources. Soil moisture conditions respond to precipitation irregularities on a relatively short scale. Groundwater, streamflow, and reservoir storage reflect longer-term precipitation inconsistencies.

**Table A-7: Drought Magnitude Indices**

<b>SPI Values</b>	
2.0+	extremely wet
1.5 to 1.99	very wet
1.0 to 1.49	moderately wet
-.99 to .99	near normal
-1.0 to -1.49	moderately dry
-1.5 to -1.99	severely dry
-2 and less	extremely dry

(http://www.drought.unl.edu/whatis/indices.htm)

The Palmer Drought Severity Index can also be used to measure the extent of droughts. The **Palmer Drought Severity Index (PDSI)** (known operationally as the *Palmer Drought Index (PDI)*) attempts to measure the duration and intensity of the long-term drought-inducing circulation patterns. Long-term drought is cumulative, so the intensity of drought during the current month is dependent on the current weather patterns plus the cumulative patterns of previous months. Since weather patterns can change almost literally overnight from a long-term drought pattern to a long-term wet pattern, the PDSI (PDI) can respond fairly rapidly. (http://www.ncdc.noaa.gov/oa/climate/research/prelim/drought/palmer.html)

<b>Palmer Classifications</b>	
4.0 or more	extremely wet
3.0 to 3.99	very wet
2.0 to 2.99	moderately wet
1.0 to 1.99	slightly wet
0.5 to 0.99	incipient wet spell
0.49 to -0.49	near normal
-0.5 to -0.99	incipient dry spell
-1.0 to -1.99	mild drought
-2.0 to -2.99	moderate drought
-3.0 to -3.99	severe drought
-4.0 or less	extreme drought

(http://www.drought.unl.edu/whatis/indices.htm)

The greatest magnitude reported has been an Extreme Drought, which would be the greatest magnitude expected in a future event.

### **Sequence of Drought Impacts**

When drought begins, the agricultural sector is usually the first to be affected because of heavy dependence on stored soil water. Soil water can be rapidly depleted during extended dry periods. If precipitation deficiencies continue, then people dependent on other sources of water will begin to feel the effects of the shortage. Those who rely on surface water (reservoirs and lakes) and subsurface water (ground water), for example, are usually the last to be affected. A short-term drought that persists for 3 to 6 months may have little impact on these sectors, depending on the characteristics of the hydrologic system and water use requirements.

When precipitation returns to normal and meteorological drought conditions have abated, the sequence is repeated for the recovery of surface and subsurface water supplies. Soil water reserves are replenished first, followed by streamflow, reservoirs and lakes, and ground water. Drought impacts may diminish rapidly in the agricultural sector because of its reliance on soil water, but linger for months or even years in other sectors dependent on stored surface or subsurface supplies. Ground water users, often the last to be affected by drought during its onset, may be the last to experience a return to normal water levels. The length of the recovery period is a function of the intensity of the drought, its duration, and the quantity of precipitation received as the episode terminates.

### **Severe Droughts in the United States**

The period of drought that has been the most well documented in both text and photographs occurred in the 1930s when drought covered virtually the entire Plains area of the U.S. for almost a decade. The most common effect of droughts often involves large amounts of agricultural land. Crops were damaged by deficient rainfall, high temperatures, and high winds, as well as insect infestations and dust storms that accompanied these conditions. The resulting agricultural depression contributed to the Great Depression with bank closures, business losses, increased unemployment, and other physical and emotional hardships. Although records focus on other problems, the lack of precipitation would also have affected wildlife and plant life, and would have created water shortages for domestic needs.

Effects of the Plains drought sent economic and social ripples throughout the country. Millions of people migrated from the drought-stricken areas, often heading west, in search of work. These newcomers were often in direct competition for jobs with longer-established residents, which created conflict between the groups. In addition, because of poverty and high unemployment, migrants added to local relief needs, sometimes overburdening relief and health agencies.

To reduce the impact of future droughts, proactive measures were developed and implemented including an increase in conservation practices and irrigation, average farm size, and crop diversity. Federal crop insurance was established and the regional economy was diversified. Many other proactive measures taken after the 1930s drought also reduced rural and urban vulnerability to drought, including new or enlarged reservoirs, improved domestic water systems, changes in farm policies, new insurance and aid programs, and removal of some of the most sensitive agricultural lands from production.

**Table A-8: History of Drought in North Carolina and the U.S.**

<b>Year</b>	<b>Description</b>
1980	The drought/heat wave summer of 1980 caused over \$20 billion in damages to agriculture and related industries and an estimated 10,000 heat stress-related deaths in the United States.
1986	\$1 - \$1.5 billion in damages and an estimated 100 deaths nationwide.
1988	Over \$40 billion in damages and 5,000 to 10,000 deaths across central and eastern United States.
1993	During June-July 1993 most of the Southeast received less than 50% of normal rainfall along with temperatures 3 – 6 degrees above normal. Eighty-nine of the one hundred counties in NC were declared disaster areas. Crop losses for NC were estimated at \$165 million. During this period, North Carolina also recorded the second driest summer (June-August) on record (since 1895) with a statewide average precipitation of only 9.43 inches. The Raleigh-Durham area recorded the driest June on record with 0.33 inches of rain. Estimated damages for the United States exceeded \$1 billion in damages to agriculture and at least 16 deaths.
1998	Severe drought/heat wave from Texas/Oklahoma eastward to the Carolinas resulted in \$6 - \$9 billion in damages to agriculture and at least 200 deaths.
1999	Summer drought/heat wave of 1999 resulted in extensive agricultural losses estimated at over \$1.0 billion in damages and an estimated 502 deaths in the United States. The east coast was hardest hit by the drought, with record and near-record short-term precipitation deficits occurring on a local and regional scale resulting in agricultural losses and drought emergencies being declared in several states. Drought was especially severe in the mid-Atlantic states, where local water restrictions were in effect and drought emergencies were declared by several governors. February-August 1999 ranked as the fifth driest such period in the 105-year record.
2000	Severe drought and persistent heat over south-central and southeastern states caused significant losses to agriculture and related industries estimated at over \$4.0 billion in damages and 140 deaths.
2002	According to the National Climatic Data Center, moderate to extreme drought affected more than 45% of the United States June through August of 2002. Nationwide, the summer of 2002 was the third hottest on record after the summers of 1934 and 1936. The 12 months that ended with August 2002 were the driest on record for North Carolina. Local water restrictions were in effect throughout central and western North Carolina.
2007-2008	According to the National Climatic Data Center, exceptional to severe drought affected Wake County. Reservoirs and lake levels reached historical lows---depleting municipal water supplies. Water utility providers enacted mandatory water conservation restrictions for all customers and instituted fines for violators. The agricultural industry experienced low yield and lost revenues due to crop damage.

Source: National Climatic Data Center.



## **2.2 Heat Waves**

Heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of summer heat. Among large natural hazards, only the cold of winter -- not lightning, hurricanes, tornadoes, floods, or earthquakes -- takes a greater toll. In the 40-year period from 1936 through 1975, nearly 20,000

people in the United States were killed by the effects of heat and solar radiation. In the disastrous heat wave of 1980, more than 1,250 people died as a direct result of the heat wave. People at higher risk, e.g., with aging or diseased hearts, are especially susceptible to excessive heat. In recent years, the National Weather Service (NWS) has stepped up efforts to more effectively alert the general public and appropriate authorities to the hazards of heat waves and prolonged excessive heat/humidity episodes. (Source: National Oceanic and Atmospheric Administration (NOAA))

### **How Heat Affects the Body**

Human bodies dissipate heat by varying the rate and depth of blood circulation, by losing water through the skin and sweat glands, and -- as the last extremity is reached -- by panting, when blood is heated above 98.6 degrees. As heat rises, the heart begins to pump more blood, blood vessels dilate to accommodate the increased flow, and the bundles of tiny capillaries threading through the upper layers of skin are put into operation. Blood is circulated closer to the skin's surface, and excess heat drains off into the cooler atmosphere. At the same time, water diffuses through the skin as perspiration. The skin handles about 90 percent of the body's heat dissipating function. Sweating, by itself, does nothing to cool the body, unless the water is removed by evaporation -- and high relative humidity retards evaporation.

Heat disorders generally have to do with a reduction or collapse of the ability of the body to shed heat by circulatory changes and sweating, or a chemical (salt) imbalance caused by too much sweating. When heat gain exceeds the level the body can remove, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise and heat-related illness may develop.

Ranging in severity, heat disorders share one common feature: the individual has overexposed or over exercised for his/her age and physical condition in the existing thermal environment. Sunburn, with its ultraviolet radiation burns, can significantly retard the skin's ability to shed excess heat. Studies indicate that, other things being equal, the severity of heat disorders tend to increase with age -- heat cramps in a 17-year-old may be heat exhaustion in someone 40 and heat stroke in a person over 60.

**Heat Index**

The heat index, given in degrees Fahrenheit, is an accurate measure of how hot it really feels when the relative humidity is added to the actual air temperature (see Table A-9 Heat Index Chart). If the air temperature is 95°F (found on the left side of Table A-9), and the relative humidity is 50% (found at the top of Table A-9, the heat index - or how hot it really feels - is 106.7°F. This is at the intersection of the 95° row and the 50% column. Since heat index values were devised for shady, light wind conditions, exposure to full sunshine can increase these values by up to 15°F. Also, strong winds, particularly with very hot, dry air, can be extremely hazardous. In Table A-9, the shaded zone above 95°F corresponds to a heat index level that may cause increasingly severe heat disorders with continued exposure and/or physical activity.

**Table A-9: Heat Index Chart**

Temperature (F) versus Relative Humidity (%)									
°F	90%	80%	70%	60%	50%	40%	30%	20%	10%
65	65.6	64.7	63.8	62.8	61.9	60.9	60.	59.1	58.1
70	71.6	70.7	69.8	68.8	67.9	66.9	66.	65.1	64.1
75	79.7	76.7	75.8	74.8	73.9	72.9	72.	71.1	70.1
80	88.2	85.9	84.2	82.8	81.6	80.4	79.	77.4	76.1
85	101.4	97.	93.3	90.3	87.7	85.5	83.5	81.6	79.6
90	119.3	112	105.8	100.5	96.1	92.3	89.2	86.5	84.2
95	141.8	131.1	121.7	113.6	106.7	100.9	96.1	92.2	89.2
100	168.7	154.	140.9	129.5	119.6	111.2	104.2	98.7	94.4
105	200	180.7	163.4	148.1	134.7	123.2	113.6	105.8	100.
110	235.	211.2	189.1	169.4	151.9	136.8	124.1	113.7	105.8
115	275.3	245.4	218	193.3	171.3	152.1	135.8	122.3	111.9
120	319.1	283.1	250.	219.9	192.9	169.1	148.7	131.6	118.2

Source: National Weather Service Heat Index Program, NOAA.



### **Heat Index/Heat Disorders**

The Heat Index/Heat Disorders (Table A-10) relates ranges of heat index with specific disorders, particularly for people in higher risk groups. Heat disorder symptoms are described in Table A-11.

**Table A-10: Heat Index/Heat Disorders**

<b>Prolonged Exposure or Physical Activity</b>	<b>HI</b>	<b>Possible Heat Disorder</b>
Caution	80°F - 90°F	Fatigue possible with prolonged exposure and physical activity.
Extreme Caution	90°F - 105°F	Sunstroke, heat cramps and heat exhaustion possible.
Danger	105°F – 130°F	Sunstroke, heat cramps, and heat exhaustion likely, and heat stroke possible.
<b>Extreme Danger</b>	<b>130°F or greater</b>	<b>Heat stroke highly likely with continued exposure.</b>

Source: National Weather Service Heat Index Program, NOAA.

**Table A-11: Heat Disorder Symptoms**

<b>Heat Disorder</b>	<b>Symptoms</b>	<b>First Aid</b>
Sunburn	Redness and pain. In severe cases, swelling of skin, blisters, fever, headaches.	Ointment for mild cases if blisters appear. If breaking occurs, apply dry sterile dressing. Serious cases should be seen by a physician.
Heat Cramps	Painful spasms usually in muscles of legs and abdomen possible. Heavy sweating.	Firm pressure on cramping muscles, or gentle massage to relieve spasm. Give sips of water. If nausea occurs, discontinue use.
Heat Exhaustion	Heavy sweating, weakness, skin cold, pale and clammy. Shallow or weak pulse. Normal temperature possible. Fainting and vomiting.	Get victim out of sun. Lie down and loosen clothing. Apply cool wet cloths. Fan or move victim to air conditioned room. Sips of water. If nausea occurs, discontinue use. If vomiting continues, seek immediate medical attention.
Heat Stroke/ Sunstroke	High body temperature (106°F, or higher). Hot dry skin. Rapid and strong pulse. Possible unconsciousness.	Heat stroke is a severe medical emergency. Summon medical assistance or get the victim to a hospital immediately. Delay can be fatal. Move the victim to a cooler environment. Reduce body temperature with cold bath or sponging. Use extreme caution. Remove clothing, use fans and air conditioners. If temperature rises again, repeat process. Do not give fluids.

Source: National Weather Service Heat Index Program, NOAA.

### **Cities Pose Special Hazards**

The atmospheric conditions that accompany a heat wave trap pollutants within urban areas and add the risk of severe pollution to the already dangerous stresses of hot weather, furthermore creating health problems. A map of heat-related deaths in St. Louis during 1966, for example, showed a heavier concentration in the crowded alleys and towers of the inner city, where air quality would suffer during a heat wave.

The high inner-city death rates also can be contributed to lack of access to air-conditioned rooms. The convenience air-conditioning may be a comfort during normal circumstances; however, during periods of extreme heat, health concerns make it a necessity. The price to maintain air conditioning becomes irrelevant when health concerns take priority. Indications from the 1978 Texas heat wave suggest that some elderly people on fixed incomes, many of them in buildings that could not be ventilated without air conditioning, found the cost too high, turned off their units, and ultimately succumbed to the stresses of heat. Wake County has provided its residents with programs that make available fans to people in need in certain weather related conditions.

### **Hazard Analysis – Droughts and Heat Waves**

\*Note: Droughts and heat waves have regional impact thus historical data on the impact of droughts and heat waves in North Carolina (Table A-8) was assumed to have affected the entire county, including the Town of Garner.

### **Likelihood of Occurrence of Droughts and Heat Waves**

Since 1980 there have been several periods of significant drought affecting the southeastern portion of the United States. The National Climatic Data Center reported one event of extreme heat for Wake County during 7/22/98, where temperatures reached in excess of 110 degrees. These hazardous events can be considered “likely” in Wake County.

### **Likely Range of Impact for Droughts and Heat Waves**

When droughts and heat waves do occur, they impact several states or an entire region of the United States, therefore, the range of impact can be classified as “large”.

### **Probable Level of Impact for Droughts and Heat Waves**

In rural agrarian societies, extended droughts can have a significant impact on local resources and the economy. However, in more urban areas such as the Town of Garner and Wake County, the probable level of impact can be classified as “negligible”.

### **Town of Garner Hazard Index for Droughts and Heat Waves**

The hazard index for droughts and heat waves in the Town of Garner is categorized as “moderate” based on a “likely” occurrence, “large” range of impact, and “negligible” level of impact. However, mitigating the impact of a drought or heat wave is generally considered a State or regional issue and planned for at those levels. Locally viable strategies include public education and water usage policies.



### **3. Floods** (Garner Multi-Hazards Map, A-1 Appendix F)

Areas susceptible to flood damage caused by heavy rainfall have been determined through the Federal Emergency Management Agency (FEMA) floodplain mapping program. The economic and human impact a hurricane or other heavy rainfall event has on a community depends greatly on how development has occurred within that community. Development in areas of high risk or vulnerability greatly increases the potential for property damage and loss of life.



Flooding is normally the result of a larger event such as a hurricane, nor'easter or thunderstorm, but flooding can be as frequent as the occurrence of a spring rain or a summer thunderstorm. Flooding is caused by excessive precipitation and can be generally considered in two categories: flash floods and general floods.



Flash floods are the product of localized, high-intensity precipitation over a small drainage basin in a short time period. Flash floods, which typically occur more frequently than general floods, occur along small streams and creeks. The undermining or washing out of roads is typically associated with flash floods. General floods are caused by precipitation over a longer time period and over a given river basin. These larger storm events occur along the East Coast of the

United States most often in the late summer and fall.

*Photos 1-3: Flooding caused by Hurricane Fran (Source: (1) City of Raleigh, (2) Undermined footings downstream at Vandora Ave. Culvert, Garner, NC., (3) Downstream Culvert at Forest Ridge Rd., Garner, NC.)*

A combination of river basin physiography, local thunderstorm movements, past soil moisture conditions, the degree of vegetative clearing and the amount of impervious surface coverage (buildings, pavement, etc) determine the severity of a flooding event. Flooding is typically most severe in areas of the floodplain immediately adjacent to major streams and rivers.

The Federal Emergency Management Agency classifies flood precautions in four different categories:

**Flood Watch:**

Flooding is possible.

**Flash Flood Watch:**

Flash flooding is possible.

**Flood Warning:**

Flooding is occurring or will occur soon; if advised to evacuate, do so immediately.

**Flash Flood Warning:**

A flash flood is occurring; seek higher ground on foot immediately

Source: [http://www.fema.gov/hazard/flood/fl\\_terms.shtml](http://www.fema.gov/hazard/flood/fl_terms.shtml)

The magnitude of a flooding event is defined by the Base Flood Elevation, the elevation of surface water resulting from a flood that has a 1 percent chance of equaling or exceeding that level in any given year. Base Flood Elevations are denoted on Flood Insurance Rate Maps (FIRM).

FEMA designates the magnitude of flooding by the probability that a certain amount will occur at a given time:

- A) 1%- the probability that the surface water level will exceed Base Flood Elevation, referred to as the "100-Year Flood."
- B) .2%- the probability that the surface water level will exceed Base Flood Elevation, referred to as the "500-Year Flood."

Based on past events, the Town of Garner would expect the magnitude of future flood events to be in the 1% probability range, with an approximate flood depth of 3 feet. The Town of Garner routinely designs storm water bmp's for the 4% (25-Year Flood) storm event.

**Historic Impact of Floods in Wake County**

Since 1995, thirty-four floods have been reported in Wake County (Table A-12). North Carolina Division of Emergency Management has rated Wake County as a "moderate" risk for floods (Local Hazard Mitigation Planning Manual, p.86).

In 1996, the eastern part of the state of North Carolina was severely affected by Hurricane Fran. The town of Garner experienced a 1% flood event that caused significant localized flooding as a result of an overwhelmed storm water system. The flood elevation at the Hwy. 50 bridge was high enough to warrant the blocking of the road at that point. In the past, significant events, not related to hurricanes, have had a flood depth of up to 5 feet over base flood elevation in Wake County, which would be the worst case scenario for the Town of Garner in a future flood event.

**Table A-12: Flood Event Data for Wake County – 1966 - 2010**

<b>Location</b>	<b>Date</b>	<b>Time</b>	<b>Type</b>	<b>Damages</b>
Countywide	2/13/1966	N/A	Flooding	\$5,000
Countywide	2/28/1966	N/A	Flooding	\$500
Countywide	3/4/1966	N/A	Flooding	\$5,000
Countywide	9/21/1979	N/A	Flooding	\$122,000
Countywide	3/17/1983	N/A	Flooding	\$694
Countywide	8/18/1986	N/A	Flooding	\$50,000
Countywide	8/20/1986	N/A	Flooding	\$500,000
Countywide	10/10/1990	N/A	Flooding	\$5,000
Countywide	3/4/1993	N/A	Flooding	\$6,000
Countywide	10/22/1990	N/A	Flooding	\$500
Northern	6/24/1995	4:05 PM	Flash Flood	\$50,000
Northeast Raleigh	8/27/1995	6:40 PM	Flash Flooding	\$6,000,000
Raleigh	10/4/1995	3:46 PM	Flash Flood	N/A
Southeast Portion	10/5/1995	9:00 AM	Flash Flood	N/A
Raleigh	9/6/1996	12:30 AM	Flash Flood	N/A
Raleigh/Wendell	9/10/1996	3:40 PM	Flash Flood	N/A
Raleigh	9/10/1996	5:50 PM	Flash Flood	N/A
Raleigh	9/11/1996	6:40 PM	Flash Flood	N/A
Raleigh	10/8/1996	7:00 AM	Flash Flood	N/A
Raleigh	4/28/1997	11:10 PM	Flash Flood	N/A
Countywide	7/24/1997	6:30 AM	Flash Flood	N/A
Raleigh	1/16/1998	5:00 PM	Flash Flood	\$50,000
Raleigh	1/23/1998	12:00 PM	Urban Flood	N/A
Raleigh	3/9/1998	1:50 AM	Flash Flood	N/A
Raleigh	3/19/1998	4:00 AM	Flash Flood	N/A
Raleigh	8/8/1998	2:30 AM	Urban Flood	\$20,000
Raleigh	8/16/1998	8:15 PM	Urban Flood	\$40,000
Wake Forest	8/26/1999	7:15 AM	Flash Flood	N/A
Countywide	9/05/1999	1:00 PM	Flash Flood	N/A
Countywide	9/15/1999	10:00 PM	Flash Flood	N/A
Countywide	9/27/1999	8:08 AM	Flash Flood	N/A
Countywide	9/28/1999	4:30 PM	Flash Flood	N/A
Raleigh	7/29/2000	1:10 AM	Flash Flood	N/A
Raleigh	8/1/2000	8:50 PM	Flash Flood	N/A
Raleigh	8/4/2000	5:15 PM	Flash Flood	N/A
Fuquay-Varina	8/4/2000	7:36 PM	Flash Flood	N/A
Raleigh	9/3/2000	6:10 PM	Flash Flood	N/A
Raleigh	9/4/2000	2:50 PM	Flash Flood	N/A
Raleigh	9/25/2000	6:30 PM	Flash Flood	N/A
Countywide	6/16/2001	7:10 PM	Flash Flood	N/A
Southern Portion	7/4/2001	8:00 PM	Flash Flood	N/A
Southern Portion	7/9/2001	10:30 PM	Flash Flood	N/A
Holly Springs	8/11/2001	1:00 AM	Flash Flood	N/A
Wake Forest	9/10/2001	6:15 PM	Flash Flood	N/A
Raleigh	3/31/2002	6:45 PM	Flash Flood	N/A
Raleigh	6/28/2002	10:15 PM	Flash Flood	N/A
Raleigh	8/26/2002	3:30 AM	Flash Flood	N/A
Raleigh	10/11/2002	10:30 AM	Flash Flood	N/A
Countywide	3/20/2003	6:30 AM	Flood	\$150,000

Location	Date	Time	Type	Damages
Countywide	4/10/2003	12:15 PM	Flood	N/A
Raleigh	6/07/2003	8:35 PM	Flash Flood	N/A
Fuquay-Springs	7/17/2003	9:00 PM	Flash Flood	N/A
Raleigh	7/29/2003	2:35 PM	Flash Flood	N/A
East Portion	8/1/2003	7:35 PM	Flash Flood	N/A
Central Portion	8/8/2003	8:10 PM	Flash Flood	N/A
Central Portion	8/8/2003	9:45 AM	Flash Flood	N/A
Fuquay Spgs	6/04/2004	1:40 PM	Flash Flood	N/A
Morrisville	7/29/2004	4:30 PM	Flash Flood	N/A
Countywide	8/12/2004	3:35 PM	Flash Flood	N/A
Raleigh	8/13/2004	6:10 PM	Flash Flood	N/A
Raleigh	8/30/2004	6:30 AM	Flash Flood	N/A
Raleigh	6/07/2005	4:07 PM	Flash Flood	N/A
Raleigh	6/07/2005	4:28 PM	Flash Flood	N/A
Garner	6/11/2006	8:20 PM	Flash Flood	N/A
Countywide	6/14/2006	9:00 AM	Flash Flood	N/A
Morrisville	6/23/2006	3:25 PM	Flash Flood	N/A
Morrisville	6/23/2006	3:30 PM	Flash Flood	N/A
Morrisville	6/23/2006	3:30 PM	Flash Flood	N/A
Raleigh	6/23/2006	3:45 PM	Flash Flood	N/A
Cary	6/23/2006	4:08 PM	Flash Flood	N/A
Morrisville	8/30/2006	7:30 PM	Flash Flood	N/A
Cary	7/17/2007	23:59 PM	Flash Flood	N/A
Brentwood	4/27/2008	18:30 PM	Flash Flood	N/A
Millbrook	4/27/2008	19:00 PM	Flash Flood	N/A
Cario	8/28/2008	00:00 AM	Flash Flood	N/A
Morrisville	8/30/2008	19:10 PM	Flash Flood	N/A
Echo Hgts	8/30/2008	20:15 PM	Flash Flood	N/A
Millbrook	9/06/2008	00:30 AM	Flash Flood	100,000
Millbrook	5/05/2009	18:15 PM	Flash Flood	N/A
Morrisville	5/05/2009	18:15 PM	Flash Flood	N/A
Brentwood	5/05/2009	18:18 PM	Flash Flood	N/A
Asbury	5/05/2009	18:35 PM	Flash Flood	N/A
Raleigh	6/16/2009	5:34 AM	Flash Flood	N/A
Westover	6/16/2009	8:30 AM	Flash Flood	N/A
Willow	9/22/2009	19:40 PM	Flash Flood	N/A
Wake Forest	12/02/2009	23:03 PM	Flash Flood	N/A
College View	12/02/2009	23:15 PM	Flash Flood	N/A
Westover	12/02/2009	23:15 PM	Flash Flood	N/A
Camp Polk	12/02/2009	23:40 PM	Flash Flood	N/A
Raleigh	1/25/2010	4:00 AM	Flash Flood	N/A
Caraleigh	1/25/2010	4:15 AM	Flash Flood	N/A
Asbury	6/01/2010	15:15 PM	Flash Flood	N/A
Apex	7/27/2010	12:00 PM	Flash Flood	N/A
Apex	7/27/2010	12:17 PM	Flash Flood	N/A
Leesville	8/05/2010	20:00 PM	Flash Flood	N/A
Caraleigh	8/24/2010	6:30 AM	Flash Flood	N/A
<b>Totals</b>				<b>\$7,104,694</b>

Source: National Climatic Data Center, <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent-Storms> and SHEL DUS (Spatial Hazard Events and Losses Database for the United States, [http://go2.cla.sc.edu/hazard/db\\_registration](http://go2.cla.sc.edu/hazard/db_registration)).

## **Hazard Analysis – Floods**

### **Likelihood of Occurrence of Floods**

Localized flooding can occur several times a year within the Town of Garner. In recent years there have also been a number of more widespread flooding events caused by hurricanes and tropical storms. The likelihood of localized flooding can be categorized as “highly likely”, whereas general flooding can be categorized as “likely”.

**Likely Range of Impact for Floods**

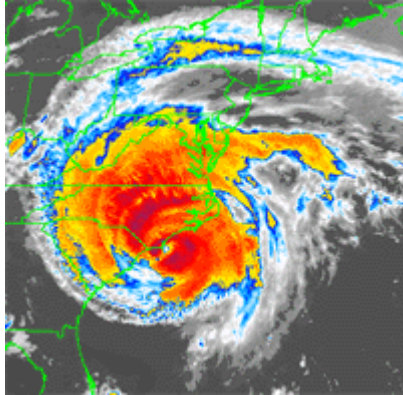
Flooding is normally confined to specific, known flood hazard areas where development can be controlled or limited. The likely range of flood impact can be classified as “small”.

**Probable Level of Impact for Floods**

Localized flooding typically has a “negligible” level of impact within the Town of Garner.

**Town of Garner Hazard Index for Floods**

The composite hazard index for floods within the Town of Garner is categorized as “moderate” based on a “likely” level of occurrence, “small” range of impact, and “limited” level of impact. This hazard index indicates that flood damage potential should be a focus of local hazard mitigation efforts.



#### **4. Hurricanes and High Winds**

Hurricanes are cyclonic low-pressure system storms originating in tropical ocean waters and fueled by latent heat from the condensation of warm water. Hurricanes and tropical storms that affect North Carolina normally form in the Atlantic Ocean off the coast of western Africa between the months of June and November with the peak season occurring in early September. *Photo – Hurricane Fran (Source: NC Office of Archives and History)*

Hurricanes are born over tropical oceans when the water is warmer than about 80 degrees. These storms start as areas of disturbed weather where a combination of clouds and falling pressure combined with the rotation of the earth result in increasing winds. Once these winds mature into hurricanes, they can remain constant for days or they may peak and quickly die. Hurricanes lose power when taken away from a warm water source - which is what happens when a storm moves over land.

Hurricanes and other cyclones that form in the tropics during summer months are different from the extratropical storms (nor'easters) that form during winter months. Both types of storms produce strong winds and may cause flooding. The main differences between hurricanes and nor'easters are:

- Hurricanes and tropical systems have no fronts.
- Hurricane winds weaken with height.
- The centers of hurricanes are warmer than the surroundings.
- Hurricanes and tropical systems form under weak high-altitude winds.
- Air sinks at the center of a hurricane.
- Latent heat of condensation is the major energy source for hurricanes.
- Hurricanes weaken rapidly when over land.

#### **Tropical Storm Categories**

Tropical systems/hurricanes are classified into four categories according to degree of organization and maximum sustained wind speed:

1. Tropical Disturbance/Tropical Wave - unorganized mass of thunderstorms, very little, if any, organized wind circulation.
2. Tropical Depression - evidence of closed wind circulation around a center with sustained winds from 20-34 knots (23-39 mph).
3. Tropical Storm - maximum sustained winds are from 35-64 knots (40-74 mph). A storm is named once it reaches tropical storm strength.
4. Hurricane - maximum sustained winds exceed 64 knots (74 mph).

With favorable atmospheric and oceanic conditions, a storm will intensify from a tropical depression to a tropical storm and then to a hurricane. Heavy precipitation, high winds and tornadoes are all typically associated with hurricanes. Hurricanes have long threatened the North Carolina coast and, as evidenced in recent years, can strongly affect inland areas as well.



The Saffir-Simpson Scale measures hurricane intensity ranging from one (minimal) to five (catastrophic). The scale ratings are based on wind speeds, surface pressure and height of storm surge (Table A-13). To improve storm-rating accuracy, scientists are currently considering revising the Saffir-Simpson Scale to include rainfall potential as a fourth rating variable.

**Hurricane Categories**

Major hurricanes are categorized as 3, 4 or 5 on the Saffir-Simpson Scale. While hurricanes within this range comprise only 20% of total tropical cyclone landfalls, they account for over 70% of the damage in the United States. Maximum sustained winds of category 3, 4 and 5 hurricanes range from 112 mph to over 156 mph. The higher wind intensities topple trees and cause severe damage to structures.

**Table A-13: Saffir-Simpson Hurricane Scale**

Category	Barometric Pressure (mb)	Wind Speed ( in miles per hour)	Height of Storm Surge (in feet)	Damage Potential
1 Weak	>980.2	75 – 95	4 – 5	Minimal damage to vegetation
2 Moderate	979.68 – 965.12	96 – 110	6 – 8	Moderate damage to houses
3 Strong	945.14 – 964.78	111 – 130	8 – 12	Extensive damage to small buildings
4 Very Strong	920.08 – 944.80	131 – 155	13 – 18	Extreme structural damage
5 Devastating	<920.08	> 155	> 18	Catastrophic building failures possible

Source: State Climate Office of North Carolina, NC State University.

The National Hurricane Center, describes damages associated with hurricanes categories as:

**Category 1**

Damage primarily to unanchored mobile homes, shrubbery and trees. Some damage to poorly constructed signs. Also, some coastal road flooding and minor pier damage.

**Category 2**

Some building roofing material, door and window damage. Considerable damage to shrubbery and trees with some trees blown down. Considerable damage to mobile homes, poorly constructed signs and piers. Coastal and low-lying escape routes flood 2-4 hours before arrival of the hurricane center. Small craft in unprotected anchorages break moorings.

**Category 3**

Some structural damage to small residences and utility buildings with a minor amount of curtain wall failures. (Curtain walls are typically associated with non-residential buildings where non-structural window and/or wall panels are attached to the structural framework to form the exterior skin of the building.) Damage to shrubbery and trees with foliage blown off trees and large trees blown down.

Mobile homes and poorly constructed signs are destroyed. Low-lying escape routes are cut by rising water 3-5 hours before arrival of the hurricane center. Flooding near the coast destroys smaller structures with larger structures damaged by battering of floating debris. Terrain continuously lower than 5 feet above mean sea level may be flooded inland 8 miles or more. Evacuation of low-lying residences within several blocks of the shoreline may be required.

**Category 4**

More extensive curtain wall failures with some complete roof structure failures on small residences. Shrubs, trees, and all signs are blown down. Complete destruction of mobile homes. Extensive damage to doors and windows. Low-lying escape routes may be cut by rising water 3-5 hours before arrival of the hurricane center. Major damage to lower floors of structures near the shore. Terrain lower than 10 feet above sea level may be flooded requiring massive evacuation of residential areas as far inland as 6 miles.

**Category 5**

Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. All shrubs, trees, and signs blown down. Complete destruction of mobile homes. Severe and extensive window and door damage. Low-lying escape routes are cut by rising water 3-5 hours before arrival of the hurricane center. Major damage to lower floors of all structures located less than 15 feet above sea level and within 500 yards of the shoreline. Massive evacuation of residential areas on low ground within 5-10 miles of the shoreline may be required.

**Historic Impact of Hurricanes and High Winds**

Information on the extent of damages from hurricanes and high winds (Table A-14) was available only as a statewide estimate.

**Table A-14: Hurricanes Affecting Wake County**

Date	Storm Name	Deaths and Injuries in NC		Damages in NC	
		Deaths	Injuries	Property	Crop
10/16/1954	Hazel	5.3	0.5	\$1,360,000	N/A
9/4/1979	David	0.01	0	\$50,000	\$5,000
7/24/1985	Gloria	0	0	\$7,692	N/A
7/12/1996	Bertha	0	0	N/A	N/A
9/05/1996	Fran	7	2	4,000,000,000	N/A
8/27/1998	Bonnie	0	0	N/A	\$50,000,000
9/04/1999	Dennis	0	0	N/A	\$3,000,000
9/15/1999	Floyd	0	0	\$3,000,000,000	\$500,000,000
9/17/2003	Isabel	1	0	\$7,300,000	N/A
9/1/2006	Ernesto	0	0	0	N/A
<b>Totals</b>		<b>13.31</b>	<b>2.5</b>	<b>\$7,008,717,692</b>	<b>\$553,005,000</b>

Source: National Climatic Data Center, <http://www4.ncdc.noaa.gov/cgi-win/wwwcqi.dll?wwEvent-Storms> and SHEL DUS (Spatial Hazard Events and Losses Database for the United States, [http://go2.cla.sc.edu/hazard/db\\_registration](http://go2.cla.sc.edu/hazard/db_registration)).

## **Hazard Analysis – Hurricanes and High Winds**

### **Likelihood of Occurrence of Hurricanes and High Winds**

There have been a number of hurricanes (and high winds) whose impacts have been felt in Wake County. Hurricanes that have struck North Carolina in the last 50 years include Hazel in 1954, Connie, Diane and Ione all in 1955, Donna in 1960, Hugo in 1989, Emily in 1993, Opal in 1995, Bertha and Fran in 1996, Bonnie in 1998, and Dennis, Floyd in 1999, and Isabel in 2003. Because of the size of these storms (up to 400 miles wide), the Wake County area felt some impact (including torrential rains and high winds) from these storms. In addition to the above named hurricanes there have been smaller tropical storms in which the high winds also impacted Wake County. The probability of Wake County, including the Town of Garner, experiencing the affects of a hurricane, or high winds, can be classified as “likely”.

### **Likely Range of Impact of Hurricanes and High Winds**

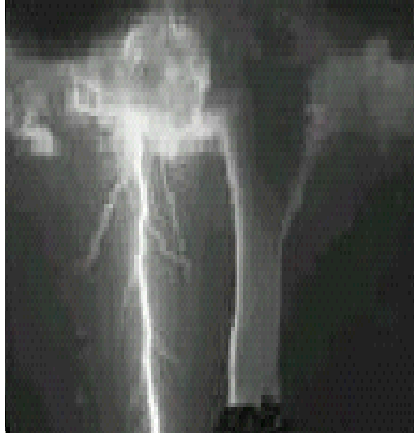
Hurricanes and high winds are not localized events. The diminishment of the destructive force of a hurricane or high winds from one side of Wake County to the other would probably be negligible. The impact of the wind element of a hurricane within the County would be fairly uniform among structures which were built using comparable construction methods and materials. The impact of the associated rainfall from a hurricane or high winds would primarily affect structures and infrastructure in proximity to regulatory floodplains and secondary tributaries and creeks. The accumulation of wind blown debris in public or private storm drainage inlets and drainage swales has the potential to cause minor flooding problems throughout the area. If a hurricane or high winds were to occur, the entire Wake County area, including the Town of Garner, would be subject to the effects of the storm, therefore the range of impact can be classified as “large”.

### **Probable Level of Impact of Hurricanes and High Winds**

Property damage can result when the high winds of a hurricane or a tropical storm combine with saturated soils from extended heavy rains which may cause trees to be uprooted and fall onto nearby structures, or when wind blown debris damages structures. Additionally, hurricanes and tropical storms generally include bands of severe thunderstorms, which may produce hail and spawn tornadoes. The probable level of impact of a hurricane or tropical storm can be classified as “limited”.

### **Wake County/Town of Garner Hazard Index for Hurricanes and High Winds**

The hazard index for hurricane impacts in Wake County, including the Town of Garner, is “moderate” based on the probability of occurrence being “likely”, the “large” area that would be impacted, and the probable “limited” damage impact. This hazard index indicates that hurricanes and high winds pose a relatively large, but infrequent threat. Since hurricanes and high winds are also significant contributors to flooding, there are opportunities for local hazard mitigation efforts to have a significant impact on exposure to future events.



## **5. Severe Storms and Tornadoes**

### **5.1. Severe Storms (Thunderstorms, Hail and Lightning)** *(Photo – Source: NC Department of Transportation)*

Severe thunderstorms can occur alone or in clusters, but affect relatively small areas compared to those affected by hurricanes or nor'easters. In eastern North Carolina, thunderstorms most frequently occur in the late afternoon or during the evening or night hours during the summer months. Summer thunderstorms involve lightning, strong winds, heavy rains and hail that can result in wildfires, localized wind damage and flash flooding.

According to the North Carolina State Climate Office, thunderstorms typically are 15 miles or less in diameter and last an average of 20 to 30 minutes. Downbursts and straight-line winds associated with thunderstorms can produce winds of 100-150 miles per hour - enough to flip large trucks and endanger airplane landings and takeoffs. The potential impact of thunderstorms, however, can be rated low due to the localized nature of the storms.

The National Weather Service considers a thunderstorm severe if it produces hail at least three-quarters of an inch in diameter, has winds of 58 miles per hour or greater or produces a tornado. Of the estimated 100,000 thunderstorms in the United States each year, only about 10% are classified as severe.

Lightning, a major threat during a thunderstorm, is responsible for more deaths each year in the United States than are tornadoes. Since lightning strikes are very unpredictable, the risk to individuals and property can be significant.

#### **Historic Impact of Thunderstorms within the Town of Garner**

Thunderstorm/high wind storm events and thunderstorm related events (lightning and hail) that have directly affected the Town of Garner are reported in Tables A-15, and A-16. Note: There was no specific data recorded for lighting events within the Town of Garner.

**Table A-15: Thunderstorm/High Wind Data for the Town of Garner 1958 – 2010**

<b>Location</b>	<b>Date</b>	<b>Time</b>	<b>Magnitude (in knots)</b>	<b>Deaths</b>	<b>Injuries</b>	<b>Property Damages</b>
Garner	3/3/1999	3:55 PM	50	0	0	0
Garner	07/12/2004	06:04 PM	50			
Garner	07/28/2005	09:35 PM	52			
Garner	04/17/2006	02:35 PM	50			
Garner	04/25/2006	09:27 PM	54			
	06/11/2006	08:29 PM	56			
	07/29/2006	04:25 PM	50			
	04/15/2007	13:47 PM	50			
	08/21/2007	17:55 PM	50			
	08/21/2007	18:06 PM	50			

Location	Date	Time	Magnitude (in knots)	Deaths	Injuries	Property Damages
<b>Totals</b>				<b>0</b>	<b>0</b>	<b>N/A</b>

Source: National Climatic Data Center, <http://www4.ncdc.noaa.gov/cgi-win/wwwcgi.dll?wwEvent~Storms> and SHELDDUS (Spatial Hazard Events and Losses Database for the United States, [http://go2.cla.sc.edu/hazard/db\\_registration](http://go2.cla.sc.edu/hazard/db_registration)).

**Table A-16: Hail Storm Data for the Town of Garner 1998 – 2010**

Location	Date	Time	Magnitude (in inches)
Garner	5/26/1998	10:10 PM	0.75
Garner	5/27/1998	9:00 PM	0.75
Garner	5/28/2000	8:10 PM	1.00
Garner	6/03/2000	3:47 PM	1.75
Garner	7/14/2004	9:20 PM	1.00
Garner	7/13/2005	3:55 PM	1.00
Garner	4/22/2006	11:40 AM	1.75
Garner	5/14/2006	2:00 PM	1.75
Garner	5/20/2006	7:18 PM	1.00
Garner	5/20/2006	7:18 PM	1.75
Garner	5/20/2006	7:20 PM	.88
Garner	5/20/2006	7:28 PM	.75
Garner	5/20/2006	9:23 PM	.75

Source: National Climatic Data Center, <http://www4.ncdc.noaa.gov/cgi-win/wwwcgi.dll?wwEvent~Storms> and SHELDDUS (Spatial Hazard Events and Losses Database for the United States, [http://go2.cla.sc.edu/hazard/db\\_registration](http://go2.cla.sc.edu/hazard/db_registration)).

## **Hazard Analysis – Thunderstorms**

### **Likelihood of Occurrence of Thunderstorms**

There are only five thunderstorm related event records for the Town of Garner. However, the likelihood of occurrence can be rated as “highly likely” due to the frequency of occurrence within Wake County.

### **Likely Range of Impact for Thunderstorms**

The entire Garner planning jurisdiction is subject to the effects of a thunderstorm, including lightning and hail. Thunderstorms may be somewhat localized in relatively small bands or squalls, which may result in varying amounts of rainfall and wind being felt at different locations within the Town. The range of impact is classified as “small”.

### **Probable Level of Impact for Thunderstorms**

Although occurring frequently, severe thunderstorms typically have only a minor impact on the areas affected. The probable level of impact of severe thunderstorms, hail and lightning within the Town of Garner can be categorized as “negligible”.

### **Town of Garner Hazard Index for Thunderstorms**

The hazard index for severe thunderstorms within the Town of Garner is categorized as “moderate” based on a “highly likely” occurrence, “medium” range of impact, but “negligible” level of impact. This hazard index of “moderate” indicates that although thunderstorms definitely pose a regular threat within the Town of Garner, the impacts are not at the level that requires a concentration of local hazard mitigation efforts.



**5.2 Tornadoes** (Wake County Multi-Hazards Map – map pocket)

Many times severe storms, such as thunderstorms and hurricanes, can produce concentrated windstorms called tornadoes. Tornadoes are violently rotating columns of air created where warm, moist air intersects with cold, dry air. Tornadoes have a much more localized impact than a hurricane or nor'easter and have been known to destroy one building while leaving a nearby building virtually unharmed.

Tornadoes can produce a path of destruction from 0.01 mile wide to greater than 1 mile wide but generally tornadoes are less than 0.6 mile in width. In terms of length, paths of destruction vary from a few hundred feet to several miles in length. The duration of a tornado is typically less than 30 minutes.

The destruction caused by tornadoes may range from light to severe depending on the intensity of the storm and the travel path. Typically, tornadoes cause the greatest damages to structures of light construction, such as residential homes. The Fujita-Pearson Scale for tornado strength is shown in Table A-17.

**Table A-17: Fujita-Pearson Tornado Scale**

F-Scale	Damage	Winds (mph)	Path Length (miles)	Mean Width (miles)
F0	Light	40-72	<1.0	<0.01
F1	Moderate	73-112	1.0-3.1	0.01-0.03
F2	Considerable	113-157	3.2-9.9	0.04-0.09
F3	Severe	158-206	10-31	0.1-0.3
F4	Devastating	207-260	32-99	0.32-0.99
F5	Incredible	261-318	100+	1.0+

Source: *Local Hazard Mitigation Planning Manual*, North Carolina Division of Emergency Management, 1998.

Tornadoes are most likely to occur during the spring and early summer months of March through June. Tornadoes during these months tend to be the strongest, resulting in the greatest amount of physical harm and property damage. Tornadoes can occur at any time of day but are mostly likely to form between the hours of 3 p.m. and 9 p.m. (Photo: (1-2; top and bottom left) Greenbrier Estates, (3; bottom right) Warehouse, 1998. Source: Town of Garner, NC)



**Historic Impact of Tornadoes in Wake County/Town of Garner**

North Carolina ranks 22<sup>nd</sup> out of the 50 states for frequency of tornadoes, 18<sup>th</sup> for number of tornado related deaths, 17<sup>th</sup> for injuries and 21<sup>st</sup> for cost of damages. Although tornadoes in North Carolina are typically less severe than in other parts of the country, the North Carolina Division of Emergency Management has rated Wake County as a “high” risk for tornadoes (Local Hazard Mitigation Planning Manual, p. 86).

Thirty tornadoes hit Wake County between 1950 and 2010. (Table A-18) Although only 2 events were recorded within the Town of Garner, the history of tornadoes within the County indicates that the Town is at risk.

**Table A-18: Tornado Data for Wake County – 1950 - 2010**

Location	Date	Time	Magnitude	Deaths	Injuries	Property Damages
Wake County	5/12/1950	5:00 PM	F0	0	0	0
Wake County	5/12/1950	5:00 PM	F1	0	0	0
Wake County	4/5/1952	12:45 AM	F2	0	0	25K
Wake County	3/18/1956	2:30 PM	F2	0	0	3K
Wake County	3/18/1956	2:30 AM	F1	0	1	25K
Wake County	11/2/1966	9:35 AM	F2	0	9	250K
Wake County	5/14/1967	4:30 PM	F0	0	0	0
Wake County	7/11/1967	1:25 PM	F1	0	0	25K
Wake County	5/28/1973	3:00 PM	F1	0	0	25K
Wake County	5/29/1973	2:00 PM	F0	0	0	25K
Wake County	12/31/1975	4:00 PM	F1	0	0	3K
Wake County	5/7/1977	2:50 AM	F0	0	0	3K
Wake County	2/11/1981	3:05 PM	F2	0	2	250K
Wake County	6/13/1982	2:10 AM	F1	1	0	25K
Wake County	6/16/1982	12:25 PM	F2	0	0	250K
Wake County	3/14/1986	3:55 PM	F1	0	0	25K
Wake County	3/26/1986	7:55 PM	F0	0	0	0
Wake County	11/28/1988	12:00 AM	F4	2	105	250M
Wake County	10/23/1990	2:18 AM	F1	0	0	0
Raleigh	3/27/1993	4:05 PM	F0	0	0	0
Wendell	4/15/1996	5:08 PM	F0	0	0	10K
Wendell	4/15/1996	5:25 PM	F1	0	26	3.0M
Cary	7/12/1996	1:25 PM	F0	0	0	50K
Holly Springs	3/20/1998	6:15 PM	F0	0	0	0
Garner	3/20/1998	6:40 PM	F2	0	2	650K
Raleigh	3/20/1998	6:45 PM	F0	0	0	15K
Cary	6/1/2001	1:00 PM	F0	0	0	0
Apex	09/27/2004	06:30 PM	F0	0	0	0
Garner	09/14/2007	18:25 PM	F0	0	0	0
Rockton	04/25/2010	18:59 PM	F0	0	0	250K
<b>Totals</b>				<b>3</b>	<b>145</b>	<b>\$254.7M</b>

Source: National Climatic Data Center, <http://www4.ncdc.noaa.gov/cgi-win/wwcqi.dll?wwEvent~Storms> and SHEL DUS (Spatial Hazard Events and Losses Database for the United States, [http://go2.cla.sc.edu/hazard/db\\_registration](http://go2.cla.sc.edu/hazard/db_registration)).

## **Hazard Analysis – Tornadoes**

### **Likelihood of Occurrence of Tornadoes**

The National Climatic Data Center indicates that there have been 27 tornadoes in Wake County since 1950, however there is only 1 record of a tornado in the immediate Garner area. Most of the Wake County tornadoes have been fairly weak events (F0 and F1 on the Fujita-Pearson Tornado Scale); however, there have been six F2 tornadoes since 1950. The most destructive tornado in Wake County history occurred when Raleigh experienced a severe F4 tornado in late November 1988. Thus, the likelihood of a tornado in the Garner area is rated “highly likely”.

### **Likely Range of Impact for Tornadoes**

A tornado event would have a localized effect over a “small” area.

### **Probable Level of Impact for Tornadoes**

The probable level of impact of tornadoes within the Town of Garner can be categorized as “negligible” based on the history of tornado occurrences in the Wake County area.

### **Town of Garner Hazard Index for Tornadoes**

The hazard index for tornadoes for the Town of Garner is categorized as “low” based on a “highly likely” occurrence, “small” range of impact, and “negligible” level of impact. This hazard index of “low” indicates that although tornadoes pose a threat, the overall impact of tornadoes is expected to be minor.





Lake Benson Park Trail, February 1997  
 Source: Town of Garner

**6. Wildfires** (Wake County Multi-Hazards Map - map pocket)

Wildfires occur in North Carolina during the dry spring and summer months. The potential for wildfires depends upon recent climate conditions, surface fuel characteristics, and fire behavior. Wildfires can destroy precious natural resources and forestry essential to the survival of wildlife. There are four types of wildfires as described in Table A-19.

**Table A-19: Types of Wildfires**

Type	Description	Control
Ground	Burns in natural litter, duff (decayed organic matter), roots, or high organic soils.	Once started, difficult to control. Fire may rekindle.
Surface	Burns in grasses, low shrubs, and lower branches of trees.	May move rapidly. Ease of control depends upon fuel involved.
Crown	Burns in tops of trees.	Difficult to control; wind plays important role.
Spotting	Produced by crown fires; wind/topography conditions. Large burning embers thrown ahead of main fire.	Makes fire very difficult to control.

Source: National Weather Service, [www.seawfo.noaa.gov/fire/olm/firetype.htm](http://www.seawfo.noaa.gov/fire/olm/firetype.htm)

In recent years, increased residential development has been occurring along the urban/rural interface where homes built in or near forests become susceptible to wildfire damage. These buildings are at great risk since wildfires often begin unnoticed and spread rapidly igniting brush, trees and buildings. Potential wildfire areas (defined as areas with forest cover and greater than 50 acres in size) are indicated on the Wake County Multi-Hazards Map (map pocket).

State forestry personnel have estimated that Hurricanes Fran and Floyd together multiplied the amount of forest fire fuel (pine needles, cones, twigs and damaged trees on the ground) by more than three times – increasing potential wildfire fuel from five tons to sixteen tons per acre in central and eastern North Carolina. In areas where downed or damaged trees were not removed, excess wildfire fuel has greatly increased the likelihood of uncontrollable wildfires due to increased fire intensity and blocked fire roads.

### **Historic Impact of Wildfires in Wake County**

From 1980 to 2007, 763 wildfires were reported in Wake County (Table A-20). These fires burned 4179 acres of land. The primary causes of these fires were debris burning, children and smoking. Only eleven fires were caused by a natural hazard - lightning. The North Carolina Division of Emergency Management has rated Wake County as a “moderate” risk for wildfires (Local Hazard Mitigation Planning Manual, p. 86).

The number of fires and acres burned per year varied widely over the reporting period. However, the potential for significant property damage is greatest for those structures in close proximity to woodlands as wind direction and velocity changes can quickly imperil properties close to wildfire fuels.

### **Hazard Analysis – Wildfires**

\*Note: Wildfire data is reported by the NC Division of Forest Resources only at the county level, thus no specific information was available for the Town of Garner.

### **Likelihood of Occurrence of Wildfires in Wake County/Town of Garner**

Between 1980 and 2007, there were 763 wildfires in Wake County – an average of 27 per year. The likelihood of occurrence of a wildfire can be classified as “highly likely”. Potential wildfire areas (areas greater than 50 acres in size and with forest cover) are shown on Map A-1 Town of Garner Multi-Hazards Map; Appendix F.

### **Likely Range of Impact for Wildfires in Wake County/Town of Garner**

When wildfires do occur they typically impact a relatively small area of land. Since 1980, wildfires have burned on average 149 acres per year. The range of impact can be classified as “small”.

### **Probable Level of Impact for Wildfires in Wake County/Town of Garner**

Wildfires have a very limited impact on the community so the level of impact of wildfires can be classified as “negligible” for Wake County.

### **Wake County/Town of Garner Hazard Index for Wildfires**

The hazard index for wildfires in Wake County/Town of Garner is categorized as “moderate” based on a “highly likely” occurrence, but “small” range of impact, and “negligible” level of impact. This hazard index of “moderate” indicates that the threat of wildfires does not warrant significant additional hazard mitigation activities at the local level beyond those carried out by the State of North Carolina.

There have been no wildfires reported in Garner since the last update.

**Table A-20: Forest Fire Data for Wake County – 1980 - 2007**

Year	Number of Fires	Number of Acres Burned	Causes								
			Lightning	Camping	Smoking	Debris Burning	Incendiary	Machine Use	Railroad	Children	Miscellaneous
1980	49	208	1	1	5	4	9	0	18	5	6
1981	79	514	0	0	15	14	13	1	21	10	5
1982	32	474	0	0	1	7	8	0	9	6	1
1983	14	112	0	0	2	2	2	0	3	2	3
1984	6	13	0	0	2	1	0	0	2	1	0
1985	49	285	0	2	7	15	6	2	7	4	6
1986	43	276	2	0	8	10	7	4	2	5	5
1987	14	77	0	0	2	3	3	0	0	5	1
1988	21	100	2	0	3	5	1	0	1	7	2
1989	11	23	0	0	2	2	0	0	4	0	3
1990	15	46	1	1	3	4	0	0	1	3	2
1991	28	138	0	1	6	10	2	1	0	6	2
1992	29	133	0	2	9	7	1	0	1	9	0
1993	32	314	4	2	3	9	7	0	0	5	2
1994	36	175	0	3	3	14	3	0	1	10	2
1995	23	64	1	0	4	8	0	0	1	8	1
1996	12	65	0	1	2	4	1	0	0	4	0
1997	27	131	0	4	4	8	2	1	0	6	2
1998	24	137	0	0	4	5	1	0	5	3	1
1999	37	207	0	3	2	14	3	2	1	8	4
2000	16	45	0	0	0	9	2	0	0	2	3
2001	39	113	0	2	6	15	4	0	0	4	8
2002	32	95	2	1	1	13	5	1	0	7	2
2003	9	52.3	0	1	0	5	0	1	0	1	1
2004	14	28.7	0	1	1	4	0	3	0	4	1
2005	19	65	1	2	2	4	3	0	1	5	1
2006	24	167.4	1	0	2	6	4	1	1	7	2
2007	29	120.9	0	0	3	5	12	3	0	4	2
<b>Totals</b>	<b>636</b>	<b>3,650</b>	<b>11</b>	<b>22</b>	<b>93</b>	<b>170</b>	<b>75</b>	<b>11</b>	<b>77</b>	<b>118</b>	<b>59</b>

Source: NC Division of Forest Resources.



Source: US Army Corps of Engineers.

## **7. Winter Storms and Freezes**

Severe winter weather is typically associated with much colder climates; however, in some instances winter storms do occur in the warmer climate of North Carolina. On occasion, the Town of Garner has had moderate winter weather as a result of a nor'easter originating in the Gulf Stream and producing frozen precipitation. Winter storms can paralyze a community by shutting down normal day-to-day operations. Winter storms produce an accumulation of snow and ice on trees and utility lines resulting in loss of electricity and blocked transportation routes.

Frequently, especially in rural areas, loss of electric power means loss of heat for residential customers, which poses an immediate threat to human life. Because of the rare occurrence of these events, central and eastern North Carolina communities are often not prepared because they can not afford to purchase expensive road and debris clearing equipment for these relatively rare events.

### **Historic Impact of Severe Winter Storms in Wake County**

The North Carolina Division of Emergency Management has rated Wake County as a “moderate” risk for severe winter storms (Local Hazard Mitigation Planning Manual, p. 86).

## **Hazard Analysis – Winter Storms and Freezes**

### **Likelihood of Occurrence of Severe Winter Storms within the Town of Garner**

North Carolina averages two severe winter storms per year in the Piedmont area of the State. Even though the Town of Garner does not have any specific data indicating the occurrence of severe winter storms, the likelihood of occurrence of a severe winter storm can be classified as “highly likely”.

### **Likely Range of Impact for Severe Winter Storms within the Town of Garner**

When severe winter storms do occur they typically impact a relatively large area or region of the State, thus the range of impact can be classified as “large”.

### **Likely Range of Impact for Severe Winter Storms within the Town of Garner**

Severe winter storms can have a tremendous impact on communities within the State, but they do not typically result in more than “limited” impact.

### **Town of Garner Hazard Index for Severe Winter Storms**

The hazard index for severe winter storms for the Town of Garner is categorized as “high” based on a “highly likely” occurrence, “large” range of impact, and “limited” level of impact. This hazard index of “high” indicates that the severe winter storms are a serious threat that should be addressed by local hazard mitigation initiatives where possible. Because of the regional impact of severe winter storms, however, many initiatives are more appropriately addressed and coordinated by the State and utility providers, e.g., electric, phone, and cable companies. Based on previous occurrences, the Town of Garner would expect a magnitude of future winter storm/freezes events of 12 inches of snow fall.

**Table A-21: Snow and Ice Events in or near Wake County Zone, 1990-2010**

<b>Location or County</b>	<b>Date</b>	<b>Time</b>	<b>Type</b>	<b>Mag</b>	<b>Dth</b>	<b>Inj</b>	<b>PrD</b>	<b>CrD</b>
1 <u>Statewide</u>	03/12/1993	1600	Winter Storm	N/A	2	10	50.0M	0
2 <u>Northern And Central</u>	01/03/1994	1800	Heavy Snow	N/A	0	0	0	0
3 <u>Northern Interior And</u>	02/10/1994	1000	Ice Storm	N/A	0	0	0	0
4 <u>NCZ041</u>	01/06/1996	01:00 PM	Winter Storm	N/A	0	0	0	0
5 <u>NCZ041</u>	01/11/1996	10:00 PM	Ice Storm	N/A	0	0	0	0
6 <u>NCZ041</u>	02/02/1996	02:00 AM	Ice Storm	N/A	0	0	0	0
7 <u>NCZ041</u>	02/16/1996	06:00 AM	Heavy Snow	N/A	0	0	0	0
8 <u>NCZ027&gt;028 - 041&gt;043 - 073&gt;077 - 083&gt;084 - 086</u>	01/19/1998	06:00 AM	Heavy Snow	N/A	0	0	0	0
9 <u>NCZ007&gt;011 - 021&gt;028 - 038&gt;043 - 073&gt;078 - 083&gt;086 - 088&gt;089</u>	12/23/1998	02:00 PM	Ice Storm	N/A	0	0	0	0
10 <u>NCZ007&gt;011 - 021&gt;028 - 038&gt;043 - 073&gt;078 - 083&gt;086 - 088&gt;089</u>	01/18/2000	02:00 AM	Winter Storm	N/A	0	0	0	0
11 <u>NCZ007&gt;011 - 021&gt;024 - 026&gt;028 - 038&gt;043 - 076&gt;077 - 089</u>	01/20/2000	12:00 AM	Winter Storm	N/A	0	0	0	0
12 <u>NCZ007&gt;011 - 021&gt;028 - 038&gt;043 - 073&gt;078 - 083&gt;086 - 088&gt;089</u>	01/22/2000	06:00 PM	Winter Storm	N/A	0	0	0	0
13 <u>NCZ007&gt;011 - 021&gt;028 - 038&gt;043 - 073&gt;078 - 083&gt;086 - 088&gt;089</u>	01/24/2000	05:00 AM	Winter Storm	N/A	0	0	0	0
14 <u>NCZ007&gt;011 - 021&gt;028 - 038&gt;043 - 073&gt;077 - 083&gt;086 - 088&gt;089</u>	01/28/2000	10:00 AM	Winter Storm	N/A	0	0	0	0
15 <u>NCZ007&gt;011 - 021&gt;028 - 038&gt;043 - 073&gt;077 - 083</u>	11/19/2000	11:00 AM	Heavy Snow	N/A	0	0	0	0
16 <u>NCZ007&gt;011 - 021&gt;028 - 038&gt;043 - 073&gt;078 - 083&gt;086 - 088&gt;089</u>	01/03/2002	12:00 AM	Winter Storm	N/A	0	0	0	0
17 <u>NCZ007&gt;011 - 021&gt;028 - 038&gt;043 - 073&gt;077 - 083&gt;084</u>	12/04/2002	03:00 PM	Winter Storm	N/A	0	0	0	0
18 <u>NCZ007&gt;011 - 021&gt;027 - 038&gt;043 - 073&gt;077 - 083&gt;084 - 086</u>	02/16/2003	12:00 PM	Winter Storm	N/A	0	0	0	0
19 <u>NCZ007&gt;009 - 021&gt;025 - 038&gt;041</u>	02/27/2003	12:00 AM	Winter Storm	N/A	0	0	0	0
20 <u>NCZ007&gt;011 - 021&gt;028 - 038&gt;043 - 073&gt;078 - 083&gt;086 - 088&gt;089</u>	01/26/2004	04:30 AM	Winter Storm	N/A	0	0	0	0

21 <u>NCZ007&gt;011 - 021&gt;027 - 038&gt;039 - 041</u>	02/15/2004	11:00 PM	Winter Storm	N/A	0	0	0	0
22 <u>NCZ007 - 021&gt;028 - 038&gt;039 - 041&gt;043 - 073&gt;078 - 083&gt;086 - 088&gt;089</u>	02/26/2004	09:00 AM	Winter Storm	N/A	0	0	0	0
23 <u>NCZ011 - 026&gt;028 - 041&gt;043 - 075&gt;078 - 084&gt;086 - 088&gt;089</u>	12/26/2004	01:00 AM	Winter Storm	N/A	0	0	0	0
24 <u>NCZ007&gt;010 - 021&gt;026 - 038&gt;042 - 073</u>	01/18/2007	05:00 AM	Winter Weather	N/A	0	0	OK	OK
25 <u>NCZ038 - 041 - 073 - 075 - 083 - 088</u>	02/01/2007	08:00 AM	Winter Storm	N/A	0	0	OK	OK
26 <u>NCZ038 - 041 - 073 - 075 - 083 - 088</u>	02/01/2007	08:00 AM	Winter Weather	N/A	0	0	OK	OK
27 <u>NCZ007 - 021&gt;025 - 038&gt;042 - 073&gt;077 - 083&gt;086 - 088</u>	01/17/2008	02:00 AM	Winter Weather	N/A	0	0	OK	OK
28 <u>NCZ009 - 039 - 041 - 043 - 073&gt;076 - 084</u>	01/20/2009	00:00 AM	Winter Storm	N/A	0	0	OK	OK
29 <u>NCZ008&gt;010 - 025&gt;026 - 041</u>	03/02/2009	01:00 AM	Winter Storm	N/A	0	0	OK	OK
30 <u>NCZ007 - 010 - 021&gt;024 - 041&gt;043 - 078 - 083</u>	01/29/2010	21:00 PM	Winter Storm	N/A	0	0	OK	OK
31 <u>NCZ007&gt;011 - 024 - 026&gt;027 - 041 - 043 - 078 - 088</u>	02/12/2010	20:00 PM	Winter Storm	N/A	0	0	OK	OK
32 <u>NCZ007&gt;011 - 024 - 026&gt;027 - 041 - 043 - 078 - 088</u>	02/12/2010	20:00 PM	Winter Weather	N/A	0	0	OK	OK
33 <u>NCZ007 - 011 - 021&gt;028 - 038&gt;043 - 073&gt;078 - 088</u>	03/02/2010	15:00 PM	Winter Storm	N/A	0	0	OK	OK
34 <u>NCZ007 - 011 - 021&gt;028 - 038&gt;043 - 073&gt;078 - 088</u>	03/02/2010	15:00 PM	Winter Weather	N/A	0	0	OK	OK
35 <u>NCZ007&gt;009 - 025&gt;026 - 041 - 076 - 088</u>	12/16/2010	03:00 AM	Winter Weather	N/A	0	0	OK	OK
36 <u>NCZ026 - 041</u>	12/25/2010	19:00 PM	Winter Storm	N/A	0	0	OK	OK
TOTALS:					2	10	50.000M	0

Source: <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>

#### **D. NC Emergency Management Hazard Analysis for Wake County/Town of Garner**

The North Carolina Local Hazard Mitigation Planning Manual, published by the NC Division of Emergency Management, was used as another reference source for assessing natural hazards. Table A-22 shows the State's summary assessment for Wake County for the nine natural hazards identified in the Local Hazard Mitigation Planning Manual. (Note: Information in the manual was presented only on the county level.)

**Table A-22: Natural Hazard Summary Assessment for Wake County**

Natural Hazard <sup>a</sup>	Vulnerability of Wake County <sup>b</sup>
Hurricane/ High Winds	Low
Flood	Moderate
Tornado/ Severe Storms	High
Thunderstorm <sup>c</sup>	Moderate
Severe Winter Storm	Moderate
Wildfire	Moderate

Updated from original Source: Local Hazard Mitigation Planning Manual, NCDEM, 1998, p. 84-5.

<sup>a</sup> The "Local Hazard Mitigation Planning Manual" does not rate the following hazards for Wake County - coastal erosion, levee failures, coastal storms, tsunamis, and volcanoes.

<sup>b</sup> The North Carolina Division of Emergency Management Methodology: Each of the one hundred counties in North Carolina was categorized into one of three levels of natural hazard likelihood - "Low", "Moderate", or "High" for eight natural hazards. Some assignments were made, in part, using the Climate Division (formulated by the National Climatic Data Center - Guttman and Quayle, 1995) to which each county was assigned. The Climate Division number for Wake County is 8. For additional information on how ratings were developed, see Local Hazard Mitigation Planning Manual, North Carolina Division of Emergency Management, November 1998.

<sup>c</sup>Thunderstorms were not rated in the Local Hazard Mitigation Planning Manual. For the purposes of this report, thunderstorms were rated moderate.

The manual also estimated the potential impact of various natural hazards for Wake County as shown in Table A-23. This information from the Local Hazard Mitigation Planning Manual was considered as part of the analysis process.

**Table A-23: Natural Hazards–Potential Impact Data for Wake County**

Natural Hazard	Range	Wake County
Frequency of All Hurricanes, 1900-96	Saffir-Simpson Class 1-5	0
Frequency of Minor Hurricanes, 1900-96	Saffir-Simpson Class 1-2	0
Frequency of Major Hurricanes, 1900-96	Saffir-Simpson Class 3-5	0
Frequency of Tornadoes, 1950-2010	Number of tornadoes	30
Extreme 1-day snowfall	In inches	10.1
Cold Air Damming Vulnerability	1 = some vulnerability	1
Wildfires, 1950-1993	Low = 1, Mod. =2, High = 3	2
Number of Acres Burned	Low = 1, Mod. =2, High = 3	1

Source: Local Hazard Mitigation Planning Manual, NCDEM, 1998, pp. 88-91.

### **E. Town of Garner Composite Hazard Index**

Certain parts of the Town of Garner planning jurisdiction, such as floodplains, are more prone to hazards than other areas. In addition, certain types of hazards are likely to produce only localized effects while others have wide spread effects. Some natural hazards have extraordinary impacts but occur infrequently. Other hazards occur annually or several times a decade, but cause little damage.

The total potential impact of each type of hazard has been projected using a combination of likely strength of the event, the size of the area(s) affected, and the density of human activity within the likely path of the hazard. Table A-24 gives natural hazards a “composite hazard index” rating based on the combination of three factors – likelihood of occurrence, likely range of impact, and probable level of impact. (Note: An explanation of the terms and the ranking system are included in Tables A-1 through A-4 at the beginning of Appendix A.)

**Table A-24: Town of Garner Composite Hazard Index**

<b>Hazard Type</b>	<b>Likelihood of Occurrence</b>	<b>Likely Range of Impact</b>	<b>Probable Level of Impact</b>	<b>Hazard Index (combined ranking)</b>
<b>Dam Failure</b>	Unlikely (1)	Small (1)	Negligible (1)	<b>Low (3)</b>
<b>Droughts and Heat Waves</b>	(3) Likely	(3) Large	(1) Negligible	<b>(7) Moderate</b>
<b>Floods</b>	(3) Likely	(1) Small	(2) Limited	<b>(6) Moderate</b>
<b>Hurricanes and High Winds</b>	(3) Likely	(3) Large	(2) Limited	<b>(8) Moderate</b>
<b>Severe Storms and Tornadoes</b>	(4) Highly Likely	(1) Small	(1) Negligible	<b>(6) Moderate</b>
<b>Wildfires</b>	(4) Highly Likely	(1) Small	(1) Negligible	<b>(6) Moderate</b>
<b>Winter Storms and Freezes</b>	(4) Highly Likely	(3) Large	(2) Limited	<b>(9) High</b>

The Town of Garner Composite Hazard Index (Table A-24) addresses the seven hazards that could potentially happen in Garner, NC. The focus throughout this plan is on the six that received a “moderate” or “high” rating as these hazards pose the greatest potential risk to persons and property. Three of these hazards – droughts and heat waves, hurricanes and high winds, and winter storms and freezes – typically have a regional impact; however, the impact of droughts and heat waves on an urbanized area such as the Town of Garner would be considered negligible as compared to rural, agrarian communities. For purposes of calculating vulnerability, the community is assumed to have 100% exposure to hurricanes and high winds and to winter storms and freezes (see Appendix B Vulnerability Assessment for more detail).

The other three hazards – floods, severe storms and tornadoes, and wildfires – typically have a much more limited area of impact. Floods only impact flood hazard areas thus exposure is limited to development within these identified and mapped areas of Town. For severe storms and tornadoes and for wildfires, the community is assumed to have an approximate 10% exposure (see Appendix B Vulnerability Assessment for more detailed information).



## Appendix B: Vulnerability Assessment

### **A. Introduction**

The Town of Garner Composite Hazard Index (Table A-25 in Appendix A) outlines the six hazards rated “moderate” or “high” for potential threat to persons and property. Three of these hazards – droughts and heat waves, hurricanes and high winds, and winter storms and freezes – typically have a regional impact; however, the impact of droughts and heat waves on an urbanized area such as the Town of Garner would be considered negligible as compared to rural, agrarian communities. Based on hazard event history, it is estimated that the Town of Garner has a maximum 100% exposure to hurricanes and high winds and to winter storms and freezes. A 100% exposure means that all structures both public and private within the Town could possibly be impacted by these types of hazard events.

The other three hazards – floods, severe storms and tornadoes, and wildfires – typically have a much more limited area of impact. Floods only impact flood hazard areas thus exposure is limited to development within these identified and mapped areas of Town. For severe storms and tornadoes and for wildfires, it is estimated that the Town of Garner has a maximum 10% exposure, i.e., 10% or less of all structures within the Town could be impacted by these types of hazard events. This information from Appendix A will be used in this section to estimate a dollar amount of exposure to these hazards.

### **B. Community Description** (Map B-1, Appendix F: Population and Size)

The Town of Garner is located in the southeastern portion of Wake County, North Carolina. Garner is in close proximity to the interchanges of Interstate 40 and US-70. Over the last ten years Garner has experienced moderate growth, this steady increase has allowed for planned development of essential facilities and services. The 1990 Census indicated that the total population for the Town of Garner to be 13,958, while the 2000 Census indicated an increase to 17,787 persons, a growth of 27.4%. The 2010 Census estimates the Garner population at 25,600.

The Garner area includes access to an excellent interchange of highways, including major arterial highways I-40 and US-70, nearby I-95 and US-401. The intersection of I-40/US-70 forms the nucleus of Garner’s industrial corridor. Also, US-401/US-70 intersection merges at the Town’s large commercial center. Given Garner’s location, travel time within Wake County is minimal. Two rail lines provide service to Garner, including Norfolk-Southern and Amtrak. Air travel to and from Garner is located approximately 30 miles away at the Raleigh-Durham International Airport, which accommodates a wide array of carriers. Airlines include: Air South, American, Delta, Midway, Northwest, TWA, and US Air, while commuter flights are handled by United Air Express/Atlantic Coast Airlines, Delta-Comair, US Air Express, and Atlantic Southeast.

The Town of Garner’s citizens are served electricity by Progress Energy. Natural gas service is provided by Public Service Gas Company (PSNC). Local phone service is provided by BellSouth. Cable Television is provided by Time Warner and AT&T. The Town of Garner and the City of Raleigh merged their water and sewer systems together in March of 2001. The City of Raleigh owns and operates the water and wastewater system that provides service to residents and businesses within the urban service area designated for the Town of Garner. The Town will retain authority as to when and where new water and sewer services can be extended to support growth and development within its planning and zoning

jurisdiction, subject to conditions in the inter-local agreement. The Town of Garner contracts for collection of residential and small business solid waste.

Under the terms of the merger agreement Garner has a wastewater allocation of 3.25 million gallons per day (MGD) and a water allocation of 3.7 MGD through the end of 2005. From 2006 through 2015 those allocations can increase at an annual rate of up to four (4) percent. From 2016 through 2025 the annual allocation growth rate decreases to a maximum of three (3) percent. Beyond 2025 the maximum annual allocation growth rate will be the same as the annual growth rate of the City of Raleigh.

Although water and sewer service is provided to the vast majority of town residents, it is not provided to all. There are some residences in the older parts of town that have access to water and sewer but are not tied-on. Likewise there are a few areas in town that do not have access to one or the other utility.

### **Major Employers and Demographics**

The top major employers within the Town of Garner include: Con Agra (600 employees); Pergo, Inc (280 employees); Hamlin Companies (250 employees); Wal-Mart (212 employees); Garner High School (200 employees); LL Vann Electric (200 employees); Lowe's (200 employees); Laurels of Forest Glenn (160 employees); Town of Garner (157 employees); Home Depot (150 employees); Ultratech Industries, Inc (150 employees); and Target (140 employees).

The economy of the Town of Garner depends largely on the management or professional related sector which in the 2005-2007 American Community Survey (Table B-1) accounted for 43.6% of the total work force. The average travel time to work in the Town of Garner is 25.5 minutes.

Only 7.4% of The Town of Garner's residents have less than a high school education. 39.6 % of all residents of the Town of Garner are college graduates with either an associates, bachelors, or graduate degree. The median age of residents was 34.5 years of age with 68.6% of the population above the age of 21.

### **Developed and Undeveloped Areas** (Map B-2 Existing Land Use and Map B-3 Zoning and Flood Zones, Appendix F)

The majority of developed land within the Town of Garner consists of single-family residential development, however, in recent years the number of smaller residential lots and multi-family housing has been increasing more rapidly. In Garner's ETJ, there are approximately 1,346 single-family homes (94.7%) and 75 multi-family units (5.3%). This totals 1,421 residential units. Approximately 49.6% of Garner's ETJ area is developed while 50% is classified as vacant according tax land use records.

In Garner's town limits, there are approximately 8,190 single-family homes (75.8%), 2,516 multi-family units (21.3%), and 316 group quarter units (2.8%). This totals 11,022 residential units. Approximately 65% of Garner's town limits area is developed while 35% is classified as vacant according tax land use records.

The historic downtown area is located along E. Garner Road and Main Street. The downtown business district is located along 3 blocks on Main Street fronting the NC railroad. Industrial uses are located along Mechanical Boulevard and along Jones Sausage Road. Industrial Parks are located in the vicinity of US 70 and I-40.

The Town of Garner corporate limits encompass 9,491.2 acres (14.83 square miles). By dividing current population (26,348) by the area in the corporate limits, the population density is approximately 1,776 persons per square mile or 2.78 persons per acre.

Table B-2 on the following page shows the 2009 value of land, buildings, and other improvements within the Town corporate limits totaled around \$4.9 billion in tax value. All real estate improvements and land (tree damage, erosion, etc.) are exposed to possible damage from future natural hazards such as hurricanes that impact large areas of land.

### **Land Suitability**

The terrain in and around the Town of Garner consists of gently rolling hills with fairly narrow inter-stream valleys. Within the Town of Garner growth boundary, there are currently 1,598.38 acres designated as floodplain along the eleven creeks and stream branch tributaries (Map B-1).

**Table B-1: Town of Garner Demographics**

<b>Economic</b>		
Total Population		21,156
Median Household Income		\$51,884
Average Household Size		2.60
Percent of Individuals Below Poverty Level		9.2 %
<b>Occupation</b>	<b>People</b>	<b>Percent</b>
Management, professional, etc.	4,761	43.6 %
Service related	1,664	15.2%
Sales and office	2,397	22 %
Farming, fishing, and forestry	0	0 %
Construction, extraction, and maintenance	1,242	11.4 %
Production, transportation, material moving	848	7.8 %
<b>Social</b>		
<b>Level of Educational Attainment</b>	<b>People</b>	<b>Percent</b>
Less than 9 <sup>th</sup> grade	636	4.7 %
9 <sup>th</sup> – 12 <sup>th</sup> (no diploma)	1,007	7.4%
High School Diploma (includes GED)	3,767	27.7 %
Some college, no degree	2,805	20.6 %
Associate degree	1,357	10 %
Bachelor's degree	2,671	19.7 %
Graduate or professional degree	1,348	9.9 %
<b>Housing</b>		
Total Housing Units		8,634
Occupied Housing Units		8,047
Vacant Housing Units		587
<b>Occupied Housing</b>	<b>People</b>	<b>Percent</b>
Owner Occupied	5,569	69.2%
Renter Occupied	2,478	30.8%
Median Value Owner Occupied Units		\$144,100

Source: 2005-2007 American Community Survey, US Census, corporate limits only.

All of the hazards described in this plan often impact the entire jurisdictional area, leaving all existing and future buildings, facilities, and populations exposed to the

impact of each respective hazard. Given its inland location, the town of Garner would be expected to experience a lesser intensity impact than that of coastal areas. However, all areas of the town are still considered at-risk. Many hazards, such as hurricanes and tropical storms, can cause damage through numerous additional hazards such as high winds and precipitation, thus it is difficult to estimate total potential losses from these cumulative effects. Nevertheless, Table B-2 describes the total number of structures located in Garner. In this assessment, all of the structures in Garner are considered vulnerable to each of the hazards described in the plan.

**Table B-2: Value<sup>1</sup> of Developed Facilities and Undeveloped Land within Town of Garner Municipal Corporate Limits**

Land Class Description	Number of Parcels	Number of Acres	Building Value	Land Value	Total Value
Residential < 10 Acres	8,250	2,865	\$1,090,086,430	\$357,830,777	\$1,447,917,207
Apartments	20	194	\$116,141,436	\$14,004,000	\$130,145,436
Manufactured Homes <sup>2</sup>	6	6.4	N/A	\$272,840	\$272,840
Historic	3	6	\$1,570,016	\$345,000	\$1,915,016
Condominium	6	4.26	\$6,440,000 <sup>3</sup>	N/A	\$6,440,000
<b>Residential Subtotal</b>	<b>8,285</b>	<b>3,076</b>	<b>1,272,197,885</b>	<b>372,452,617</b>	<b>1,586,690,499</b>
Commercial	465	1,125	\$467,357,393	\$250,921,914	\$718,279,307
Retirement Home	3	6	\$3,344,734	\$1,424,953	\$4,769,687
Industrial	11	208	\$40,928,803	\$10,594,860	\$51,523,663
<b>Commercial/Industrial Subtotal</b>	<b>479</b>	<b>1339</b>	<b>\$511,630,930</b>	<b>\$262,941,727</b>	<b>\$774,572,657</b>
Residential >10 Acres	4	67	\$590,801	\$1,951,500	\$2,542,301
Acreage with Improvements	16	20	\$236,520	\$3,092,836	\$3,329,356
Agricultural/Farm	31	540	\$179,510	\$28,423,916	\$28,603,426
Vacant	828	1,442	0	\$94,771,002	\$94,771,002
<b>Farm and Other Subtotal</b>	<b>879</b>	<b>2,069</b>	<b>\$1,006,831</b>	<b>\$128,239,254</b>	<b>\$129,246,085</b>
<b>Total</b>	<b>19,286</b>	<b>12,968</b>	<b>\$3,569,671,292</b>	<b>\$1,527,267,196</b>	<b>\$4,981,018,482</b>

Source: Wake County Revenue Department, September 2009.

<sup>1</sup> Values as of January 1, 2008 (appraisal year)

<sup>2</sup> Note: Mobile homes were listed according to Wake County Revenue Department, building values are not known.

<sup>3</sup> Estimated building value using \$145,000 as the average price for 46 units on 6 parcels

**Housing Growth**

As shown in Table B-3 for the Town of Garner, there were 10,702 total housing units. Only nine (0.1 %) of these housing units were mobile homes which are generally more susceptible to damage by natural hazards, particularly high wind damages. Table B-3 shows that 28% of the total housing units were built within the last 9 years. A little over half of the residential development within the Town took place between 1961 and 1999.

**Table B-3: Housing Units/Year Built – Town of Garner**

Types of Housing Units			Single-Family Housing Units by Year Built		
Type of Unit	Number of Units	Percent of Total Units	Year Built	Number of Units	Percent of Total Units
Single-family	8,190	76.5%	To 1960	1,397	17.1%
Multi-family	2,503	23.4%	1961 to 1999	4,501	55%
Manufactured Homes	9	.1%	2000 to 2009	2,292	28%
<b>Total Units</b>	<b>10,702</b>	<b>100%</b>	<b>Total Units</b>	<b>8,190</b>	<b>100%</b>

Source: Garner Planning Department, corporate limits only; data current through August 2009

**2009 Growth and Population Conditions**

The Town of Garner has continued to grow at a moderate pace around 3.5 to 4 % annually over the last several years. There was a significant slowdown due to market conditions in 2008 and 2009. In 2009 no new residential subdivisions have been submitted for approval, and only 64 residential certificates of occupancy (CO) have been issued since January compared to 300 and 424 COs issued in 2007 and 2008 respectively.

The 2000 Census population for the Town of Garner was 17,787. The current September 2009 population estimate is 26,348. This is an increase of 8,561 (48%) persons in 9 years. The chart below shows the population growth history since 1940.

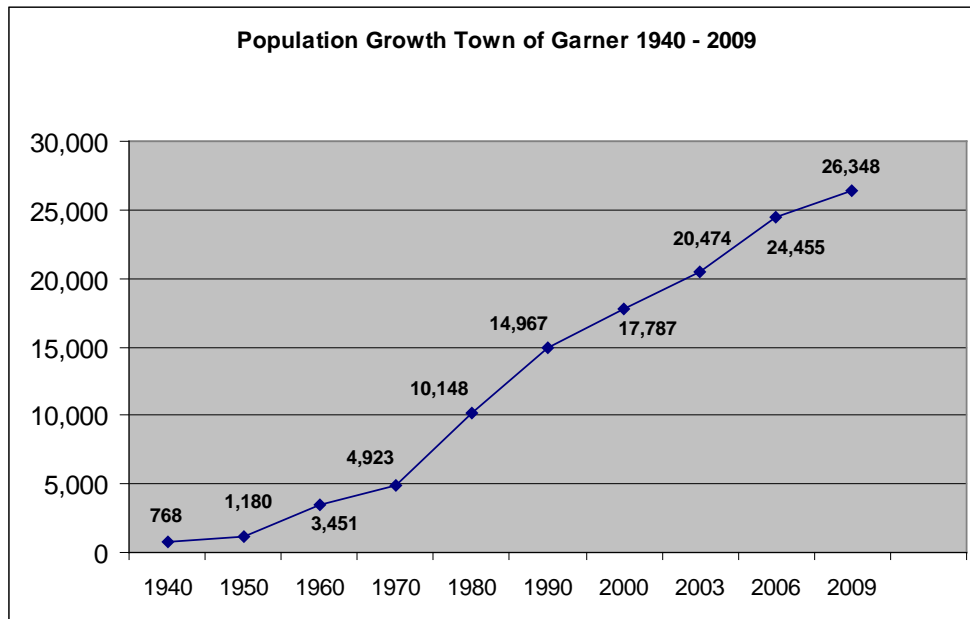


Table B-4 shows the growth in single-family residential units and corresponding increasing tax values. The table shows an increase in the annual number of single family units built between 1992 and 2006. Other noteworthy details in this table include the strong increase in land and building values during that time period. Due to the recent housing market slump, the numbers for all categories significantly drop after 2006.

**Table B-4: Single Family Housing Units/Year Built – Town of Garner**

Year Built	Number of Units	Land Value (in 000s)	Building Value (in 000s)	Total Value (in 000s)
1992	128	\$3,775	\$13,615	\$17,390
1993	78	\$2,268	\$9,133	\$11,401
1994	135	\$4,026	\$16,312	\$20,338
1995	120	\$3,435	\$14,705	\$18,140
1996	139	\$3,896	\$17,342	\$21,238
1997	199	\$5,558	\$23,284	\$28,842
1998	134	\$3,630	\$14,999	\$18,629
1999	176	\$4,348	\$22,136	\$26,484
2000	195	\$6,754	\$28,851	\$35,605
2001	173	\$5,570	\$28,787	\$34,356
2002	218	\$7,377	\$32,431	\$39,808
2003 <sup>1</sup>	250	\$6,578	\$26,311	\$32,889
2004 <sup>2</sup>	186	\$8,857	\$37,934	\$46,791
2005 <sup>2</sup>	376	\$18,437	\$73,863	\$92,300
<b>2006<sup>2</sup></b>	<b>509</b>	<b>\$25,961</b>	<b>\$104,482</b>	<b>\$130,443</b>
<b>2007<sup>2</sup></b>	<b>301</b>	<b>\$15,901</b>	<b>\$67,442</b>	<b>\$83,343</b>
<b>2008<sup>2</sup></b>	<b>94</b>	<b>\$5,663</b>	<b>\$23,352</b>	<b>\$29,015</b>
<b>2009<sup>2</sup></b>	<b>4</b>	<b>\$247</b>	<b>\$328</b>	<b>\$575</b>
<b>Total</b>	<b>3,415</b>	<b>\$132,281</b>	<b>\$555,307</b>	<b>\$687,587</b>

Source: Wake County Tax Department

<sup>1</sup> Note: Information provided by US Census Building Permit data, however land and building value were not coded separate, therefore a ratio was assumed of 80% building and 20% land for 2003 and through February 2004.

<sup>2</sup> Source is Garner Planning Department

### **Undeveloped Areas**

The Town of Garner expects that the rate of population growth will increase more rapidly in the coming years. As the currently undeveloped areas begin to become developed, the Town has planned for sensitive environmental areas; particularly wetlands and flood hazard areas to be protected from inappropriate development (see Appendix C Community Capability). Overtime, floodplain protection regulations should ease the impact of stormwater runoff in areas susceptible to floods.

### **C. Critical Facilities** (Map B-4: Garner Critical Facilities/Vulnerable Populations Map; Appendix F)

Critical public facilities are those facilities that are essential to the health, safety, and viability of the community. Critical facilities include public buildings, public infrastructure (roads,

highways, bridges, water and sewer facilities\*) and private utility services, e.g., electric, phone and cable, without which residents and businesses could not survive for extended periods of time. Certain facilities are critical to the response and recovery efforts in the wake of a disaster resulting from a natural or technological hazard. These include fire and rescue facilities, hospitals, major transportation facilities, communication facilities, and public water and sewer infrastructure.

The inventory of critical public facilities within the Town of Garner planning jurisdiction is shown in Table B-5 while other privately-owned or semi-public critical facilities and essential and supportive public facilities are listed in Table B-6. All facility locations are shown on Map B-4. The ability to protect these facilities from damage from a future natural hazard event is vital to the welfare of the citizens of the Town.

Note: Critical facilities designated as Emergency Planning Zone (EPZ) are a part of the NC Division of Emergency Management in-depth emergency response in support of Harris Nuclear Power Plant. The area around Harris Nuclear Power Plant (HNPP) for which off-site emergency planning efforts are required is defined as the Planning Zone. This zone is further subdivided into two specific planning areas: 1) the plume exposure pathway (an area representing approximately a 10-mile radius surrounding HNPP), and 2) the ingestion exposure pathway (approximately a 50-mile radius surrounding HNPP). The Town of Garner falls within this 50-mile radius.

#### **Rationale for Designating a Facility as Critical**

Facilities within the Town of Garner have been divided into three categories of importance for hazard mitigation:

1. Critical (Table B-5) – Municipal-owned facilities that are absolutely necessary for response and recovery efforts during and after a disaster. This category includes all municipal-owned facilities that must either remain in operation without interruption or should be operational within 24 hours after an emergency. Other-owned critical facilities are listed in Table B-6.
2. Essential (Table B-6) – facilities that are essential for normal community functions. Should be back in service within 72 hours following a disaster.
3. Supportive (Table B-6) – facilities/services that are typically available to the public but which can be closed for a week or more following a disaster without undue harm to public health and safety.

\*(Note: Underground public water and sewer lines are generally not considered vulnerable to the types of hazards that could impact the Town of Garner with the exception that underground distribution and collection lines could be impacted by erosion associated with flooding events. Due to the very limited nature of this potential impact, underground lines are not included in the list of critical public facilities. Major roads, highways and bridges within the Town of Garner are owned and operated by the State of North Carolina and the Federal Highway System. Since the Town is not responsible for the operation and maintenance of these facilities, they are not included in vulnerability calculations.)



**Table B-5: Town of Garner Critical Public Facilities**

Type of Facility	Location	Function	Size (sq. ft)	Replacement Value
<b>Municipal Buildings</b>				
Public Works Building	610 Rand Mill Road	Government Services	12,200	\$1,076,000
Government Complex / Police	900-A Seventh Avenue	Government Services	28,600	\$1,745,000
<b>Subtotal</b>				<b>\$2,821,000</b>
<b>Volunteer Fire Stations</b>				
Fire Station #1	503 W Main Street	Fire Protection	8,000	\$1,000,000
Fire Station #3	1695 Timber Drive	Fire Protection	9,600	\$1,400,000
Fire Station #4	125 Spaceway Ct.	Fire Protection, EMS	11,658	\$2,500,000
<b>Subtotal</b>				<b>\$4,900,000.00</b>
<b>Police Stations</b>				
Police Annex / Operations Center	400 Aversboro Road	Law Enforcement	3,000	\$167,000
E District Substation	102 E. Main Street	Law Enforcement	3,800	\$74,000
<b>Subtotal</b>				<b>\$241,000</b>
<b>Emergency Medical Services</b>				
Garner EMS	990 Vandora Springs Road	Medical Services	5,400	\$300,000
<b>Emergency Shelters (Wake County Public Schools)</b>				
Garner Senior High	2101 Spring Drive	Emergency Shelter	238,000	\$15,778,000
Creech Road Elementary	450 Creech Road	Emergency Shelter	76,000	\$6,092,000
North Garner Middle	720 Powell Drive	Emergency Shelter	128,000	\$8,369,000
<b>Subtotal</b>				<b>\$30,239,000</b>
<b>Public Infrastructure<sup>1</sup></b>				
Water Treatment Plant	Hwy. 50, Garner	Public Water	77,278	\$97,000,000
Wastewater Spray Facility	8828 Wrenn Road	Wastewater Treatment	2,600	\$6,800,000
Water Tower <sup>2</sup>	140 Rand Mill Road	Public Water	N/A	\$200,000
Water Tower	121 Penny Street	Public Water	N/A	\$300,000
Water Tower	840 East Garner Road	Public Water	N/A	\$200,000
Water Booster Station	2045 W. Garner Road	Public Water	500	\$200,000
Water Booster Station <sup>3</sup>	510 Mechanical Blvd.	Public Water	N/A	\$500,000
Water Booster Station <sup>3</sup>	4567 Jones Sausage Road	Public Water	N/A	\$500,000
Pumping Station <sup>3</sup>	2775 Benson Road	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	2390 Aversboro Road	Public Sewer	N/A	\$300,000

Type of Facility	Location	Function	Size (sq. ft)	Replacement Value
Pumping Station <sup>3</sup>	205 Inkster Cove	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	319 St. Mellion Street	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	781 E. Garner Road	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	221 E. Garner Road	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	1018 N. Spring Garden	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	1203 Claymore Drive	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	2355 Benson Road	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	921 Buffaloe Road	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	695 Maxwell Drive	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	Ten Ten Road and Hwy 401	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	1301 – ½ US Hwy 70	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	3960 Junction Road	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	2301 Buffaloe Road	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	600 Wilton Meadow Road	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	5480 Raynor Road	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	2355 Benson Rd.	Public Sewer	N/A	\$300,000
Pumping Station <sup>3</sup>	116 Cossack Circle	Public Sewer	N/A	\$300,000
<b>Subtotal</b>				<b>\$111,400,000.00</b>

Source: Town of Garner.

<sup>1</sup> All water and wastewater facilities are owned by the City of Raleigh.

<sup>2</sup> Emergency communications antenna is located on top of water tower.

<sup>3</sup> Replacement values are based on the assumption that a facility could be totally destroyed and no parts could be salvaged.

**Table B-6: Essential and Supportive Facilities within the Town of Garner**

<u>Other-Owned Critical Facilities</u>	<u>Essential Facilities</u>	<u>Supportive Facilities</u>
<u>State/Federally-Owned Critical Facilities</u>	<u>Municipal-Owned Facilities</u>	<u>Publicly-Owned Facilities</u>
<ul style="list-style-type: none"> <li>• I-40</li> <li>• I-95</li> <li>• US-70</li> <li>• US-401</li> <li>• NC-50</li> <li>• Timber Drive</li> </ul>		<ul style="list-style-type: none"> <li>• Aversboro Elementary</li> <li>• East Garner Middle</li> <li>• Fred A. Smith Elementary</li> <li>• Garner Senior High</li> <li>• Rand Road Elementary</li> <li>• Timber Drive Elementary</li> <li>• Vance Elementary</li> <li>• Vandora Springs Elementary</li> <li>• East Garner Elementary</li> </ul>
US Post Office		
<u>Privately-Owned Critical Facilities</u>	<u>Privately-Owned Facilities</u>	<b>Community Centers</b>
<b>Utilities</b>		<ul style="list-style-type: none"> <li>• Senior Citizen Center</li> <li>• Avery Street Recreation Center</li> </ul>
<ul style="list-style-type: none"> <li>• Progress Energy (formally CP&amp;L)</li> <li>• Progress Energy Central Warehouse / Operations Center</li> <li>• BellSouth</li> </ul>		

Source: Town of Garner

**D. Description of All-Hazards Exposure** (Map A-1 Multi-Hazards; Appendix F)

As detailed in Appendix A, Wake County Hazard Identification and Analysis, the entire planning jurisdiction of the Town of Garner is exposed to general hazards such as severe storms, hurricanes, droughts and heat waves, and winter storms and freezes. Tornadoes are another common threat but the exact location of a future tornado event can not be predicted. Within the Town, only flood hazards have a known hazard location – the floodplains along major streams and creeks. The 100-year floodplain/flood hazard area for major drainage basins is shown on all Plan maps.

**Vulnerable Populations** (see Map B-4, Appendix F)

Vulnerable populations within the Town of Garner have been identified as special needs populations and mobile home parks as listed in Table B-7 and shown on Map B-4. Special needs populations are those persons in child day care or senior citizens centers that may need special assistance during a natural hazard event. Mobile home parks were identified as vulnerable due to their increased susceptibility to high wind hazards.

**Table B-7: Vulnerable Populations within the Town of Garner**

Special Needs Populations	
Child Day Care Providers	Mobile Home Parks
• Garner Academy	• Auburn Estates
• Good-Honey Bears Child Development	• Buffalo Acres
• Heather Park Child Development Center	• Indian Creek
• Huckleberry Friends Child Development Center	• Mobile Hill Estates
• La Petite Academy	• Village of White Oak
• Lord of Life Preschool and Kindergarten Academy	• Woodway
• New Beginnings Childcare	• Rockdale
• Ridoutt’s Nursery and Kindergarten	• Weston Mobile Homes
• Sonshine Learning Center	• Green Pine
• Thompson’s Preschool	• Watkins Valley
• Klassy Kids	• Richardson Mobile Home Park
<b>Senior Citizen Centers</b>	• Walker’s Mobile Home Park
• Laurels of Forest Glenn	• Mini Horse Trail area
• Lawndale Manor	•
• Meadows of Garner	•

Source: Town of Garner

**Hazardous Area Intersections with Community Features**

The Town of Garner has limited exposure regarding community features located within known hazardous areas. The Town has an estimated 2 mobile homes that are located within either the 500 or 100-year floodplain areas. There are approximately 7 mobile homes that are located within either the 500 or 100-year floodplain areas within the Town’s planning jurisdiction or ETJ.

### **Flood Hazard Areas**

Known flood hazard areas are located along creeks and stream branch tributaries within the Town of Garner. A summary of total acreage at risk for flood hazards is shown in Table B-7. Historically, the most significant flooding has occurred primarily along Swift Creek which incorporates over 584 acres in the 100-year floodplain. Also, Mahler's Creek along with White Oak Creek contribute to large amounts of acres prone to flooding.

**Table B-8: Acres Susceptible to Flooding –Town of Garner**

Creek or Branch	Floodplain Acres		Total Acres within Floodplain
	100-year	500-year	
Bagwell Branch	97.88	8.47	106.35
Big Branch	32.36	1.12	33.48
Buck Branch	51.09	10.65	61.74
Echo Creek	64.15	5.37	69.52
Hilliard Creek / Adams Branch	110.77	0.48	111.25
Mahler's Creek	189.17	8.14	197.31
Reedy Branch	78.35	10.14	88.49
Reedy Branch Tributary	21.78	3.33	25.11
Swift Creek	584.08	7.66	591.74
White Oak Creek	164.95	13.21	178.16
Yates Branch	125.34	9.89	135.23
<b>Total</b>	<b>1,519.92</b>	<b>78.46</b>	<b>1,598.38</b>

Source: Town of Garner Planning Department.

### **National Flood Insurance Program (NFIP)**

The Town of Garner is an active participant in the National Flood Insurance Program (NFIP). Although the position of the Federal government is to discourage development within flood hazard areas, the NFIP was created to ensure that owners of flood susceptible properties could purchase flood insurance coverage. Data on current NFIP insurance policies and recent claims within the Town of Garner are shown in Table B-9.

**Table B-9: National Flood Insurance Program Statistics (NFIP)**

Category	Number or Value
<b>Total Insured Value</b>	<b>\$24,853,200</b>
Number of Policies	108
<b>Total Premiums</b>	<b>\$62,537</b>
Average Premium	\$579.05
NFIP Claims Since 1978	26
NFIP Claim Amounts Paid Since 1978	\$100,101.78

Source: Federal Emergency Management Agency (FEMA), Policy & Claim Statistics through April 2009.

### **Repetitive Loss Claims**

One of the main objectives of the hazard mitigation process is to determine how to best reduce repetitive loss claims. To accomplish this objective, FEMA annually makes available grants to local governments for the purchase and/or elevation of flood prone properties in order to reduce the re-occurrence of flood damage. Between 1995 to 2006 there have been three repetitive loss claims in the Garner town limits totaling almost

\$26,000 in property and contents. Two of the residential properties are along the Reedy Branch Tributary and the remainder is along Bagwell Branch.

**High Wind Hazard Vulnerability**

The Town as a whole is susceptible to high wind hazards but predicting where damage from high winds and tornadoes will occur is impossible. Mobile/manufactured homes, however, are more vulnerable to the damaging effects of high winds than are site-built structures.

Mobile/manufactured homes built before 1993 when more stringent Department of Housing and Urban Development (HUD) wind resistance standards became effective are especially susceptible to wind damage (Table B-10). County tax records do not indicate the age of individual manufactured home units, however, in the 2005-2007 American Community Survey, only 103 (1.2%) of all residential units within the Town of Garner were mobile/manufactured homes. All of these units regardless of age are generally more susceptible to wind damage than are site-built dwelling units.

**Table B-10: HUD Wind Resistance Standards for Mobile/Manufactured Homes**

Year	Wind Resistance <sup>1</sup>	Weight (lbs)	Anchor Requirements <sup>2</sup>
Pre-1993	75 mph	16,000	5-6 anchors/side
Post 1993	100 mph	40,000	11-14 anchors/side

Source: *Manufactured Housing Institute, [www.mfghome.org](http://www.mfghome.org)*

<sup>1</sup> Wind resistance standards for coastal placement are more rigorous.

<sup>2</sup> An anchor is a weighted disc buried in the ground and attached to the manufactured unit with steel cable.

**E. Future Hazard Vulnerability** (Map B-5 Comprehensive Growth Plan; Appendix F)

Future vulnerability can be defined as the extent to which people are expected to experience harm and the likelihood of property damage by a hazardous event if projected development were to occur. If development is allowed to occur within identified floodplains, then vulnerability will increase accordingly. The Office of State Planning projects population growth rates for counties but not for municipalities. State projections for population growth rates for Wake County are shown in Table B-11 along with population projections prepared by the Town of Garner using the projections in conjunction with the Public Works and Utilities Department.

**Table B-11: Projected Population Figures for Wake County and Town of Garner**

Year	Wake County		Town of Garner	
	Population Estimate	Ten-Year Growth Rate	Population Estimate	Ten-Year Growth Rate
1990	426,311	41.4%	13,958	37.1%
2000	627,847	47.3%	17,787	27.4%
2010	940,122	50%	27,220 <sup>1</sup>	53% <sup>1</sup>
2020	1,291,832	37%	35,990 <sup>1</sup>	32% <sup>1</sup>

Source: *Office of State Planning, Town of Garner Planning Department, US Census*

<sup>1</sup> Note: Town of Garner population projections.

The population of the Town of Garner is projected to reach 27,220 persons by 2010 and 35,990 (Source: Comprehensive Growth Plan) persons by 2020. Using the 2005-2007 Census average household population size for the Town of Garner of 2.6 persons/household, an estimated 3,708 new residential units will be built in Garner by 2020. This future growth and development must be encouraged in areas of low vulnerability. Strict enforcement of mitigation measures, such as hurricane building codes and flood damage prevention regulations, will, over time, decrease the Town's vulnerability to hazards.

### **Redevelopment**

Planning for redevelopment in the wake of a natural disaster also serves to reduce future vulnerability. Redevelopment should be encouraged in a manner which will result in lower vulnerability by restricting rebuilding within high-risk areas and requiring, where building does occur, the use of mitigation measures such as higher finished floor elevations and flood proofing.

### **Urbanization**

Over time, urbanization in upstream areas may contribute to higher levels of flooding in lower areas. Flash flood levels within small drainage basins might be expected to increase long term if mitigation measures such as on-site storm water retention are not required for sites with high impervious surface coverage. Another long term problem may be a reduction in the amount of time between a rainfall event and actual flooding. Without mitigation, urbanization increases the likelihood of flash floods, increases the land susceptible to flooding, and reduces warning time for evacuation of susceptible populations.

## **F. Summary Conclusions**

### **Current Vulnerability**

The Town of Garner, as determined in Appendix A, is most vulnerable to droughts and heat waves; hurricanes and high winds; winter storms and freezes; floods; severe storms and tornadoes; and wildfires. Since dam failure, droughts and heat waves have low to minimal impact on urbanized areas such as the Town of Garner, these hazards are not included in vulnerability assessment tables at the end of this section. (The Town has included water conservation measures as part of the Town's mitigation action plan (see Section II. Mitigation Action Plan)).

Based on hazard event history, it is estimated that the Town of Garner has a maximum 100% exposure to hurricanes/high winds and winter storms/freezes. A 100% exposure means that all structures both public and private within the Town could possibly be impacted by these types of hazard events.

Floods only impact flood hazard areas thus exposure is limited to development within these identified and mapped areas of Town. For severe storms and tornadoes and wildfires, it is estimated that the Town of Garner has a maximum 10% exposure, i.e., 10% or less of all structures within the Town could be impacted by these types of hazard events.

**Table B-12: Potential Hazard Exposure**

<b>Hazard</b>	<b>Hazard Ranking</b>	<b>Estimated Level of Exposure</b>
Dam Failure	Low	Negligible
Droughts and Heat Waves	Moderate	Minimal
Hurricanes and High Winds	Moderate	100% Exposure
Winter Storms and Freezes	High	100% Exposure
Floods	Moderate	Limited to Flood Hazard Areas
Severe Storms and Tornadoes	Moderate	10% Exposure
Wildfires	Moderate	10% Exposure

Source: Appendix A Table A-25.

**Methodology for Calculating Current Hazard Exposure**

Current (Year 2009) hazard exposure was estimated using 2009 data from the Wake County Revenue Department. The left side of Tables B-13 and B-14 summarize the vulnerability of persons and property values in the Year 2009. This information is presented in two categories - Private Development and Public Critical Facilities. (Note: Due to the limited amount of data that was available on specific monetary damages from past hazard events; it is difficult to predict exactly what monetary level of damages can be expected with future hazard events. With better data available at the first Plan update, a more detailed analysis will be possible.)

**Current Vulnerability to Hurricanes/High Winds and Winter Storms/Freezes**

Based on hazard event history, it is estimated that the Town of Garner has a maximum 100% exposure to hurricanes/high winds and winter storms/freezes. A 100% exposure means that all existing development - both public and private - within the Town could possibly be impacted by this type of hazard event. A dollar estimate of current exposure to these hazards is detailed on the left side of Table B-13 Current Conditions (Year 2009).

**Current Vulnerability to Flooding**

The Town of Garner has limited exposure to flood hazards and the town currently prohibits any new residential construction within a flood plain. In most cases, construction must be located no closer than 50 feet from the 100-year floodplain. For new subdivisions, lots must be platted outside the flood plain. However, there are some vulnerable structures located in older neighborhoods developed before the 1980s.

Using GIS to overlay the floodplain layer with the parcel base layer, the Town estimates that 450 developed properties are wholly or partially within the 100-year floodplain. Of the 450 properties, the Town estimates that 100 or fewer have structures located within flood hazard areas. The total estimated building value of these 450 flood threatened properties is \$136,555,738. Of the 450 properties, approximately 415 are residential with a building value of \$54,622,476. (The Town plans to inventory flood hazard structures as part of Section II. Mitigation Action Plan).

The Town also has a limited amount of public infrastructure, e.g., stormwater culverts, that are exposed to flood hazards. (Note: Major roads, highways, and bridges within the Garner area are owned and operated by the State of North Carolina and the Federal Highway System. Since the Town is not responsible for the operation and maintenance of these facilities, they are not included in vulnerability calculations. See Section C. Critical Facilities Tables B-5 and B-6.) Total current exposure to flooding is estimated to be \$13 million.



### **Current Vulnerability to Severe Storms/Tornadoes and Wildfires**

For severe storms and tornadoes, and for wildfires, it is estimated that the Town of Garner has a maximum 10% exposure, i.e., 10% or less of all structures within the Town could be impacted by these types of hazard events. A dollar estimate of current exposure to these hazards is detailed on the left side of Table B-14 Current Conditions (Year 2009).

### **Methodology for Calculating Potential Future Vulnerability**

The Town of Garner expects to continue to grow substantially in the next two decades. Using local population projections (Table B-11) the Town estimates that total population will increase to almost 35,990 by Year 2020. To estimate the number of housing units that will be needed to accommodate expected population growth, 2020 population estimates were divided by the average household size from the 2009 data from the Wake County Revenue Department. The number of commercial/industrial and other structures were then estimated to increase a comparable amount. Year 2020 values were predicted using the average per property values from Year 2009 multiplied by the number of projected units (constant Year 2009 dollars were assumed – no factor was used for inflation). Potential Future Conditions (Year 2020) are shown on the right side of Tables B-13 and B-14.

### **Future Vulnerability to Hurricanes/High Winds and Winter Storms/Freezes**

Future exposure to hurricanes/high winds and winter storms/freezes (right side of Table B-13 – Potential Future Conditions (Year 2020)) was estimated using the methodology described above. A 100% exposure of all development - both public and private - was assumed for these two types of hazards.

### **Future Vulnerability to Flooding**

Future flooding vulnerability should be reduced over time through the purchase and/or elevation of existing flood threatened properties. The Town will pursue voluntary acquisition of flood exposed structures through State and Federal funding sources (see Section II. Mitigation Action Plan), but actual realization of flood hazard reduction will be dependent on the number of property owners who choose to participate in the program. The Town will continue to enforce and enhance land use regulations that limit construction in flood hazard areas (see Section II. Mitigation Action Plan). The Town will also be considering strengthening these regulations under the 5-year Mitigation Action Plan. Total future flooding exposure (Year 2020) should not exceed the current exposure level of \$13 million and this exposure may be reduced if the Town is successful in purchasing and/or elevating flood endangered properties.

### **Future Vulnerability to Severe Storms/Tornadoes and Wildfires**

Future exposure to severe storms/tornadoes and wildfires (right side of Table B-14 – Potential Future Conditions (Year 2020)) was estimated using the methodology described above. A 10% exposure of all development – both public and private – was assumed for these two hazards.

**Table B-13: Town of Garner Vulnerability Assessment for Hurricanes/High Winds and Winter Storms/Freezes**

Private Development						
Current Conditions (Year 2009) <sup>1</sup>				Potential Future Conditions (Year 2020) <sup>2</sup>		
Type of Development	Number of Existing Private Buildings	Current Building Value (Year 2009)	Current Number of People	Projected Number of Private Buildings	Projected Value (Year 2020)	Projected Number of People
Single-Family Residential	8,194	\$1,090,668,168	19,833	10,209	\$1,458,300,000	25,328
Multi-Family Residential	2,503	\$129,804,449	6,058	2,642	\$163,600,000	6,555
Mobile/Manufactured Home	3	\$121,502	7.2	50	\$1,300,000	124
<b>Subtotal Residential</b>	<b>10,700</b>	<b>\$1,220,594,119</b>	<b>25,898</b>	<b>12,901</b>	<b>\$1,622,200,000</b>	<b>32,007</b>
Non Residential	793	\$733,221,780	0	555	\$569,500,000	0
<b>Subtotal Non-Residential</b>	<b>793</b>	<b>\$733,221,780</b>	<b>0</b>	<b>612</b>	<b>\$588,700,000</b>	<b>0</b>
<b>Subtotal Private</b>	<b>11,493</b>	<b>\$1,953,815,899</b>	<b>25,898</b>	<b>13,514</b>	<b>\$2,210,900,000</b>	<b>32,007</b>

Public Buildings and Critical Facilities						
Current Conditions (Year 2009) <sup>1</sup>				Potential Future Conditions (Year 2020) <sup>2</sup>		
Type of Development	Number of Existing Buildings and Critical Facilities	Current Replacement Value	Current Number of People	Projected Number of Public Buildings and Critical Facilities	Projected Replacement Value	Projected Number of People
Municipal Buildings	2	\$2,821,000	0	3	\$4,200,000	0
Fire Stations	2	\$2,000,000	0	3	\$3,000,000	0
Police Stations	3	\$241,000	0	4	\$300,000	0
Emergency Medical Services	1	\$300,000	0	1	\$300,000	0
Emergency Shelter	3	\$30,239,000	0	4	\$40,300,000	0
Public Infrastructure	26	\$14,400,000	0	37	\$20,492,000	0
<b>Subtotal Public</b>	<b>37</b>	<b>\$50,000,000</b>	<b>0</b>	<b>52</b>	<b>\$68,592,000</b>	<b>0</b>
<b>Community Total</b>	<b>7,734</b>	<b>\$1,398,412,000</b>	<b>17,787</b>	<b>13,566</b>	<b>\$2,279,492,000</b>	<b>32,007</b>

<sup>1</sup> 2009 Housing units, estimate of commercial/industrial and other properties, and tax revenue data were compiled from September 2009 Wake County Revenue Department data. Number of persons in non-residential buildings assumed to be zero to avoid double counting the population.

<sup>2</sup> 2020 Projections based on Town of Garner population projections (Table B-11) and estimated number of new dwelling units to accommodate population growth (Note: Due to fast urbanization and relatively high land prices, only a small increase in the number of mobile/manufactured homes was assumed with the number of multi-family units increased to accommodate the projected slow down in increase of mobile/manufactured units.) Comparable percentage increase used to forecast 2020 commercial/industrial properties. Number of critical facilities in 2020 based on projected population growth. Number of persons in non-residential buildings assumed to be zero to avoid double counting the population.

**Table B-14: Town of Garner Vulnerability Assessment for Severe Storms/Tornadoes and Wildfires**

Private Development						
Current Conditions (Year 2009) <sup>1</sup>				Potential Future Conditions (Year 2020) <sup>2</sup>		
Type of Development	Number of Existing Private Buildings	Current Value	Current Number of People	Projected Number of Private Buildings	Projected Value	Projected Number of People
Single-Family Residential	819	\$109,066,816	1,983	1,021	145,830,000	2,533
Multi-Family Residential	250	\$12,980,444	605	264	16,360,000	656
Mobile/Manufactured Home	0	0	0	5	130,000	12
<b>Subtotal Residential</b>	<b>1,070</b>	<b>\$122,047,261</b>	<b>2,589</b>	<b>1,290</b>	<b>162,220,000</b>	<b>3,201</b>
Commercial/Industrial	79	\$73,322,178	0	56	56,950,000	0
<b>Subtotal Non-Residential</b>	<b>79</b>	<b>\$73,322,178</b>	<b>0</b>	<b>61</b>	<b>58,870,000</b>	<b>0</b>
<b>Subtotal Private</b>	<b>1,149</b>	<b>\$195,369,439</b>	<b>2,589</b>	<b>1,351</b>	<b>\$221,090,000</b>	<b>3,201</b>

Public Buildings and Critical Facilities						
Current Conditions (Year 2009) <sup>1</sup>				Potential Future Conditions (Year 2020) <sup>2</sup>		
Type of Development	Number of Existing Buildings and Critical Facilities	Current Replacement Value	Current Number of People	Projected Number of Public Buildings and Critical Facilities	Projected Replacement Value	Projected Number of People
Municipal Buildings	0.2	282,000	0	0.3	420,000	0
Fire Stations	0.2	200,000	0	0.3	300,000	0
Police Stations	0.3	24,000	0	0.4	30,000	0
Emergency Medical Services	0.1	30,000	0	0.1	30,000	0
Emergency Shelter	0.3	3,024,000	0	0.4	4,030,000	0
Public Infrastructure	2.6	1,440,000	0	3.7	2,049,000	0
<b>Subtotal Public</b>	<b>4</b>	<b>5,000,000</b>	<b>0</b>	<b>5</b>	<b>6,859,000</b>	<b>0</b>
<b>Community Total</b>	<b>773</b>	<b>\$139,841,000</b>	<b>1,779</b>	<b>1,356</b>	<b>\$227,949,000</b>	<b>3,201</b>

<sup>1</sup> This was calculated by taking 10% of the values found in Table B 13. This is because it is estimated that 10% or less of all structures within the Town could be impacted by these types of hazard events.

<sup>2</sup> 2020 Projections based on Town of Garner population projections (Table B-11) and estimated number of new dwelling units to accommodate population growth (Note: Due to fast urbanization and relatively high land prices, only a small increase in the number of mobile/manufactured homes was assumed with the number of multi-family units increased to accommodate the projected slow down in increase of mobile/manufactured units.) Comparable percentage increase used to forecast 2020 commercial/industrial properties. Number of critical facilities in 2020 based on projected population growth. Number of persons in non-residential buildings assumed to be zero to avoid double counting the population.

## Appendix C: Capability Assessment

### **A. Introduction**

This section of the Plan is a detailed assessment of the capacity of the Town of Garner as a local governmental unit to mitigate the impacts of the natural hazards that were identified and analyzed in Appendix A. This assessment includes an examination of the following local government capabilities:

1. Institutional Capability – A review of Town departments that have direct and indirect responsibility for hazard mitigation activities.
2. Policies, Programs and Ordinances - An examination and evaluation of existing Town plans, policies, and ordinances that either increase or decrease local vulnerability to natural hazards.
3. Legal Capability – A review of State granted powers – regulation, acquisition, taxation and spending - that can be employed by local governments to further hazard mitigation efforts.
4. Fiscal Capability – An examination of the Town's use of local operating budget and capital improvement program funds to mitigate the effects of hazards.
5. Technical Capability – A more detailed review of relevant Town staff, technical equipment and software programs that are used or could be used to enhance mitigation activities.
6. Political Climate – A description of local political will and commitment to implementing hazard mitigation activities.

### **B. Institutional Capability**

The Town of Garner is a local government body with a council-manager form of government. The elected Town Council is the decision making body for the Town. The Planning Commission serves as an advisory body to the Town Council and deals with land use, zoning and development issues. The Board of Adjustment hears and decides appeals from any order, decision, requirement or interpretation made by the land use administrator or other administrative officials in carrying out or enforcing provisions of the Garner Land Use Ordinance. The Board of Adjustment also hears and decides on applications for special use permits, special exceptions, and variances.

The Town has a number of professional staff departments to serve the citizens of the Town and to conduct day-to-day administrative activities. Town departments/divisions are divided into two categories – those with a direct impact on hazard mitigation activities (Table C-1) and those with an indirect impact (Table C-2). The list is presented in alphabetical order within each category.

Another agency with responsibility for assisting with local hazard mitigation efforts is the North Carolina Department of Transportation (NCDOT). NCDOT is responsible for construction and maintenance of state-owned roads and highways, including the construction and placement of stormwater drainage systems. Sizing and maintenance of stormwater drainage systems can have an impact on hazard mitigation. If inadequately sized structural elements, e.g., piping, channels, etc., cannot handle stormwater runoff, then upstream flooding will occur. Lack of maintenance, sometimes due to insufficient resources, such as staff and equipment, can also increase the likelihood of system failure and stormwater damage to system elements, e.g., culverts, during flooding.

**Table C-1: Departments with Direct Impact on Hazard Mitigation**

<b>Department</b>	<b>Duties</b>
Department of Administration	Town Manager, Assistant Town Manager, and the Town Clerk. Responsible for managing day to day activities.
Computer Information Services	Provides computer related technical assistance to all Town departments.
Department of Engineering	Responsible for addressing complaints, questions, and concerns; providing technical information to prospective developers; and providing technical assistance to other departments. Oversees and manages growth and development of Town utility systems (streets and storm drainage).
Inspections Department	Responsible for receiving permit applications, reviewing building plans and specifications, issuing or denying permits, conducting all necessary inspections, issuing or denying certificates of compliance (COCs), issuing orders to correct violations, keeping records, and taking other actions as necessary to enforce building codes.
Planning Department	Responsible for long range comprehensive planning analysis, special studies and reports, annexation reports, ETJ studies, address assignments, and other special projects.
Police Department	Supervises all police operations through several divisions including patrol division, investigations division, civilian division, and community services division.
Public Works Department	Provides a comprehensive solid waste management program, streets, park maintenance, and building maintenance.

Source: Town of Garner.

**Table C-2: Departments with Indirect Impact on Hazard Mitigation**

<b>Department</b>	<b>Duties</b>
Economic Development	The department is dedicated to improving the quality of life for our community by promoting our assets, stabilizing our neighborhoods and developing partnerships with citizens, other Town departments, boards and commissions, elected officials, State agencies, civic organizations, Chamber of Commerce and others. Our goal is to effectively and efficiently foster a positive environment for existing and new businesses within Garner and those considering developing in, or a relocation to, the Garner community.
Finance Department	Responsible for oversight and coordination of the entire finance function which includes accounting, payroll and purchasing.
Human Resources	Responsible for ensuring compliance with federal and state personnel laws and regulations, and assisting with attracting and maintaining qualified and motivated employees.
Parks and Recreation Department	Responsible for ensuring that a variety of quality recreation programs and activities are provided for all residents, regardless of age, sex, race, or ability. Provides operating policy, fiscal management, registrations, record keeping, training evaluation, and input on open space acquisition.

Source: Town of Garner.

### **C. Existing Policies, Programs and Ordinances**

The Town of Garner has the statutory authority to plan for growth and development including the power to make studies of the Town, to determine growth objectives, to prepare and adopt plans for achieving those objectives, and to develop policies, ordinances and the administrative means to implement plans.

North Carolina local government enabling legislation requires that zoning regulations, when adopted by a town, be made in accordance with a comprehensive land use plan. The existence of the land use plan and other long-term plans and policies helps ensure that town boards and staff are developing regulations and ordinances that are consistent with the overall goals of the community.

The Town of Garner has used its legislated regulatory power to adopt and implement policies, programs, and ordinances that regulate land use and development. These policies and regulations help mitigate potentially harmful effects of natural hazards. Each Town policy, ordinance or regulation has a unique and varying impact on hazard mitigation. Although, policies and ordinances may have not been created specifically for hazard mitigation purposes, they have been and can be utilized to implement hazard mitigation initiatives.

The following Town policies and ordinances have been reviewed:

- The Centennial Long Range Plan, 2005
- North Garner Small Area Plan
- Unified Development Ordinance (UDO)
- Erosion and Sedimentation Control Ordinance
- Utility Extension Policy
- Open Space and Greenway Plan
- Transportation

#### **The Centennial Long Range Plan, 2005** (1989)

This Centennial Long Range Plan, 2005 is a long range plan that establishes the mission, goals, policies, and implementation steps that guide community development through 2005. The Plan seeks to guide the Town's growth from a Raleigh suburb to a more independent city with its own image, identity and diverse economy. The Plan, adopted in the fall of 1989, sets criteria for development of more detailed development standards and regulations.

#### **Mission Statement**

The Centennial Plan includes a mission statement that sets the overall guiding principles for community development. In the statement, the Town recognizes that the natural environment is worthy of protection:

“To become a more self-sufficient community of moderate size featuring a more diversified economy and a tax base that is more non-residential than residential, good jobs that require less commuting, major shopping facilities, superior educational and cultural opportunities, fair housing options and a wide variety of housing styles, a preserved historic fabric, enhanced human services, protected natural resources, improved transportation, water, sewer, and parks and greenway systems, and tasteful community appearance, all based upon an appropriate distribution of land use while comprising a new community image, indicating that Garner is become an even better place in which to live, work, and play.”

The Plan identified eight major development issues: population growth and distribution, land use and development, urban design and community appearance, economic development, community services and facilities including parks and greenways, transportation, environment, and housing. The Plan outlines land use goals in four major topic areas:

1. To develop according to an adopted plan of the nodal concept of urban development, designed to promote efficiency of service delivery and stratification of intensities around strategically designated central places, classified according to scale and significance of current or future urban nature, expressly avoiding strip development patterns while promoting cluster (bulls eye) development patterns.
2. To develop in a manner which highlights the diversity of different sections of the community, enriching the quality of life by reducing sameness.
3. To achieve a fiscal distribution of tax base that is at least 40% non-residential and not more than 60% residential.
4. To capitalize on features of the Garner landscape that can create a “Community of Features” for the future.

Land use goal #1 in particular should have an impact on hazard mitigation as a denser, integrated land use development pattern will over time result in fewer automobile trips, fewer road miles, and increased use of alternative modes of transportation such as walking and mass transit. These more dense development patterns will need to be centered in areas where environmentally sensitive lands such as flood hazard areas and wetlands are least impacted.

### **Environment**

The Environment section of the Centennial Plan contains introductory remarks regarding the history of development practices and the renewed interest in the social and economic value of environmentally sensitive lands. These paragraphs convey the local concern that the Town of Garner has for protecting valuable and sensitive community resources.

“Attitudes toward land have been changing during the past decade. Previously, land was treated only as a commodity, to be bought, bartered or sold through the real estate market. Land that was not flat and dry was in the way. Where land was cheap, wetlands and hills were left alone; where land was expensive, land was made buildable by flattening, draining or filling it.

“Experience, however, has taught us that land is a complicated resource, and that it has value in its own rights as a wastewater processor and supporter of ecological functions important to the quality of our overall environment. The essentially public character of land resources carries not only environmental value and benefits but also social and economic welfare of a community.

“Environmentally sensitive areas are lands whose destruction or disturbance will immediately affect the life of the community by either (1) creating hazards such as flooding and landslides, or (2) destroying important public resources such as water supplies and the water quality of lakes and rivers, or (3) wasting important lands and renewable resources.

“The function of environmentally sensitive areas are what economists call public goods, they are the responsibility of everyone and for the benefit of all. Thus, the loss of such resources threatens the general welfare of a community and results in economic loss. The direct costs of not protecting these areas can be high. In the private sector, costs may include the reduction of property value or the actual destruction of property; in the public sector, they including finding alternative sources of water or installing expensive storm sewers and water purification systems.” (The Centennial Long Range Plan, 2005, Volume 1: Policies and Procedures, October 2, 1989, page 67.)

The Plan goes on to identify and prioritize environmentally sensitive areas as: 1) watersheds, 2) creeks and streams, 3) wetlands (both associated with streams and those freestanding), 4) special vegetation clusters, and 5) other fragile land areas. The environmental goal is set as “to safeguard and perpetuate the ecological, cultural, economic, social, and aesthetic value of priority environmentally sensitive areas within the Town of Garner and extraterritorial jurisdiction.” (Centennial Plan, page 68)

Among the land use related goals developed for this section are policies related to the preferred method for protecting the environment (preservation of existing resources); protection of the Lake Benson Water Supply Watershed, Neuse River Basin and Swift Creek Watershed; use of conservation buffers of varying width depending on specific attributes (soil, slope, etc.) of the location; the use of residential cluster developments as the preferred environmentally sensitive design; and designation of wetland areas and animal habitat areas as highlights along the greenway system. (Centennial Plan, pages 69-70)

**Community Services and Facilities**

The Centennial Plan sets a goal to maintain and improve community services and facilities including the public water supply system, the sanitary sewer system and the parks and recreation system. Provision of parks and recreation, in particular, could have an impact on the protection of environmentally sensitive lands and therefore on the preservation of flood hazard areas, in particular, from inappropriate development. The Plan includes the following land use related parks and greenways goals that include identifying and planning for conservation areas of special value such as floodplains, historic areas, natural preserves, and wetlands.

The Town also has a policy to coordinate the development of greenway corridors with the acquisition of sewer easements and the enforcement of conservation buffer requirements. The recommended greenway corridor widths in the Plan are:

<b>Type of Stream</b>	<b>Buffer Recommendation</b>
Major Rivers and Creeks (Neuse, Little Crabtree, Swift)	150’ from the stream bank
Other Streams	100’ from the stream bank
Spurs on Streams	50’ from the stream bank
Other Spurs	50’ total



**North Garner Small Area Plan (SAP)** (draft 2003)

The North Garner SAP is a land use study and plan specifically for this area of Town. The Plan supplements the 1989 Centennial Plan and will be incorporated into the impending update of the Centennial Plan.

The purpose of the North Garner SAP is to set forth a vision of how this area of Town should look and function in ten to fifteen years and to provide the framework for achieving that vision. The SAP was developed with extensive collaboration and participation by stakeholders that represented the interests of the citizens and business community of North Garner.

The Environment section of the SAP identifies the area as being within the Big Branch Watershed which includes Big Branch, Mile Creek, Adams Branch and several smaller tributaries of these streams. The major streams all have 100-year floodplains and wetlands that were identified as greenway/open space assets for both North Garner and the entire Town. Hazard mitigation issues identified in the SAP include a recurring stormwater backup problem along Main Street in the historic downtown area which needs to be evaluated for specific causes and effects and repaired as necessary. Goals and objectives of the SAP that relate to hazard mitigation include the following:

<b>Goal</b>	<b>Objective</b>
Goal D Upgrade public utility infrastructure to meet existing and future needs.	Objective D-1: Conduct a feasibility study to assess stormwater drainage needs and if warranted and where financially feasible, improve the stormwater collection system to function more effectively through design assessment, etc.
Goal H Address environmental concerns as they affect new development, re-development and revitalization.	Objective H-1: Identify, protect and enhance viewsheds. Objective H-2: Prevent erosion and contamination of watersheds. Objective H-3: Encourage minimal alteration of topography during construction. Objective H-4: Preserve existing natural vegetation whenever possible. Objective H-5: Minimize increased noise levels through appropriate natural and man-made buffers.
Sub-Area 4 Goal A Promote environmentally sensitive development (watersheds, topography, wetlands, etc.)	Objective A-1: Encourage minimal topographic alterations. Objective A-2: Protect watersheds and viewsheds. Objective A-3: Require aesthetic stormwater drainage retention/detention facilities. Objective A-4: Encourage the preservation of natural vegetation.

### **Unified Development Ordinance (UDO)** (2003)

The Town of Garner adopted a unified development ordinance (UDO) in 2003. The UDO is a comprehensive implementation tool that combines the conventional zoning ordinance with subdivision and other regulations into a single document. The UDO is more internally consistent and easier to understand and implement than traditional separate free standing ordinances. The UDO is intended to protect the health, safety, and general welfare of the existing and future residents of the town by:

- a. Providing for adequate light, air and open space;
- b. Preventing the overcrowding of land, avoid undue concentrations of population and lessen street congestion;
- c. Facilitating creation of a convenient, attractive; and harmonious community;
- d. Protecting and preserve scenic, historic; or ecologically sensitive areas;
- e. Regulating population density and distribution of population, and the uses of buildings, structures and land for trade, industry, residence, recreation, agriculture, forestry, conservation, airports and approaches thereto, water supply, sanitation, protection against floods, public activities; and other purposes;
- f. Facilitating economic growth and business development;
- g. Facilitating the adequate provision or availability of transportation, police and fire protection, water, sewage disposal, parks and other recreational facilities, affordable housing, disaster evacuation and other public services;
- h. Securing safety from fire, flood and other dangers; and
- i. Furthering the public welfare in any other way specified by the Town Council.

### **Garner Transportation Plan** (2010 Update) (Excerpt from - Ch. 1 Hazard Mitigation Plan)

While there was limited inclusion of transportation-specific measures in the plan, there were some mitigation actions that related to the Streetscape and Transportation Plan for Garner. These include:

- Keeping infrastructure extensions out of hazardous areas in order to limit development in know hazardous areas;
- Zoning ordinances that minimize impervious surface coverage;
- Implementing soil erosion and sedimentation control measures in the development approval process;
- Addressing street connectivity as well as paving and widening of roads for evacuation routes; and
- Amending landscape ordinance requirements for maintenance of pervious surface areas for stormwater detention.

### **Zoning Districts** (Town of Garner Zoning Map – Appendix B, Map B-1))

The UDO establishes several types of zoning districts - general use districts, conditional use districts, planned development districts, and overlay districts. A brief description of the various zoning districts is included in Table C-3. The Town of Garner Zoning Map (with flood hazard overlay) is included in Appendix B as Map B-1.

### **General Development Standards** (UDO Article 7)

The section of the UDO sets development standards for certain design elements among which are two that relate to natural hazard mitigation - standards for landscaping and tree protection (Section 7.1) and for stormwater management (Section 7.2). Town development requirements for maintenance or enhancement of natural vegetation contribute to a reduction in quantity and velocity of stormwater runoff. Stormwater management has more specific design standards for the quality and quantity of stormwater runoff.

**Stormwater Management** (UDO Section 7.2)

Stormwater management rules and standards cover five areas – soil erosion and sedimentation control, stormwater quantity, conservation or protected buffers, nitrogen reduction, water supply, watershed protection and floodplain management. All of these areas have some bearing on natural hazard mitigation by reducing stormwater runoff and restricting development in sensitive environmental areas.

The floodplain management section covers restriction of construction within floodways and floodplains, sets standards for allowable construction within floodplains (finished flood elevation minimum 2’ above base flood), for construction of water supply and sanitary sewer systems in floodways and floodplains, and for floodplain variance procedures. Each proposed new development or major redevelopment is subject to the standards established in the ordinance.

**Table C-3: Zoning Districts - Town of Garner**

Zoning Districts	Description
<b>Residential Zoning Districts</b>	
Single Family Residential Zoning Districts	Designed to create and maintain residential neighborhoods composed primarily of single-family dwellings and, as special uses, such institutional, public, and other compatible uses that are designed, constructed and maintained so as not to detract from the quality of each district as a place for healthful, quiet, and aesthetically pleasing residential living.
R-40	Minimum lot area 40, 000 square feet.
R-20	Minimum lot area 20, 000 square feet.
R-15	Minimum lot area 15, 000 square feet.
R-12	Minimum lot area 12, 000 square feet.
R-9	Minimum lot area 9, 000 square feet.
Multifamily Residential Zoning Districts	These districts are designed to create and maintain higher density residential neighborhoods composed primarily of multifamily dwellings and, as special uses, those service, institutional, public and other compatible uses that are so designed, constructed and maintained that they do not detract from the quality of the neighborhood as a place for healthful, quiet and aesthetically- pleasing residential living.
MF-1	9.5 units per acre
MF-2	13 units per acre
<b>Manufactured Home Zoning Districts</b>	
RMH Manufactured Home Park/Subdivision	RMH district provides for development of manufactured home parks or manufactured home subdivisions in which Class A, Class B or Class C manufactured homes may be located.
-MH Manufactured Home Floating Zone	Designates areas within selected residential zones other than RMH within which Class A Manufactured Homes may be located. When the regulations and standards of this Section are met, the suffix -MH is attached to a base residential zone on the Town’s Official Zoning Map. Without an -MH designation, a Manufactured Home cannot be placed in any residential zone except RMH. Such -MH designated districts may not consist of an individual lot or scattered lots, but shall consist of a defined area of not less than two acres.
<b>Commercial/Mixed Use Districts</b>	
NO	Accommodates modest-scale professional and service occupations, along with

<b>Zoning Districts</b>	<b>Description</b>
Neighborhood Office	single-family residential units, to serve as a neighborhood activity center and as a transition between residential and more intense commercial uses.
NC Neighborhood Commercial	Accommodates low intensity commercial enterprises that provide goods or services primarily to residents of the surrounding neighborhood so that such residents can have convenient access to such goods and services without the necessity for making cross-town trips. The uses permitted are of such a nature and on such a scale that incompatibility with or disruption to nearby residences is minimized. Uses that depend on a majority of business traffic from the whole community rather than the immediate neighborhood are not permitted.
CR Community Retail	Designed to accommodate commercial activities that serve the entire community, especially retail businesses conducted within a building.
CBD Central Business District	Intended to provide for and maintain the Main Street business district.
SB Service Business	Accommodates commercial activities that are more intense in nature than those permitted in neighborhood or community business districts. Allows merchandise or equipment to be stored and operations to be conducted outside a building.
OI Office and Institutional	Accommodates more intense professional and service occupations than permitted in the Neighborhood Office (NO) District and insures that the environmental effects (including noise, odor, glare, heat, vibration and air pollution) resulting from the conduct of such operations shall not interfere with the quality of any surrounding district. This district is also intended to accommodate, as special uses, certain other compatible uses that are so designed, constructed and maintained that they do not interfere with the conduct of permitted professional and service occupations. When used as part of a rezoning, this district serves as a transition between residential districts and more intense districts, including commercial districts.
<b>Industrial Districts</b>	
I-1 Light Industrial	Provides for a limited range of low-intensity industrial uses that are not noxious or offensive due to odors, smoke, dust, noise, fumes or vibration.
I-2 Heavy Industrial	Provides for industrial uses that are may be noxious or offensive due to odors, smoke, dust, noise, fumes or vibration.
<b>Planned Development Districts (Floating Districts)</b>	
PUD Planned Unit Development	Provides for a mix of uses, including commercial and residential uses. PUD provisions are intended to encourage creativity in the design and planning of parcels by allowing greater design flexibility than the underlying base districts to protect natural features and concentrate development in more suitable or less environmentally sensitive areas. The end result is creativity in design, additional open space and an appropriate mix of uses. PUD development is permissible on tracts of land of 5 acres or greater.
PRD Planned Residential Development	Provides for master-planned residential communities containing a mix of housing types, including associated amenities. This district is primarily intended for large-scale residential projects that require either additional flexibility not available in the base residential districts or greater scrutiny by the Town due to scale. PRD development is permissible on tracts of land of 20 acres or greater.
TND Traditional Neighborhood Development	Development option allowing new standards for development focused on mixed residential development with a pedestrian orientation and a centralized commercial or mixed use node serving as the focal point for the development. TND development must also incorporate a network of open space, a network of internal streets, and connections to the surrounding area. TND development is permissible on tracts of land of 40 acres or greater.
MXD Mixed Use	Intended to produce higher levels of urban land use intensity at or near Community Focus Nodes or Regional Focus Nodes, consistent with the long-

<b>Zoning Districts</b>	<b>Description</b>
Development	range land use plan map. MXD zoning districts permit various combinations of usually separated uses, primarily promoting the development of business parks. It is not intended to be applied in a limited way to only inner city development or to mixed uses within one structure (high-rise), but rather, may be used to support either infill or new development on relatively large tracts. MXD development is permissible on tracts of land of 75 acres or greater.
<b>Overlay Districts</b>	
CBA Conservation Buffer Area	Establishes conservation buffer areas for the following purposes: <ol style="list-style-type: none"> <li>1. Soil and pollutants carried overland, primarily from roads, construction and development, can be effectively trapped by leaving a relatively undisturbed strip of vegetation parallel and adjacent to the watercourse.</li> <li>2. Properly managed overland water flow can be directed into this buffer area in a manner that will reduce velocity and cause dispersion of the water.</li> <li>3. Sediments and associated pollutants carried by the water will settle out as a result of this slowing and dispersion process.</li> <li>4. These are highly desirable effects of stream and watershed protection in that non-point pollution, erosion and sedimentation, and the resulting property damage and devaluation, are so reduced.</li> </ol>
LBC Lake Benson Overlay District	Establishes standards for protection of Lake Benson as a water supply for the Raleigh water service area, which includes Garner. Protection of the lake from non-point pollution sources is the intent of the provisions of this district.
O-TD Timber Drive Overlay District	Functions as a means to direct commercial development at recommended Focus Areas consistent with established standards in order to protect the general appearance of the Timber Drive Corridor, while sustaining the livability of the surrounding residential neighborhoods and the natural beauty of the area.
O-70 U.S. 70/401 Overlay District	Functions to improve conditions on US 70 and US 401 in order that the highways will function efficiently as transportation corridors, provide opportunities for new business locations, and promote a strong commitment to quality community appearance.
O-40 I-40 Overlay District	Functions to preserve the natural scenic beauty and aesthetic character; promote design quality; and enhance trade, tourism, capital investment, and the general welfare along the Interstate 40 corridor. It is the intent of this district that the tracts within the corridor be left, as possible, in an undisturbed or enhanced state of vegetation, and that sufficient areas of natural transitional buffer between uses remain so that the proposed use will be visually in harmony with the natural wooded character of the area. Removing or denuding natural forest vegetation along I-40 is prohibited except as provided for in the ordinance.

Source: Town of Garner

### **Soil Erosion and Sedimentation Control**

The regulation of soil erosion and sedimentation requires that land disturbing activities be monitored to control accelerated erosion and loss of sediment. Controlling erosion and sedimentation reduces the loss of valuable topsoil and reduces the likelihood of water pollution and damage to watercourses. Although its intended purpose is not targeted at hazard mitigation, it can impact mitigation initiatives.

The UDO stipulates that an erosion control permit is required for any land disturbing activity uncovering 40,000 square feet or more. The Town through interlocal agreement has delegated review and approval of soil erosion and sedimentation control plans to Wake County.

### **Subdivision Design/Improvements** (UDO Article 8)

This section of the UDO establishes design standards for the subdivision of land including standards for street design; sewage disposal facilities, water supply and utilities; open space and recreational facilities; subdivision dedication requirements and improvement guarantees. All these standards are designed to help minimize the impact of new land development on community services and facilities.

The open space section (Section 8.4) relates directly to the potential to reduce vulnerability to natural hazards by specifying that the provisions are designed to preserve open vistas, environmentally sensitive lands, habitat for wildlife, and historically or archaeologically significant areas. The section defines primary conservation areas as:

1. Areas shown as greenways on the Garner Open Space and Greenway Plan;
2. Wetlands;
3. Floodplains;
4. Lakes and ponds; or
5. Areas containing slopes greater than 25%

and secondary conservation areas as:

1. Areas containing slopes greater than 15% but not more than 25%;
2. Other areas containing unique vistas or unusual natural features (such as major rock formations); or
3. Other environmentally, historically, or archaeologically significant or unique areas.

### **Utility Extension Policy (1989)**

The Utility Extension Policy sets standards for the provision of public water and sewer service. The policy states that the planning and extension of the water and sewer system of the Town of Garner should be accomplished in accordance with the following general principals.

- a. Extension shall be made in a manner so as to promote the orderly growth of the community without regard to Town boundaries.
- b. An acreage charge shall be established to aid in the financing of new major facilities and the replacement or enlargement of existing facilities. This charge shall apply uniformly to all properties to which services are extended.
- c. Extension of utilities to properties shall be financed by the owners of the benefited property. The Town may participate to the extent that net revenue from immediate improvements repays Town costs within three years.
- d. Developers are responsible for the full cost of installing utilities within their own subdivisions and/or developments. Developers are required to install transmission lines, mains, outfalls and pump stations within the subdivision and/or development sufficient to serve the subdivision and/or development.

### **Open Space and Greenway Plan (2002)**

The Town of Garner has in place an Open Space and Greenway Plan to (1) identify parcels and corridors of land in need of protection and conservation, (2) to establish a comprehensive approach that will link greenspace land and corridors for recreational,

residential, commercial, and institutional areas of the community; and (3) to define a concise set of strategies for protection and conserving these corridors while developing public uses and facilities to provide residents with access to these lands and corridors.

The Plan recommends that the Town of Garner supplement existing park systems with park and open space acquisitions. Acquisitions are broadly defined within the plan to cover geographical regions of the community which were agreed upon through the public participatory process. The proposed acquisitions have also been identified to meet the recreation requirements of the various sections of Garner.

The Town has identified three levels of recreational parks: neighborhood (10 – 15 acres); district (50 – 60 acres); and regional (90 acres or more). The proposed parks would serve multiple purposes including active and passive recreation, protection of water quality, flood plain management and environmental education Proposed parks include:

#### **Neighborhood Parks**

- Cloverdale Park - existing park too small to host neighborhood activities. With more land, Cloverdale Park would become a more effective park.
- Smith Elementary – this area of Garner is currently underserved. A park near the school would be beneficial to both neighborhood and school children.
- Rand Mill Park – neighborhood residents have expressed interest in adding more land and uses to the Rand Mill park site.
- Intersection of Jordan and Ten Ten – currently no parks in the area. A neighborhood park would keep neighborhood residents from having to drive to Garner and would reduce stress on Garner park facilities. This area is outside of the Garner future growth area, Wake County should be responsible for the park.

#### **District Parks**

- Intersection of Old Stage and Ten Ten – identified in the public meetings as underserved. Park would serve residents and Vance Elementary.
- WRAL Athletic Complex – Large piece of land that could be acquired to serve the future expansion of Garner into the White Oak area. This is open space that is outside of Garner's expected growth area. Therefore, it should be Wake County's responsibility.
- Intersection of Auburn Creek Road and Big Branch – suggested as location for a district park in the northeast quadrant of Garner.

#### **Regional Parks**

- Intersection of Swift Creek and Raleigh Wastewater Treatment Plant – regional park could be jointly developed with Johnston County.
- Intersection of Yates Branch and Swift Creek – beaver pond in this area has been suggested as a regional park for special interest groups.
- Garner Town Central Park – “central park” that combines White Deer Park, Thompson Park, and Lake Benson Park. Park would display the character of the Town.

#### **Community Capability Assessment Summary**

The overall assessment of Town of Garner community capability to address hazard mitigation through existing policies and ordinances is summarized in Table C-4.

### **Incorporating Hazard Mitigation Requirements into Community Plans**

No policies, programs or ordinances have been found to have the effect of hindering hazard mitigation; however, there are opportunities to make current policies more effective for mitigation. Existing policies and ordinances are regularly reviewed and considered for updates/revisions to meet changing community needs and to stay in compliance with State and Federal regulations.

The Town will create a process to incorporate requirements in the Hazard Mitigation Plan into existing community plans and ordinances. The Planning Department will be responsible for providing a copy of the Hazard Mitigation Plan to each Town department and for ensuring that the responsible department (see Table C-4) incorporates hazard mitigation goals, objectives and actions into plan updates and ordinance revisions to ensure that updates and revisions do not contribute to increased community vulnerability to natural hazards.

The specific departments, as noted in Table C-4, that are responsible for implementation, enforcement, and updates to community plans and ordinances will be charged with monitoring programs and regulations for opportunities to improve hazard mitigation actions. More specific information on recommendations for new or revised policies and programs is detailed in Section II. Mitigation Action Plan.



**Table C-4 Community Capability Assessment – Town of Garner**

<b>Policies and Programs</b>	<b>Program Status</b>	<b>Purpose/Description</b>	<b>Effectiveness for Mitigation</b>	<b>Recommendations for Incorporating Hazard Mitigation into Existing Plans and Mechanisms</b>
The Centennial Long Range Plan, 2005 (1989)	Existing	Establishes goals, objectives, policies and guidelines for development over an extended time period.	Medium	Objectives addressed in the Long Range Plan will limit development in hazard prone areas while protecting existing environmentally sensitive areas. The Planning Department is responsible for plan updates.
North Garner Small Area Plan (2003)	Existing	Establishes goals, objectives, policies and guidelines for development for this specific area of Town.	High	Plan objectives related specifically to how this area of Town should be developed. The Planning Department is responsible for plan updates.
Unified Development Ordinance (UDO) (2003)	Existing	Ties in multiple ordinances to create an organized set of regulations for growth and development.	High	The UDO contains numerous provisions that limit development in certain hazard prone areas including zoning, water supply watershed protection, subdivisions standards, stormwater management, and soil erosion and sedimentation control. The Planning Department is responsible for plan updates.
Utility Extension Policy (1989)	Existing	Establishes public utility extension guidelines.	Medium	Requires that utility extensions be made in a manner that promotes orderly growth of the community. The Engineering Department is responsible for plan updates.
Open Space and Greenway Plan (2002)	Existing	An action plan to identify and protect Town's natural resources and other special environmental and cultural features.	High	Outlines certain attributes to consider when designating open space and greenways. Serves as a foundation for protection and preservation of natural resources. The Planning Department is responsible for plan updates.
Transportation Plan (2010 update)	Existing	Plans for efficient and safe travel options for auto, bicycle, pedestrian, and public transit users.	Medium	The Transportation plan proposes access to different areas of the town, therefore, it has an effect on development patterns.

Source: Town of Garner

#### **D. Legal Capability**

Local governments in North Carolina have a wide array of powers that enable counties and municipalities to adopt and implement policies and ordinances that may be used to mitigate the potential harmful effects of natural hazards. Below is a summary of the legal authority and powers that North Carolina has conferred on local governments within the state (*Local Hazard Mitigation Planning Manual*, NC Division of Emergency Management, 1998, Appendix B, pg. 61-64.) These powers fall into four broad categories: regulation, acquisition, taxation, and spending.

#### **Regulation (General Police Power)**

Local governments in North Carolina have been granted broad regulatory powers. North Carolina bestows the general police power on local governments, allowing them to enact and enforce ordinances which define, prohibit, regulate, or abate acts, omissions, or conditions detrimental to the health, safety, and welfare of the people and to define and abate nuisances (including public health nuisances). Since hazard mitigation can be included under the police power (as protection of public health, safety and welfare), towns, cities and counties may include requirements for hazard mitigation in local ordinances. Local governments may also use their ordinance-making power to abate “nuisances,” which could include, by local definition, any activity or condition making people or property more vulnerable to any hazard (NCGS 160A Art. 8 (Delegation and Exercise of the General Police Power to Cities and Towns); 153A, Art. 6 (Delegation and Exercise of the General Police Power to Counties)).

#### **Town of Garner**

The Town of Garner has enacted and enforces regulatory ordinances designed to promote the public health, safety and general welfare of its citizens. These ordinances are listed and described in detail elsewhere in this section.

#### **Building Codes and Building Inspection**

Many structural mitigation measures involve constructing and retrofitting homes, businesses and other structures according to standards designed to make the buildings more resilient to the impacts of natural hazards. Most of these standards are imposed through the building code.

North Carolina has a state compulsory building code, which applies throughout the state (NCGS 143-238(c)). However, municipalities and counties may adopt codes for their respective areas if approved by the state as providing “adequate minimum standards” (NCGS 143-238(e)). Local regulations cannot be less restrictive than the state code. Exempted from the state code are: public utility facilities other than buildings; liquefied petroleum gas and liquid fertilizer installations; and farm buildings outside municipal jurisdictions. No state permit may be required for structures under \$20,000. (Note that exemptions apply only to state, not local permits).

Local governments in North Carolina are also empowered to carry out building inspections. NCGS 160A, Art. 19, Part 5; and 153A Art. 18, Part 4 empower cities and counties to create an inspection department, and enumerates department duties and responsibilities, which include enforcing state and local laws relating to the construction of buildings, installation of plumbing, electrical, heating systems, building maintenance and other matters.

### **Town of Garner**

The Town of Garner enforces the NC State Building Code within the Town planning jurisdiction.

### **Land Use**

Land use regulatory powers granted by the state to local governments are the most basic manner in which a local government can control the use of land within its jurisdiction. Through various land use regulatory powers, a local government can control the amount, timing, density, quality and location of new development. All these characteristics of growth can determine the level of vulnerability of the community in the event of a natural hazard. Land use regulatory powers include the power to engage in planning, and to enact and enforce zoning ordinances, floodplain ordinances, and subdivision controls.

Each community possesses great power to prevent unsuitable development in hazard-prone areas. (NCGS 160A, Art. 8. (Delegation and Exercise of the General Police Powers to Cities and Towns); Art. 19 (Planning); Part 3 (Zoning); and 153A. Art. 6 (Delegation and Exercise of the General Police Power to Counties; Art. 18 (Planning and Regulation of Development); Part 2 (Subdivision Regulation); Part 3 (Zoning).

### **Planning**

In order to exercise the regulatory powers conferred by the General Statutes, local governments in North Carolina are required to create or designate a planning agency (NCGS 160A-3 87). The planning agency may perform a number of duties, including: make studies of the area; determine objectives; prepare and adopt plans for achieving those objectives; develop and recommend policies, ordinances, administrative means to implement plans and perform other related duties (NCGS 160A-361).

The importance of the planning powers of local governments is emphasized in NCGS 160A-383, which requires that zoning regulations be made in accordance with a comprehensive plan. While the ordinance itself may provide evidence that zoning is being conducted “in accordance with a plan,” the existence of a separate planning document ensures that the government is developing regulations and ordinances that are consistent with the overall goals of the community.

### **Town of Garner**

The Town of Garner has a Centennial Long Range Plan that addresses various aspects of hazard mitigation through policies regarding environmental sustainability. When updated, the scope of the Plan should be expanded to more directly address ways to mitigate hazards.

### **Zoning**

Zoning is the traditional and nearly universal tool available to local governments to control the use of land. Broad enabling authority for municipalities in North Carolina to engage in zoning is granted in NCGS 160A-381; and for counties in NCGS 153A-340. (Counties may also regulate inside a municipal jurisdiction at the request of a municipality (NCGS 160A-360(d))). The statutory purpose for the grant of power is to promote health, safety, morals and the general welfare of the community. Land uses controlled by zoning include the type of use (residential, commercial, industrial) as

well as minimum specifications such as lot size, building height and set backs, density of population, etc.

Local governments are authorized to divide their territorial jurisdictions into districts, and to regulate and restrict the erection, construction, reconstruction, alteration, repair, or use of buildings, structures or land within those districts (NCGS 160A-382). Districts may include general use districts, overlay districts, and special use or conditional use districts. Zoning ordinances consist of maps and written text.

#### **Town of Garner**

The Town of Garner has a Unified Development Ordinance (UDO) that establishes zoning districts and development standards and regulations. The ordinance includes development standards that would reduce stormwater runoff and the potential for flooding.

#### **Subdivision Regulations**

Subdivision regulations control the division of land into parcels for the purpose of building development or sale. Flood-related subdivision controls typically require that subdividers install adequate drainage facilities and design water and sewer systems to minimize flood damage and contamination. Subdivision regulations prohibit the subdivision of land subject to flooding unless flood hazards are overcome through infilling or other measures. Subdivision regulations are a more limited tool than zoning and only indirectly affect the type of use made of land or the minimum specifications for structures.

Broad subdivision control enabling authority for municipalities is granted in NCGS 160-371, and in 153-330 for counties outside of municipalities and municipal extraterritorial planning jurisdictions. Subdivision is defined as all divisions of a tract or parcel of land into two or more lots and all divisions involving a new street (NCGS 160A-376). The definition of subdivision does not include the division of land into parcels greater than 10 acres where no street right-of-way dedication is involved (NCGS160A-376(2)).

#### **Town of Garner**

The Town of Garner has adopted a Unified Development Ordinance (UDO) which contains subdivision regulations that establish minimum standards for land development.

#### **Floodplain Regulation**

In the summer of 2000, the North Carolina General Assembly adopted an act entitled "An Act to Prevent Inappropriate Development in the One Hundred-Year Floodplain and to Reduce Flood Hazards." By this act, the North Carolina statutes regulating development within floodways were rewritten to include floodplain regulation (NCGS 143-214.51-214.61). The purpose of the new law is to:

1. Minimize the extent of floods by preventing obstructions that inhibit water flow and increase flood height and damage.
2. Prevent and minimize loss of life, injuries, property damage and other losses in flood hazard areas.
3. Promote the public health, safety and welfare of citizens of North Carolina in flood hazard areas.

The new statute authorizes local governments to adopt a flood hazard prevention ordinance to regulate uses in flood hazard areas and to grant permits for the use of flood hazard areas that are consistent with the requirements of the statute. The statute provides for certain uses within flood hazard areas without a permit consistent with local land use ordinances (NCGS 143-215.54).

The statute establishes minimum standards for local ordinances and provides for variances for prohibited uses as follows:

- (a) A flood hazard prevention ordinance adopted by a county or city pursuant to this Part shall, at a minimum:
  - (1) Meet the requirements for participation in the National Flood Insurance Program and of this section.
  - (2) Prohibit new solid waste disposal facilities, hazardous waste management facilities, salvage yards, and chemical storage facilities in the 100-year floodplain except as noted in section (b) below.
  - (3) Provide that a structure or tank for chemical or fuel storage incidental to a use that is allowed under this section or to the operation of a water treatment plant or wastewater treatment facility may be located in a 100-year floodplain only if the structure or tank is either elevated above base flood elevation or designed to be watertight with walls substantially impermeable to the passage of water and with structural components capable of resisting hydrostatic and hydrodynamic loads and the effects of buoyancy.
- (b) A flood hazard prevention ordinance may include a procedure for granting variances for uses prohibited under G.S. 143-215.54(c). A county or city shall notify the Secretary (of Crime Control and Public Safety) of its intention to grant a variance at least 30 days prior to granting the variance. A county or city may grant a variance upon finding that all of the following apply:
  - (1) The use serves a critical need in the community.
  - (2) No feasible location exists for the location of the use outside the 100-year floodplain.
  - (3) The lowest floor of any structure is elevated above the base flood elevation or is designed to be watertight with walls substantially impermeable to the passage of water and with structural components capable of resisting hydrostatic and hydrodynamic loads and the effects of buoyancy.
  - (4) The use complies with all other applicable laws and regulations.

The statute authorizes priority ratings for local government applications for revolving loans or grants based on adoption of a local comprehensive land use plan, a zoning ordinance, or other measures that significantly contribute to the implementation of the comprehensive land use plan and the flood hazard prevention ordinance.

The Floodplain Act also instructed the Environmental Review Commission to study and report its findings to the 2001 General Assembly on the need to:

- (1) Increase the minimum elevation requirement.
- (2) Increase the authority of the Secretary of Crime Control and Public Safety to enforce the new statute.
- (3) Increase protection against the potential recurrence of damage to public and private property that resulted from the hurricanes of 1999, and other measures to reduce the likelihood that public assistance will be needed in response to future hurricanes and other storm events.

### **Town of Garner**

As part of the requirements for participation in the National Flood Insurance Program, the Town of Garner has adopted and enforces a flood damage prevention ordinance.

### **Acquisition**

The power of acquisition can be a useful tool for pursuing mitigation goals. Local governments may find the most effective method for completely “hazard-proofing” a particular piece of property is to acquire the property (either in fee simple or a lesser interest, such as an easement). Public acquisition removes the property from the private market and eliminates or reduces the possibility of inappropriate development. North Carolina legislation empowers cities and counties to acquire property for public purpose by gift, grant, devise, bequest, exchange, purchase, lease or eminent domain (NCGS 153A. Art. 8; 160A. Art. 11).

### **Taxation**

The power to levy taxes and special assessments is an important tool delegated to local governments by North Carolina law. The power of taxation extends beyond merely the collection of revenue and can have a profound impact on the pattern of development in a community. Communities can set preferential tax rates for areas, which are unsuitable for development (e.g., agricultural land, wetlands, and floodplains) to discourage development in hazardous areas.

Because the usual methods of apportionment seem mechanical and arbitrary, and because the tax burden on a particular piece of property is often quite large, the major constraint in using special assessments is political. Special assessments seem to offer little in terms of control over land use in developing areas. Assessments can, however, be used to finance the provision of necessary services within city or county boundaries. In addition, they are useful in distributing to new property owners the costs of the infrastructure required by new development.

### **Spending**

Another major power that has been delegated by the North Carolina General Assembly to local governments is the power to make expenditures in the public interest. Hazard mitigation principles should be made a routine part of all spending decisions made by a local government, including adoption of annual budgets and a Capital Improvement Plan (CIP). With regards to hazard mitigation, these expenditures could range from the purchase of equipment or the contracting of services to prepare for a hazard event before it occurs, during the event, or during the recover phase after the event has occurred.

### **Annual Budget**

Town of Garner prepares, adopts, and administers an annual budget in accordance with the North Carolina Local Government Budget and Fiscal Control Act. This act establishes responsibilities and deadlines for various phases of budget preparation and adoption, and mandates availability of the budget document for public inspection, a public hearing on the budget, and adoption of a balanced budget.

The Local Government Budget and Fiscal Control Act requires North Carolina local governments to use the modified accrual basis of accounting for budget preparation.

The modified accrual basis stipulates that revenues are recognized in the accounting period in which they become measurable and available to pay liabilities of the current

period. Expenditures are recognized in the accounting period in which a fund liability is incurred, if measurable, except for outstanding principal and interest on general long-term debt, which is recognized when due.

The Town maintains a standard fund structure:

- The General Fund - supported largely by local property taxes and State-shared revenues. Includes the majority of the Town's ongoing operations;
- Special Revenue Funds - account for the proceeds of specific revenue sources that are legally restricted to expenditures for specific purposes (including Capital Reserves and Grant Projects);
- Capital Projects Funds - tracks resources and expenditures for major projects that typically span more than one fiscal year.

The Town provides services on a program level, with each Town Department operating one or more programs. The annual budget ordinance establishes spending limits at the departmental level, although the budget document is presented on the more detailed, program level. Line item transfers, of any size within a department, may be approved by the Town Manager, while transfers between departments require Council approval. In addition, any transfer into or out of the salary line items, requires Council notification. At this time there are no hazard mitigation related items funded in the general budget.

### **Capital Improvement Program**

A CIP is a schedule for the provision of city or county services over a specified period of time. Capital programming by itself can be used as a growth management technique, with a view towards hazard mitigation. By tentatively committing itself to a timetable for the provision of capital to extend services, a community can control growth to some extent especially in areas where the provision of on-site sewage disposal and water supply are unusually expensive.

In addition to formulating a timetable for the provision of services, a local community can regulate the extension of and access to services. A CIP that is coordinated with extension and access policies can provide a significant degree of control over the location and timing of growth. These tools can also influence the cost of growth. If the CIP is effective in directing growth away from environmentally sensitive or high hazard areas, for example, it can reduce public costs associated with degradation of the environment and damages to properties caused by natural hazards.

The Town of Garner has a Capital Projects Budget (CPB) that includes planned expenditures for major infrastructure projects. At this time the CPB does not include any hazard mitigation related projects. The CPB is based on a individual project basis.

### **Bonds**

The Town of Garner has the ability to issue a variety of bond instruments (e.g.,— general obligation bonds, and revenue bonds) to pay for various long term capital needs such as the purchase of open space, buildings or equipment. Most common bond issues require voter approval via a bond referendum; however, revenue bonds which will yield a source of revenue which will pay for itself (e.g., - water and sewer projects) only need approval by the Town Council.

### **E. Fiscal Capability**

Beyond legal authority and political willpower, fiscal capability is a key component to effectively developing and implementing a hazard mitigation plan. In addition to local tax funds, non-profits and other non-governmental organizations are often interested in helping to implement hazard mitigation projects. Local governments can also apply for State and Federal funds to implement hazard mitigation initiatives. In determining fiscal capabilities, the NC Emergency Management (NCEM) website has more information including a listing of over 300 funding sources available to communities. The NCEM website address is: [www.ncem.org/Mitigation/additional\\_funding.htm](http://www.ncem.org/Mitigation/additional_funding.htm) .

#### **State and Federal Funds**

There are a variety of Federal and State funding sources available to local governments for the purpose of implementing hazard mitigation plans. These programs include Hazard Mitigation Grants, Flood Mitigation Assistance Programs, and Community Development Block Grants. A more exhaustive list and explanation of Federal and State funding sources can be found in Appendix D.

#### **Ability to Pay**

In recognition of the disparate economic prosperity of the State's one-hundred counties, the North Carolina Department of Commerce ranks counties in an economic tier system. The impetus for this system was the William S. Lee Quality Jobs and Business Expansion Act of 1996 (Lee Act) which provides for a sliding scale of state tax credits for economic investment. The Lee Act has become the State's main development tool in an effort to help smaller rural counties become more economically competitive. The tier ranking is also used by the State as a measure of an individual county's ability to pay when applying for state and federal grants.

The most economically distressed counties are ranked in Tier 1 and the most economically prosperous in Tier 5. The rankings are evaluated annually using these three factors – population growth, unemployment rate, and per capita income. The 2004 NC Department of Commerce ranking places Wake County in Tier 5.

### **F. Technical Capability**

Local government technical capabilities help build a more resilient community by implementing better planning before the occurrence of a natural hazard, as well as better response during the event and during the recovery period. The Town of Garner has a wide variety of technical capabilities available to aid in hazard mitigation efforts.

The Town's most valuable resource is the wealth of knowledge accumulated by experienced professional personnel. Staff technical capabilities include computer information services, economic development, engineering, finance, human resources, inspections, parks and recreation, planning, police, and public works. A brief review of departmental capabilities is also discussed at the front of this section of the Plan.

#### **Department of Administration**

This department consists of 3 Town officials – town manager, assistant to the town manager, and town clerk. This department is responsible for the day-to-day activities of the Town; including advising the Board of Aldermen on the financial position and future needs of the Town; ensuring the implementation of policies and activities in each Town department; and representing the Board of Aldermen and the Town in business with



other agencies. In addition, the town manager researches and proposes alternative approaches for achieving Board objectives, and presents data to assist the Board in policy development and ordinance adoption.

### **Computer Information Services Department**

The Computer Information Services department consists of a director, computer services technician, network specialist, and a computer software technician. The main function of the department is to provide computer related technical assistance to all other departments. These services include continuing to build and maintain the local and wide area networks; overseeing the telephone system; maintaining in-house web and email service; performing computer maintenance and upgrades; providing software support and streamlining suggestions for other departments; providing in-house computer training on popular software packages; developing and maintaining the document scanning program; and lastly, providing technical support with the operation of the financial system.

### **Department of Engineering**

The Engineering Department consists of the town engineer, assistant town engineer, an engineer, engineering technician and an office assistant. The department is responsible for providing technical assistance to the community at large. This function includes addressing residents' complaints, questions, and concerns; providing technical information to prospective developers; and providing technical assistance to other departments. Another function is to oversee and manage the growth and development of the Town's remaining utility systems (streets and storm drainage). This includes administration of the Water Supply Watershed Protection Program, the Neuse Basin Nutrient Watershed Strategy and the soon to be approved EPA NPDES Phase II Program, all associated with stormwater quality control.

### **Inspections Department**

The Building Inspections Administration/Enforcement program safeguards the public by enforcing compliance with state and local building codes for residential, commercial and industrial structures. Under the direction of the building code administrator, staff members receive permit applications, review building plans and specifications, issue or deny permits, make all necessary inspections, issue or deny certificates of compliance (COCs), issue orders to correct violations, keep records, and take other action as necessary to adequately enforce the building codes. In addition to inspecting new buildings and renovations, staff also enforces the Minimum Housing Code and conduct periodic inspections of existing buildings. The Inspections Department has eight State certified inspectors and two administrative support staff.

### **Parks and Recreation Department**

The Parks and Recreation department consists of a director, two recreation program managers, a recreation facility program manager, three recreation center supervisors, office assistant, two recreation program assistants and several part time and seasonal staff for various programs. Parks & Recreation ensures that a variety of quality recreation programs and activities are provided for all residents, regardless of age, sex, race, or ability. This program oversees four divisions by providing operating policy, fiscal management, registrations, record keeping, training and evaluation. The staff also maintains records of programs and participants, sets standards for facilities and grounds, and develops plans, sets priorities and implements park improvements.

### **Planning Department**

The Planning Department is responsible for receiving permit applications assuring conformance with all applicable State statutes and the Garner Land Use Ordinance requirements regarding public notification. Staff assists with long range comprehensive planning analysis, special studies and reports, annexation reports, ETJ studies, address assignments, and other special projects. Staff also reviews rezoning petitions for compliance with the Centennial Long Range Plan and ensures maintenance of all GIS databases, including an accurate and updated GIS Land Use Intensities Map and GIS Zoning Map. The Planner II (GIS/ Long Range Planning) is assigned to this program function. Town of Garner's GIS maintains several data layers including corporate limits, zoning, land use, transportation and utilities. Other data layers are available through Wake County GIS. Staff in the Land Use Permits and Enforcement Division reviews land use development applications for compliance with the Centennial Long Range Plan, Land Use Ordinance and other applicable laws and regulations. This department employs 6 professional planners.

### **Police Department**

The Garner Police Department, a nationally accredited agency, currently has 49 sworn positions and 55 total personnel. The department has a police chief, a major who supervises all police operations, including a patrol division consisting of 32 sworn officers; two lieutenants, four sergeants, and 24 officers. A lieutenant supervises two traffic safety officers. A lieutenant supervises the Investigations division, consisting of 5 criminal investigators, including one who specializes in drugs and one who specializes in juvenile cases. A lieutenant supervises the Community Services division, consisting of three school resource officers, one crime prevention officer, and one animal control officer. A lieutenant handles training and professional standards. On the civilian side, an administrative manager supervises four records clerks.

The Patrol division is divided into four teams who work twelve hour shifts. Each team staffs the town's two geographic districts for four consecutive days, and then has four days off. The department maintains a police substation in each of the districts for use by officers and the community as well. The Community Services division staffs a school resource officer at each of two middle schools (North Garner and East Garner Middle Schools) and one at the high school (Garner Senior High). The crime prevention officer works with community groups, patrol officers, and others to develop instructional material, seminars, visits, and programs to reduce crime and maintain community relations.

### **Public Works Department**

The Public Works Department provides a comprehensive solid waste management program, including weekly curbside garbage collection, weekly curbside trash, yard waste, and bulky waste collections, biweekly curbside and drop-off recycling programs, and periodic "unprepared" trash and yard waste collections. The department employs 36 personnel. The department also provides support on park construction, traffic control for special events, special cleanups, response to police calls, code enforcement requests, community development requests and all sanitation duties not under contract. Staff in the division performs non-Powell Bill eligible work such as mowing and picking up litter on State road rights-of-way. Other responsibilities include street name sign installation and maintenance.

### **G. Political Climate**

The Town of Garner has experienced the devastating effects of several natural hazards during recent years. These include a major hurricane, Hurricane Fran, in September 1996 and more minor damage from Hurricane Isabel in September 2003. Both storms brought high winds and flooding, particularly Hurricane Fran which caused widespread flooding, loss of lives, and property damages throughout the Town. The Town also regularly encounters winter storms with widespread damages from ice accumulation, most recently in December 2002 when some county residents were without electricity for as much as ten days.

The citizens, property owners, business owners, and elected officials of the Town of Garner are committed to improving the greater community through coordinated hazard mitigation planning efforts. In the coming years, the Town of Garner will continue to take a proactive role in planning for and encouraging mitigation of hazards that put citizens and property at risk. The Mayor of Garner along with the elected Council members continually strive to make the Town of Garner a safer community and see the Hazard Mitigation Plan as a essential component in helping to achieve that goal.

## Appendix D: State and Federal Resources

### ORGANIZATIONS

#### **North Carolina Division of Emergency Management**

Web: <http://www.ncem.org/mitigations/index.htm>

1830-B Tillery Place

Raleigh, NC 27604

Telephone: 919-715-8000

#### **North Carolina Center for Geographic Information and Analysis (CGIA)**

Web: <http://www.cgia.state.nc.us>

301 N. Wilmington Street, Suite 700

Raleigh, NC 27601-2825

Telephone: 919-733-2090

#### **UNC-CH Department of City and Regional Planning**

Web: <http://www.unc.edu/depts/dcrpweb/>

New East, Campus Box 3140

The University of North Carolina-Chapel Hill

Chapel Hill, NC 27599-3140

Telephone: 919-962-4775

#### **North Carolina Division of Coastal Management (DCM)**

Web: <http://dcm2.enr.state.nc.us/>

P0 Box 27687

Raleigh, NC 27611-7687

Telephone: 919-733-2293

##### **DCM Field Offices**

Elizabeth City 252-264-3901

Morehead City 252-808-2808

Washington 252-946-6481

Wilmington 910-395-3900

#### **North Carolina Division of Community Assistance (DCA)**

Web: <http://www.dca.commerce.state.nc.us/>

1307 Glenwood Avenue, Suite 250

Raleigh, NC 27605

Telephone: 919-733-2850

#### **North Carolina League of Municipalities**

Web: <http://www.nclm.org>

P0 Box 3069/2 15 N. Dawson Street

Raleigh, NC 27602

Telephone: 919-715-4000

**North Carolina State Data Center**

Web: <http://sdc.state.nc.us>  
116 West Jones Street  
Raleigh, NC 27603-8003  
Telephone: 919-733-4131

**Federal Emergency Management Agency (FEMA)**

Web: <http://www.fema.gov/about/regoff.htm>  
500 C Street SW  
Washington, DC 20472  
Telephone: 202 646-3923

**FEMA Regional Office**

3003 Chamblee-Tucker Road  
Atlanta, GA 30341  
Telephone: 770-220-5200

**FEMA National Emergency Training Center**

Web: [http://www.usfa.fema.gov/nfa/tr\\_eenet.htm](http://www.usfa.fema.gov/nfa/tr_eenet.htm)  
16825 South Seton Avenue  
Emmitsburg, MD 21727  
Telephone: 301-447-1000

**Office of Management and Budget (OMB)**

Web: <http://www.whitehouse.gov/omb/>  
New Executive Office Building  
725 17th Street, NW, Room 8002  
Washington, DC 20503  
Telephone: 202-395-3080

**Small Business Administration (SBA)**

Web: <http://www.sbaonline.sba.gov/DISASTER>  
Disaster Assistance Division  
Office of Disaster Assistance  
409 Third Street SW  
Washington, DC 20416  
Telephone: 202-205-6734

**U.S. Army Corps of Engineers (USACE)**

Web: <http://www.usace.army.mil>  
Floodplain Management Services and Coastal Resources Branch  
20 Massachusetts Avenue NW  
Washington, DC 20314  
Telephone: 202-272-0169

### **U.S. Geological Survey (USGS)**

Web: <http://www.usgs.gov>  
807 National Center  
12201 Sunrise Valley Drive  
Reston, VA 20192  
Telephone: 703-648-4000

### **U.S. Department of Housing and Urban Development (HUD)**

Web: <http://www.hud.gov>  
Community Planning and Development  
Office of Block Grant Assistance  
451 7th Street SW -  
Washington, DC 20410-7000  
Telephone: 202-708-1871

## **PUBLICATIONS AND DATA**

### **North Carolina Division of Emergency Management**

Risk Management Branch (919-715-8000)

- *Tools and Techniques for Mitigating the Effects of Natural Hazards*, 1998
- *Best Mitigation Practices for Local Governments*, 2001
- *Disaster Recovery Manual*
- *Hazard Data Diskettes (County level)*
- *Flood Insurance Rate Maps (FIRMs)* also available from the NFIP Map Service Center at 1-80-358-9616)

### **Federal Emergency Management Agency (FEMA)**

Available from the FEMA Distribution Facility (1-800-480-2520)

- *Understanding Your Risks: Identifying Hazards and Estimating Losses* (FEMA publication #386-2, 2001)
- *Post-Disaster Hazard Mitigation Planning Guidance for State and Local Governments* (FEMA publication #131, 1990)
- *Guide for the Review Of State and Local Emergency Operation Plans*
- *Disaster Assistance: A Guide to Recovery Programs* (FEMA publication #229(4))
- *Mitigation: Cornerstone for Building Safer Communities*, 1995

### **Center for Urban and Regional Studies (CURS)**

- *Making Mitigation Work: Recasting Natural Hazards Planning and Implementation*, February 1997

### **National League of Municipalities (NLM)**

- *Emergency Management Mini-Guide*, 1992

### **Office of Management and Budget (OBM)**

*Federal Programs Offering Non-Structural Flood Recovery and Floodplain Management Alternatives* – available by fax (202-395-4817) or from FEMA library website – <http://www.fema.gov/library/ombflood/pdf>

## Appendix E: Glossary

### **Best Management Practices (BMPs)**

A structural or nonstructural management based practice used singularly or in combination to reduce non-point source inputs to receiving waters in order to achieve water quality protection goals.

### **Built-Up on Area**

Built-upon areas shall include that portion of a development project that is covered by impervious or partially impervious cover including buildings, pavement, gravel areas, recreation facilities, etc. Wooden slatted decks and the water area of a swimming pool are considered pervious.

### **Cluster Subdivision**

A subdivision in which lots are grouped or “clustered” on a site to provide for more efficient use of the land resulting in a reduction in impervious surface coverage, more cost effective provision of utilities, and preservation of open space.

### **Critical Area**

The land in a water supply watershed which is adjacent and draining to the water source, where it is most important to filter out potential pollutants.

### **Dam Types - NC Department of Environment and Natural Resources**

- RE – Rolled Earth
- ER – Rockfill
- CNCB – Concrete Buttress
- CNMVCB – Concrete Multiple Arch with Buttresses
- CNPG – Concrete Gravity
- CNPGRE – Concrete Gravity and Rolled Earth
- CNPGVA – Concrete Gravity Arch
- CNVA – Concrete Arch
- MS – Masonry
- MSRE – Masonry and Rolled Earth
- OT – Other
- RECNCB – Rolled Earth and Concrete Buttress
- RECNPB – Rolled Earth and Concrete Gravity
- REER – Rolled Earth and Rockfill
- REMS – Rolled Earth and Masonry
- STMS – Stone Masonry
- STMSRE – Stone Masonry and Rolled Earth
- TC – Timber Crib

### **Detention**

Surface collection, storage, and distribution of stormwater runoff for the purposes of compensating for increased runoff volume and decreased travel time associated with an increase in impervious surfaces over the contributing catchment, and to allow for the settling-out of pollutants borne by the runoff.

**Development**

Any land-disturbing activity that changes the amount of impervious surface or partially impervious surface coverage on the land, or that otherwise decreases the infiltration of precipitation into the soil.

**Disaster/Emergency**

Any hurricane, tornado, storm, flood, high water, wind driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, drought, fire, explosion or other catastrophe in any part of the United States which, in the determination of the President, caused damage of sufficient severity and magnitude to warrant major disaster assistance under P.L. 93-288, above and beyond emergency services by the federal government, to supplement the efforts and available resources of the state, local government and disaster relief organization in alleviating damage, loss, hardship or suffering.

**Drainageway**

Any stream, watercourse, channel, ditch, or similar physiographic feature draining water from the land.

**Drainageway Buffer**

An undisturbed area adjacent to and on either side of a drainageway that serves to reduce stormwater runoff and to protect water quality.

**EMS**

Emergency Medical Services - Local medical response teams, usually rescue squads or local ambulance services, which provide medical services during a disaster.

**EOC**

Emergency Operations Center - A protected site from which government officials and emergency response personnel exercise direction and control in an emergency. The emergency Communications Center (ECC) is normally an essential part of the EOC.

**EOP**

Emergency Operations Plan - A brief, clear and concise description of action to be taken or instruction to be given to those concerned during a specific emergency. The plan will state the method or scheme for coordinated action based on pre-determined assumptions, objectives and capabilities.

**EPA**

U.S. Environmental Protection Agency

**ETJ**

Extraterritorial jurisdiction – that area of land outside and beyond the corporate limits of a municipality over which the municipality has planning and zoning jurisdiction.

**FEMA**

Federal Emergency Management Agency - A federal agency tasked with national disaster or emergency preparedness and response. Also deals in temporary emergency housing, training of state and local emergency response personnel and funding of preparedness projects and functions.



## FEMA Flood Zones

**Zone A** - Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study (FIS) by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs or depths are shown within this zone. Mandatory flood insurance purchase requirements apply.

**Zone AE and A1-A30** - Zones AE and A1-A30 are the flood insurance rate zones that correspond to the 100-year floodplains that are determined in the FIS by detailed methods. In most instances, BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply.

**Zone AH** - Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding with a constant water-surface elevation (usually areas of ponding) where average depths are between 1 and 3 feet. The BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply.

**Zone AO** - Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. The depth should be averaged along the cross section and then along the direction of flow to determine the extent of the zone. Average flood depths derived from the detailed hydraulic analyses are shown within this zone. In addition, alluvial fan flood hazards are shown as Zone AO on the FIRM. Mandatory flood insurance purchase requirements apply.

**Zone AR** - Zone AR is the flood insurance rate zone used to depict areas protected from flood hazards by flood control structures, such as a levee, that are being restored. FEMA will consider using the Zone AR designation for a community if the flood protection system has been deemed restorable by a Federal agency in consultation with a local project sponsor; a minimum level of flood protection is still provided to the community by the system; and restoration of the flood protection system is scheduled to begin within a designated time period and in accordance with a progress plan negotiated between the community and FEMA. Mandatory purchase requirements for flood insurance will apply in Zone AR, but the rate will not exceed the rate for unnumbered A zones if the structure is built in compliance with Zone AR floodplain management regulations.

For floodplain management in Zone AR areas, elevation is not required for improvements to existing structures. However, for new construction, the structure must be elevated (or floodproofed for non-residential structures) such that the lowest floor, including basement, is a maximum of 3 feet above the highest adjacent existing grade if the depth of the base flood elevation (BFE) does not exceed 5 feet at the proposed development site. For infill sites, rehabilitation of existing structures, or redevelopment of previously developed areas, there is a 3 foot elevation requirement regardless of the depth of the BFE at the project site.

The Zone AR designation will be removed and the restored flood control system shown as providing protection from the 1% annual chance flood on the NFIP map upon completion of the restoration project and submittal of all the necessary data to FEMA.

**Zone A99** - Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplains that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No BFEs or depths are shown within this zone. Mandatory flood insurance purchase requirements apply.

**Zone D** - The Zone D designation on NFIP maps is used for areas where there are possible but undetermined flood hazards. In areas designated as Zone D, no analysis of flood hazards has been conducted. Mandatory flood insurance purchase requirements do not apply, but coverage is available. The flood insurance rates for properties in Zone D are commensurate with the uncertainty of the flood risk.

**Zone V** - Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no BFEs are shown within this zone. Mandatory flood insurance purchase requirements apply.

**Zone VE** - Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply.

**Zones B, C, and X** - Zones B, C, and X are the flood insurance rate zones that correspond to areas outside the 100-year floodplains, areas of 100-year sheet flow flooding where average depths are less than 1 foot, areas of 100-year stream flooding where the contributing drainage area is less than 1 square mile, or areas protected from the 100-year flood by levees. No BFEs or depths are shown within this zone.

### **Flood or Flooding**

A general and temporary condition of partial or complete inundation of normally dry land areas from: 1) the overflow of inland or tidal waters; and 2) the unusual and rapid accumulation of runoff of surface waters from any source.

### **Flood Fringe**

Portion of the floodplain that is outside the floodway.

### **Flood Hazard Boundary Map (FHBM)**

An official map of a community, issued by the Federal Emergency Management Agency (FEMA), where the boundaries of the areas of special flood hazard have been defined as Zone A.

### **Flood Insurance Rate Map (FIRM)**

An official map of a community on which the Federal Emergency Management Agency (FEMA) has delineated both the areas of special flood hazard and the risk premium zones applicable to the community.

### **Floodplain**

Any area susceptible to being flooded by the 100-year flood. The floodplain consists of the floodway plus the floodway fringe.

**Floodway**

The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.

**Impervious Surface**

A surface resulting from human activity that obstructs or prevents infiltration of water into soil. Impervious surface includes, but is not restricted to: buildings and rooftops; walkways, driveways, and parking areas that are paved or compacted by pedestrian or vehicular traffic; solid decks and patios; pavement; recreation facilities that are paved or compacted; and any other paved, compacted, or partially impervious surface.

**Mitigation**

Any activity that actually eliminates or reduces the probability of a disaster occurrence, or reduces the effects of a disaster. Mitigation includes such actions as zoning and land use management, safety and building codes, flood proofing of buildings and public education.

**National Weather Service (NWS)**

A federal agency tasked with forecasting weather and providing appropriate warning of imminent natural disaster such as hurricane, tornados, tropical storms, etc.

**NCEM (or NCDEM)**

North Carolina Division of Emergency Management - The North Carolina state agency tasked with protecting the general public from the effects of natural or man-made disasters.

**NCDENR**

North Carolina Department of Environment and Natural Resources .

**NCDC - National Climatic Data Center Storm Events Database**

<http://www4.ncdc.noaa.gov/cgi-win/wwcqi.dll?wwEvent~Storms>

The Storm Events Database is updated on a monthly basis and is usually 90-120 days behind the current month. All of the data is received from the National Weather Service and is made available as soon as possible. The National Climatic Data Center Storm Events Database contains data from the following sources:

- 1) All Weather Events from 1993 - 1995, as entered into Storm Data (except 6/93 - 7/93, which is missing; no latitude/longitude).
- 2) All Weather Events from 1996 - current, as entered into Storm Data (including latitude/longitude).
- 3) Additional data from the Storm Prediction Center including tornadoes (1950-1992); thunderstorm winds (1955-1992); and hail 1955-1992

**Nonpoint Source Pollution**

Pollution that enters waters from dispersed sources (such as surface runoff) rather than from a point source (i.e., pipe).

**Perennial Stream**

A stream that flows continuously throughout the year. Perennial streams are indicated as perennial by a solid blue line on the most recent edition of U.S.G.S. 1:24,000 (7.5 minute) scale topographic maps.

**Recovery**

Activities which involve assistance to enhance the return of the community to normal or near-normal conditions. Short-term recovery returns vital life-support systems to minimum operating standards. Long-term recovery may continue for a number of years after a disaster and seeks to return life to normal or improved levels. Recovery activities include temporary housing, loans or grants, disaster unemployment insurance, reconstruction and counseling programs.

**Response**

Activities that occur immediately before, during, and directly after an emergency or disaster. Activities involve lifesaving actions such as, the activation of warning systems, manning the EOCs, implementation of shelter or evacuation plans and search and rescue.

**Retention**

Surface collection, storage, and reduction of stormwater runoff for the purpose of providing infiltration of the runoff into the soil.

**Runoff**

That portion of rainfall or other precipitation that is not absorbed by the soil, but rather flows across the ground surface and drains to a water body.

**SHELDUS – Spatial Hazard Events and Losses Database for the United States**

[http://go2.cla.sc.edu/hazard/db\\_registration](http://go2.cla.sc.edu/hazard/db_registration)

SHELDUS is a geo-referenced data set providing county-level data on natural hazard events and losses from 1960 to 2000. Hazard types covered in the data base include avalanches, coastal hazards, drought, earthquakes, flooding, fog, hail, heat, hurricane/tropical storms, landslides, lightning, severe storms/thunderstorms, tornadoes, tsunamis/seiches, volcanoes, wildfires, wind hazards, and winter weather. According to the SHELDUS website, this is the most comprehensive database of natural hazard events and losses available.

SHELDUS culls data from repositories such as the National Climatic Data Center Storm Data and the Council of National Seismic Systems. Variables include county name, state, Federal Information Processing Standard (FIPS) code, date, event type, property losses (in unadjusted dollars), crop losses (in unadjusted dollars), injuries, and deaths.

Only those events that generated more than \$50,000 in losses are included in the database. For events that covered multiple counties, the dollar losses, deaths, and injuries were equally divided among the counties. Where dollar loss estimates were provided in a range (e.g., \$50,000 to \$100,000), the lowest value in the range of the category was used. This results in the most conservative estimate of losses during the time period.

**USGS**

United States Geological Survey.

**Vulnerability**

The susceptibility to life, property, and the environment to damage if a hazard manifests its potential.

**Watershed**

The land area that drains runoff to a surface water body or watercourse. Also called a drainage basin, a watershed includes hills, lowlands, and the body of water into which the runoff drains.

**Watershed Best Management Practice (BMP)**

A recognized method, activity, device, maintenance procedure, or other management practice used singularly or in combination to minimize the amount of nonpoint source pollution entering surface waters.

**Watershed Buffer**

An undisturbed area of natural vegetation adjacent to a drainageway, watercourse, or water impoundment within a watershed through which stormwater runoff is intended to flow in a diffuse manner so that it does not become channelized and infiltration of runoff and filtering of pollutants can take place.

