Town of Surf City

Community-Based Hazard Mitigation Plan

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The Cape Fear Council of Governments through a sub-contract with L. Gina White, Consulting prepared this final document for the Town of Surf City. The preparation of this plan was financed in part by the Federal Emergency Management Agency through the Hazard Mitigation Grant Program and by the Town of Surf City with in-kind assistance from the Cape Fear Council of Government.

TABLE OF CONTENTS

List of Tables i

Executive Summary 1
Plan Mission 1
Plan Organization 1
Plan Financing 1
Plan Participation 1
Interagency and Intergovernmental Coordination 2
Hazards Identified 2
Plan Goals 3
Mitigation Goal, Objective, and Strategy Organization 3
Plan Implementation 3
Mitigation Strategy 5

SECTION 1: INTRODUCTION 7
Hazard Mitigation 7
Hazard Mitigation and Sustainable Development 8
Sustainable Development 8
The Mitigation Planning Process 9

SECTION 2: PLANNING AREA PROFILE 14
History 14
Geography 14
Climate 14
Soils 14
Water Resources 15
Natural Resources 15
Recreation 16
Population Trends 16
Residential Development Trends 17
Future Residential Development 18
Commercial & Industrial Development Trends 18
Future Commercial & Industrial Development 19
Critical Facility & Community Infrastructure Development Trends 19
Future Critical Facility & Community Infrastructure Development 22

SECTION 3: HAZARD VULNERABILITY ASSESSMENT 24
Natural Hazards 26
Atmospheric Hazards 26
Winter Storms 26
Severe Thunderstorms/Windstorms 28
Tropical Cyclones 30

Nor'easters 35
Extreme Temperatures 37
Tornadoes 39

Waterspouts 41
Hydrologic Hazards 41
Floods 42
Erosion 44
Drought 46
Geologic Hazards 50
Sinkholes 50
Landslides 51
Seismic Hazards 51
Earthquakes 51
Tsunami Events 53
Other Natural Hazards 54
Volcanoes 54
Wildfire 54
Technological Hazards 55
Dam/Levee Failures 56
Hazardous Materials Events 57

SECTION4: COMMUNITY CAPABILITY ASSESSMENT 59
Legal Capability 59
General Authority 59
Building Codes and Inspections 60
Land Use Planning 60
Zoning 60
Subdivision Ordinance 61
Acquisition 61
Taxation 61
Floodplain Regulation 61
National Flood Insurance Program and Community Rating System 62
FEMA's Floodplain Map Modernization Program 62
Stormwater Management 67
Emergency Management 67
Strategic Planning 67
Institutional Capability 68
Political Capability 69
Technical Capability 69
Fiscal Capability 69
Analysis Conclusion 70

SECTION 5: MITIGATION STRATEGIES 71

SECTION 6: PRIORITIZATION SCOPE 85

Appendix A: 87

Appendix B: 90

Appendix C: 99

Appendix D: 110

Appendix E: 113

Appendix F: 127

References: 132

List of Tables

Table 2.1 *Surf City 1980 – 2000 Population Change* 17

Table 2.2 *Surf City Residential Structure Trends 1980 - 2000* 18

Table 2.3 *Town of Surf City Area Vulnerability Assessment Worksheet – A* 19

Table 2.4 *Vehicles and Major Equipment Owned by Surf City Fire Department* 21

Table 2.5 *Vehicles and Major Equipment Owned by Surf City Public Works Department* 22

Table 2.6 *Town of Surf City Area Vulnerability Assessment Worksheet – B* 23

Table 3.1 *Hazard Index Ranking* 24

Table 3.2 *Frequency Of Occurrence* 25

Table 3.3 *Consequences of Impact* 25

Table 3.4 *Saffir-Simpson Hurricane Scale* 30

Table 3.5 *Approximate Vulnerability to the Effects of Wind in Zone 1* 31

Table 3.6 *Dolan – Davis Nor'easter Intensity Scale (1993)* 35

Table 3.7 *Heat Index in Relation to Heat Disorders* 38

Table 3.8 *Fujita-Pearson Tornado Scale* 40

Table 3.9 *Vulnerability to Flooding* 43

Table 3.10 *Surf City Nourishment Experience* 46

Table 3.11 *Approximate Vulnerability to the Effects of Erosion* 46

Table 3.12 *Monthly/Annual Climate Data Results* 48

Table 3.13 *Modified Mercalli Scale of Earthquake Intensity* 52

Table 3.14 *Town of Surf City Hazard Identification and Analysis Worksheet* 58

Table 6.1 *Surf City Project Prioritization Worksheet* 86

EXECUTIVE SUMMARY

Plan Mission

The mission of the Surf City Community-Based Hazard Mitigation Plan is to substantially and permanently reduce the community's vulnerability to natural and technological hazards. The plan is intended to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the natural environment. This can be achieved by increasing public awareness, documenting resources for risk reduction and loss-prevention, and identifying activities to guide the community towards the development of a safer, more sustainable community.

Plan Organization

The Surf City plan is developed and organized within the rules and regulations established under the 44 CFR 201.6. The plan contains a Mitigation Action Matrix, a discussion on the purpose and methodology used to develop the plan, a profile on Surf City, as well as, the Hazard Identification and Vulnerability Assessment of 16 natural hazards and 2 technological hazards. In addition, the plan offers a thorough discussion of the community's current capability to implement the goals, objectives and strategies identified herein. To assist in the explanation of the above identified contents there are several appendices included which provide more detail on specific subjects. This plan is intended to improve the ability of Surf City to handle disasters and will document valuable local knowledge on the most efficient and effective ways to reduce loss.

Plan Financing

The Surf City Community-Based Hazard Mitigation Plan has been (in-part) financed by and developed under a Hazard Mitigation Planning Grant provided by the Federal Emergency Management Agency (FEMA) and the North Carolina Division of Emergency Management (NCDEM). Additionally, the Town of Surf City, with in-kind assistance from the Cape Fear Council of Governments, contributed to the financing of this plan.

Plan Participation

The Surf City Community-Based Hazard Mitigation Plan is developed as the result of a collaborative effort between the Surf City Town Council, Surf City Citizens, public agencies, non-profit organizations, the private sector, as well as, regional, state and federal agencies. Interviews were conducted with stakeholders from the community, and a workshop was conducted during the plan development. Additionally, through public hearings, workshops, and draft plan display, ample opportunity was provided for public participation. Any comments, questions, and discussions resulting from these activities were given strong consideration in the development of this plan. A Mitigation Planning Committee guided and assisted the Cape Fear Council of Governments and L. Gina White Consulting in the development of the plan. The Mitigation Planning Committee was comprised of the:

- Surf City Town Manager,
- Surf City Finance Director,
- Surf City Town Clerk,
- Surf City Building Inspector,
- Surf City Police Chief,
- Surf City Public Works Director,

- Surf City Planner,
- Surf City Fire Marshall, and
- Cape Fear Council of Governments Regional Planner and GIS Specialist

Interagency and Intergovernmental Coordination
The Mitigation Planning Committee made a sound effort to include outside agencies and other governments in the development of this plan.

- *United States Forestry Service (USFS) and the North Carolina Forestry Service (NCFS)*: provided information relevant to the location of previous wildfires and areas considered to be at risk to wildfires. They did not attend any meeting but phone conferences took place that proved to be important to the development of the plan.
- *North Carolina State Climatology Office (NCSC)*: phone conversations with NCSC provided significant information in the development of the Hazard Vulnerability Assessment. In addition, the NCSC provided data and methodology that was used in the assessment of droughts, extreme temperatures, and precipitation.
- *United States Geological Survey (USGS)*: phone conversations and GIS assistance provided by the USGS was key in developing the Hazard Vulnerability Assessment for landslides and earthquakes.

Hazards Identified
The criteria provided by FEMA for the development of the Hazard Mitigation Plan identifies 11natural hazards and states that, at a minimum, Surf City must address: Winter storms/Extreme Cold, Severe Thunderstorms/Tornadoes, Hurricanes/Coastal Storms, Floods, Riverine/Coastal Erosion, Drought/Heat Wave, Landslides/Sinkholes, Earthquakes, Tsunami Events, Volcanoes, Wildfires, and Dam/Levee Failure. However, there are other hazards that were identified which are not in the minimum criteria established by FEMA that were added to the discussion.

Through the Area Vulnerability Analysis all the hazards identified by FEMA were examined, as well as, hazardous materials events (HAZMAT). Often natural hazard events can directly effect the type and frequency of HAZMAT events. As a result, HAZMAT events are reviewed as a part of this plan.

The Vulnerability Analysis identified the following hazards as being most prevalent and posing the most potential risk to the Town of Surf City.

- Tropical Cyclones
- Flooding
- Nor'easters
- Erosion
- Severe Thunderstorms
- Wildfires
- Tornadoes
- Waterspouts
- Winter storms
- Droughts
- Extreme Heat

- Earthquakes
- Hazardous Materials Events

Plan Goals

In an effort to ensure the mission of the Surf City Community-Based Hazard Mitigation Plan is met, the participants in the development of this plan defined and established a list of goals which are directly relevant to meeting the mission of the plan. The following is a list of the goals identified by the participants of this plan:

- Improve the Town's Technical Capability to prepare for, respond to, and mitigate all hazards.
- Improve Public Awareness.
- Reduce the Impacts of Flooding in Surf City
- Improve the Town's Legal Capability
- Minimize the Impact of Natural Hazard Events on Built Structures
- Minimize the Impact of Drought.
- Minimize the Potential for Damage or Injury Due to Hazardous Material Events.
- Improve the Town's Ability to Respond and Mitigate Wildfire Hazards.

Mitigation Goal, Objective, and Strategy organization

This plan has established a set of goals to assist the community in fulfilling the established purpose of this plan. In an effort to ensure the goals in this plan are met, each goal is broken down into a series of objectives which are further broken down into a series of strategies. Each strategy identifies the hazard(s) addressed by said strategy, the type of strategy, responsible party/organization, monitoring and evaluation indicators, potential funding sources and a target completion date.

Plan Implementation

Adoption

Pursuant to the authority of N.C.G.S. 30.01, the Surf City Town Council has the legislative capacity to adopt policies, ordinances and amendments. Based on that authority, the Surf City Town Council Adopted the Surf City Community-Based Hazard Mitigation Plan on August 3, 2004.

Monitoring, Evaluation, Update, and Revision

The Community-Based Hazard Mitigation Plan for Surf City will be evaluated by the Planning Department and a Mitigation Monitoring and Evaluation Committee annually to access how effective implemented mitigation strategies have been. Monitoring and evaluation involves the ongoing process of compiling information on the outcomes that result from implementing the hazard mitigation strategies contained in this plan or is a measure of success the planning area has seen through the implementation of each strategy. It also provides the planning area with an opportunity to make necessary revisions as local conditions change. Changes in development, technology or the capability of the planning area to implement the strategies adopted in the plan could necessitate the need for revisions in the plan itself.

There are many issues that the monitoring and evaluation process should include:

- The adequacy of the planning areas resources to implement the strategies as adopted
- Any redundancy among strategies that can be eliminated to free-up resources
- Whether adequate funding is available for implementation of the strategies as adopted
- Any technical, legal or coordination problems associated with implementation
- Whether mitigation actions are being implemented according to the prioritization scope

However, the primary issue that monitoring and evaluation should address is whether the vulnerability of the planning area has decreased as a result of the strategies adopted in the plan. Where vulnerability has decreased, the Committee should determine why and consider implementing successful mitigation strategies in other locations. Where vulnerability has remained constant or increased, the Committee should identify whether additional measures might be more successful or whether revisions should be made to existing measures.

As previously noted, changes in development, technology or the capability of the planning area to implement the strategies adopted in the plan could alter the ability of the planning area to implement the mitigation strategies identified and adopted in their plan or could necessitate the need for new strategies to be identified. As a result, update and revision is a necessary part of the Community-Based Hazard Mitigation planning process. While monitoring and evaluation are ongoing processes, update and revision should occur at regularly scheduled intervals. The Planning Department and a Mitigation Update and Revision Committee will be responsible for updates and revisions to the Surf City Community-Based Hazard Mitigation Plan every five years and following every Presidentially Declared Disaster to access how effective implemented mitigation strategies have been.

Implementation Through Existing Programs

Surf City addresses planning goals and legislative requirements through it's CAMA Land Use Plan, Flood Damage Prevention Ordinance, Hurricane Management Plan, Zoning Ordinance, and the North Carolina State Building Codes. The Community-Based Hazard Mitigation Plan provides a series of goals, objectives, and strategies that are closely related to the goals and objectives of these existing planning programs. Surf City will have the opportunity to implement adopted mitigation strategies through existing programs and procedures. The CAMA Land Use Plan, Hurricane Management Plan, Flood Damage Prevention Ordinance and Zoning Ordinance are updated on a schedule established within each plan and identified in the Community Capability Assessment of this plan. Each of these documents will be revised and updated to continue to include proactive mitigation processes and to reflect specific mitigation actions identified within the Community-Based Hazar4d Mitigation Plan. This will ensure the documents work together to promote mitigation activities that will reduce and potentially eliminate the vulnerability of property and life to the hazards prevalent in the area.

Continued Public Involvement

During the development of this plan the public has been provided ample opportunity to participate. In addition, the Town of Surf City is dedicated to the continued involvement of the public during the annual review and the 5 year update, as well as, in the interim. Surf City has established strategies herein which will provide opportunity for continued public involvement.

- Upon adoption of the plan by the governing board, a public information notice will be posted in all local newspapers that will identify where copies of the document can be found for review and comment purposes.

- Upon adoption the plan will be placed at the Town Hall for public review. with contact information for the public to direct questions or comments regarding the plan to the Director of Planning and Inspections.

- A copy of the adopted plan and any proposed revisions will be displayed on the Town sponsored website with a response icon and a phone number for the public to direct questions or comments regarding the plan to the Director of Planning and Inspections.

- Two weeks prior to all annual review meetings of the Mitigation Planning Committee a public announcement will be posted in all local newspapers and on the Town sponsored websites announcing each meeting and the desire for public participation in each meeting.

- Prior to any significant revisions to the plan. The Mitigation Planning Committee will hold two advertised public hearings to receive public comment on the draft versions of the changes and the final version of the changes.

Mitigation Strategy

The strategies identified herein are organizes each strategy into one of 5 categories: new policy, amended policy, continued policy, new project and continued project. In addition to the categorization of each strategy, the type of strategy, target completion date, responsible party/organization, potential funding source, monitoring and evaluation indicators, and the hazard(s) addressed by said strategy is identified.

Type of Strategy

There are 5 strategy types and each strategy will be classified as one of the five types.

- Preventative – activities that are intended to keep vulnerability from increasing.

- Property Protection – measures that protect existing structures by modifying buildings to with stand hazardous events, removing structures from hazardous locations, or adopting policy that specifically addresses hazard issues in relation to current property.

- Natural Resource Protection – activities that reduce the impacts of hazards by preserving or restoring natural areas and their mitigative functions.

- Structural Projects – projects that are intended to lessen the impact of a hazard by modifying the environment or natural progression of the hazard event.

- Public Information – activities that are used to advise citizens, business owners, potential property buyers, and visitors about hazards, hazardous areas, and mitigation techniques they can use to protect themselves and their property.

Target Completion Date
A target completion date is established to provide a timeline for completion of the strategies identified herein. The target completion date is the date established for the project to be fully complete. Many strategies, especially those that will take multiple years to complete, will require the project manager to establish an individual timeline where benchmarks can be used to monitor the progression of the strategy.

The target completion dates are established under two categories: short-term and long-term. Short-term strategies are those that can be implemented within existing resources and authorities and should be completed within a time frame of 6 months to 2 years. Short-term activities also include those activities that should be implemented immediately following the adoption of this plan and should be implemented on a continuous basis. Long-term strategies may require new or additional resources or authorities and should be organized to be implemented within a time-frame of 3 – 5 years.

Responsible Party/Organization
The responsible party/organization will organize the implementation of the strategy, seek out appropriate funding, oversee strategy implementation, and be a liaison between the community and any other organization participating in the project. In addition the responsible party/organization will report back to the monitoring and evaluation party regarding the progress of the strategy implementation.

Potential Funding Source
It is a well known fact that many small communities lack the resources to implement strategies which will assist in reducing the community's vulnerability to hazards. Thus, this plan identifies potential funding sources for each strategy identified herein. The funding sources are those sources that are currently available to communities and may change from year to year. As a result, the responsible party/organization for each strategy should always research funding sources not listed in this document.

Monitoring and Evaluation Indicators
Monitoring and evaluation indicators are benchmarks that will allow the monitoring and evaluating party to determine if a strategy has been completely implemented. Additionally, they will identify if a strategy is achieving the goal it was intended for. If it is found that the strategy is not successful in the community it may need to be altered or discontinued.

SECTION 1: INTRODUCTION

Hazard Mitigation

Mitigation is defined by the Federal Emergency Management Agency (FEMA) as any sustained action taken to reduce or eliminate long-term risk to people and property from hazards and their effects (NCDEM, 2001). Mitigation is an ongoing effort to lessen the impact that disasters have on people and property. In practice, mitigation can take many forms and include many actions, which happen locally. Local governments must recognize hazards and initiate mitigation action. According to the North Carolina Division of Emergency Management (NCDEM), at a minimum, local governments should:

- *Enact and enforce building codes, zoning ordinances, and other measures to enhance their legal capability in an effort to protect life and property.*
- *Make the public aware of hazards that present risks to people and property and measures they can take to reduce their risk and possible losses.*
- *Comply with Federal and other regulations that are designed to reduce disaster costs as well as preserve and protect natural, historical, and cultural resources.*

Through the application of mitigation technologies and practices the Town of Surf City is working to ensure that fewer citizens and fewer local businesses become victims of disasters that are prevalent to their area.

Planning is the key to making mitigation a proactive process and pre-disaster planning is an essential element in building an effective mitigation program. Mitigation plans emphasize actions taken before a disaster happens to reduce or prevent future damages. Preparing a plan to reduce the impact of a disaster before it occurs can provide a community with a number of benefits (NCDEM, 2001):

- *Saves lives and property*: In light of the fact that every community exists in a distinct natural, economic and social environment, hazard mitigation plans must fit within the specific needs of individual communities. A plan must consider the geography, demography, community size, economy, land uses, current community goals, and the hazards that define a community. Mitigation plans are designed to correspond with other community goals in order to provide a plan that best suits the overall needs of the community.

- *Achieves Multiple Objectives*: Mitigation plans can cover numerous hazards. By conducting a concurrent assessment of community vulnerability and capability to deal with various hazards, communities are able to prioritize needs and develop appropriate solutions to current and potential problems. This evaluation provides a comprehensive strategy to contend with the multiple facets of hazard preparation, response and recovery.

- *Saves Money:* The community will experience cost savings by not having to provide emergency services, rescue operations, or recovery measures to areas that are dangerous to people in the event of a hazard. They will also avoid costly repairs or replacement of buildings and infrastructure that would have been preventive mitigation measures not been taken.

- *Facilitates post-disaster funding.* Many disaster assistance agencies and programs, including FEMA, require pre-disaster mitigation plans as a condition for both mitigation funding and for disaster relief funding. Such plans must include a thorough evaluation of potential hazards and community readiness for potential disasters. Programs that require such a plan include the Hazard Mitigation Grant Program (HMGP), which is authorized by Section 404 of the Stafford Act, the Flood Mitigation Assistance Program (FMA) and the Community Rating System (CRS), all of which are overseen by FEMA and run by the state.

  The Stafford Act, which authorizes HMGP funding, requires that communities include the following components in their mitigation plan:

  44 CFR 206.405

  (a) General. In order to fulfill the requirement to evaluate natural hazards within the designated area and to take appropriate action to mitigate such hazards, the State shall prepare and implement a hazard mitigation plan or plan update. At a minimum the plan shall contain the following:

  - *An evaluation of the natural hazards in the designated area;*
  - *A description and analysis of the state and local hazard mitigation policies, programs and capabilities to mitigate the hazards in the area;*
  - *Hazard mitigation goals and objectives and proposed strategies, programs and actions to reduce or avoid long-term vulnerability to hazards;*
  - *A method of implementing, monitoring, evaluating and updating the mitigation plan. Such evaluation is to occur at least a 5-year basis to ensure that implementation occurs as planned, and to ensure that the plan remains current*

Hazard Mitigation and Sustainable Development

When structures are built in inappropriate or dangerous areas they can significantly alter the natural integrity of the area and place life and property at risk. In an effort to deter development in hazardous areas a new initiative, sustainable development, has become an integral part of mitigation planning.

Sustainability is development that maintains or enhances economic prosperity and community well being while respecting, protecting and restoring the natural environment upon which people and economics depend.

Sustainable Development

A report published by NCDEM and FEMA, entitled *Hazard Mitigation in North Carolina - Measuring Success*, provides guidelines and strategies for communities seeking to achieve sustainable development goals. According to the report, local governments and citizens can build sustainable communities by concentrating on housing, business, infrastructure and critical facilities, and the environment. These four factors must be linked to a comprehensive mitigation plan that includes information dissemination to all stakeholders about hazards and preparedness. In addition, the report recommends the following strategies to promote sustainable development:

- *Sustainable Housing*
  - *Avoid development in hazardous areas*
  - *Protect and strengthen buildings through design and building codes*
- *Sustainable Business*
  - *Integrate business and community risk assessments into business management practices*
  - *Integrate response and recovery plans for business and local government*
  - *Improve the capability of small business to effectively recover from natural disasters*
- *Sustainable Infrastructure and Critical Facilities*
  - *Promote improved hazard resistant design and construction practices for new, replaced or repaired infrastructure*
  - *Promote land use planning practices to encourage new infrastructure in appropriate areas*
  - *Promote rehabilitation of existing critical facilities that are most vulnerable to natural hazards*
- *Sustainable Environment*
  - *Relocate and prohibit unsafe land use activities*
  - *Maintain and restore the natural mitigation function of floodplains*
  - *Acquire environmentally sensitive areas in order to minimize development*

Sustainable development practices allow communities to continue to develop and grow while also maintaining the social and environmental factors that make the communities attractive places to live, visit, and do business in. Creating a resilient community is a fluid process. Once a community has completed visioning, design and implementation of sustainable development goals, these same principles are integrated into everyday community development decisions.

The Mitigation Planning Process

Planning is the key to making hazard mitigation a proactive process rather than a reactive process. In addition, it ensures that areas subject to hazards are identified and managed appropriately to reduce vulnerability. Planning ensures that individual mitigation measures are carried out in a cooperative manner such that all local activities contribute to the mitigation effort and no single measure detracts from the overall goal of creating a safer, less vulnerable county and community. Planning also plays an important role in generating citizen understanding of and support for hazard mitigation. The mitigation planning process serves to publicize hazard information and create a forum for discussion of how best to balance the public interest and private property rights.

In an effort to gather the best available data a variety of resources were used during the planning process. All the resources used are identified in detail in the reference section of this plan and are on file with L. Gina White Consulting if copies are required.

First primary resources were identified. These include: Emergency Management Incident Reports from the Fire Department and the local government, letters from residents to the local government, the 1997 CAMA Land Use Plan, the Surf City Zoning Ordinance, Subdivision Ordinance, Flood Damage Prevention Ordinance, and the Surf City Hurricane Plan. In addition to these primary documents, interviews were held with the Town Manager; the Fire Chief; the Public Works Director; Planning Department; and the Assistant State Climatologist, Ryan Boyles.

Secondary resources were also identified and used in the planning process. These include: articles from the Topsail Voice, local press releases, GIS data and products, the Topsail Island Hazard Mitigation Plan, County Emergency Management Damage Reports, and other texts identified in the References section of this plan.

The mitigation planning process in Surf City was in general an 13-step process where each step was designed to be supported by the previous step, and in turn provide support for the next. FEMA regulations require participation by local representatives in the development of this plan. Participation as defined by the Surf City Mitigation Planning Committee is: local representation in a minimum of three mitigation planning meetings, response to mitigation exercises used to collect and develop the sections herein, review of the draft plan as developed by the Mitigation Planning Committee and L. Gina White Consulting, review of the final document as developed by the Mitigation Planning Committee and L. Gina White Consulting, and adoption by the governing board of the final document.

- *Development of a Mitigation Planning Committee.* The Town Manager selected and appointed departmental directors and other local representatives to assist in the development of the plan. These individuals are collectively referred to at the Mitigation Planning Committee. The Mitigation Planning Committee is responsible for the development of the Community-Based Hazard Mitigation Plan for Surf City and is overseen by the Surf City Town Manager and comprised of the following participants:

  - Surf City Town Manager,
  - Surf City Finance Director,
  - Surf City Town Clerk,
  - Surf City Building Inspector,
  - Surf City Police Chief,
  - Surf City Public Works Director,
  - Surf City Planner,
  - Surf City Fire Marshall, and
  - Cape Fear Council of Governments Regional Planner and GIS Specialist

  The Mitigation Planning Committee, under the guidance of the Town Manager and the facilitation of L. Gina White Consulting was responsible for the development of the plan. The Committee met 5 times over a six month period, with 100 percent participation at each meeting, in an effort to:

  - Develop a Planning Area Profile;
  - Identify and collect data on population development trends, residential development trends, commercial development trends, industrial development trends, as well as, governmental development trends;
  - Identify and profile the hazards prevalent to the area;
  - Assess the areas vulnerability to each identified hazard;
  - Identify and discuss all governing documents for each jurisdiction;
  - Identify the level of mitigation planning necessary to successfully reduce the vulnerability of the planning area to the identified hazards;

- Establish goals, objectives, and strategies to be implemented through this plan; and
- To review each section of the plan as it was developed.

Subsequently, the Cape Fear Council of Governments GIS Specialist and L. Gina White Consulting met on two separate occasions to establish methodology for the development of the GIS products used to guide the hazard profiling and vulnerability assessment within this plan. These products were reviewed by the Town and the US Forestry Service to ensure accuracy.

- *Hazard Identification and Analysis*: This step was conducted by gathering data on the hazards that occurred in the planning area. This information was gathered from local, state, and federal agencies and organizations, as well as, from newspaper and other media accounts, state and local weather records, conversations, interviews and meetings with key informants within the planning area. Two Mitigation Planning meetings were held during this process: (April 8, 2003 and May 6, 2003). During these meetings attendees had the opportunity to review the general information on previous hazards and comment on them in a more specific manner. These meetings also provided a forum for discussion on the background information that was needed to gain a general understanding of the geography, geology, recreation, natural resources and water resources for Surf City.

- *Area Vulnerability Assessment*: This step was conducted through a review of a local base map, topography maps, flood-prone areas map, as well as, others. A more detailed analysis was conducted through inventory development with such documents as the US Census, tax records, community walk-throughs, as well as, conversations, interviews and meetings with key informants within the planning area. Two Mitigation Planning meetings were held during this process: (June 3, 2003 and July 29, 2003). During these meetings attendees had the opportunity to review the specific information on previous hazards accumulated and commented on during previous meetings. In addition, attendees were provided the opportunity to review all GIS products and to review areas of vulnerability in association with specific hazards. Attendees provided comments and changes to be made on both sections. Finally, attendees began work on the Community Capability Assessment.

- *Community Capability Assessment*: To conduct this step a review of all documents governing the development of the planning area was completed. This step identified the community's current legal, institutional, political, and technical capability in carrying out mitigation activities. Most importantly it determined the mitigation efforts already taken by the community.

- *Acceptability Assessment*: This step was conducted by reviewing all the information discovered within the first three steps and determining whether the community should move forward with the planning process. As a part of the assessment a public hearing was conducted on December 2, 2003 to determine the level of mitigation planning necessary (see Appendix A for information on Public Hearings). The Public Hearing was advertised in the Brunswick Beacon, notices were posted at the Town Hall, and on

the Town's website. In addition, the draft plan was posted in the Town Hall for citizens to have an opportunity to provide comments on its completion.

- *Community Goal Assessment*: This step was conducted through a review of the governing documents of the planning area, as well as, conversations, interviews and meetings with key informants within the planning area. This step identified what goals are already established and adopted for the planning area and whether or not they promote or deter mitigation activities. Another Mitigation Planning meeting was held on December 16, 2003. In this meeting a review of the entire document was conducted. The attendees reviewed all comments provided by the Mayor and Board of Commissioners as well as any comments made during the public hearing. Alterations were made to previous sections of the plan based on some of the comments and base mitigation strategies were identified. In addition a bullet-list of topics was created to be addressed during the subsequent workshop. Following the changes to the draft, an amended version of the plan was posted at Town Hall for citizens to have an opportunity to provide comments on its completion.

- *Mitigation Strategy Development*: Here all the information developed in previous steps was taken into consideration. Subsequently programs and policies were developed when an insufficiency was identified. At this time, a workshop was conducted (December 18, 2003) where key personnel of the community, representatives of the business community, academics, leaders of surrounding communities, and the like provided insight and information as to the future needs of the community (see Appendix B for Workshop invitations, attendance, and minutes). They assisted in determining appropriate goals and strategies in an effort to reduce the Town's vulnerability to hazards identified in previous steps. The dates for the workshop were posted at Town Hall and invitations were sent to representatives of the local business community, academic community, surrounding municipalities, and the County.

- *Establish Procedures for Monitoring, Evaluating, and Reporting on Progress*: This step involved a series of tasks that assisted in setting procedures for ongoing monitoring and evaluation after the plan has been completed and implementation has begun.

- *Establish Procedures for Revisions and Updates*: Here steps for establishing procedures to see that every five years (or following a Presidentially Declared Disaster) an evaluation report results in revisions and updates of the plan, when warranted.

- *Adoption*: The plan went through a public hearing process on August 3, 2004 and was adopted, by the Board of Commissioners, according to the community's enabling legislation and established legal procedures (see Appendix C for information on Public Hearing).

- *Compliance Review*: Following adoption, the plan was reviewed by the FEMA and the State of North Carolina, Hazard Mitigation Section, Risk Assessment and Planning Branch to ensure the plan's compliance with state and federal guidelines (see Appendix D for adoption resolution and state compliance letter).

- *Public Information*: At the first Board meeting following adoption and a successful state compliance review the Town Manager announced that the Surf City Community – Based Hazard Mitigation Plan is displayed on the Town sponsored website with a response icon and a phone number for the public to direct questions or comments regarding the plan to the Director of Planning and Inspections and that a hard copy will be posted at the Town Hall for public review and comment.

SECTION 2: COMMUNITY PROFILE

History

Surf City was incorporated in 1949 as the first official municipality on Topsail Island. Though it is a small family-oriented community, the Town depends heavily on tourism for its economic development and remains the commercial center for Topsail Island. Surf City is unique it that a portion of the Town is in Pender County and the other portions is in Onslow County. In the past the Town has experienced continued growth in population and acreage as a result of annexation. The first annexation was that of Settlers Beach in 1988 which added 250 acres to the area of the Town. In February 1992, the Town annexed 6.59 acres on HWY 50/210 by the non-contagious satellite method. Additionally, in 1992 the Town established a 1,785 acre area of extra-territorial jurisdiction (ETJ) on the mainland along both sides of HWY 50/210. In 1999, there was an annexation of 364 acres of land on the mainland. In addition, in 2000 approximately 36 acres were annexed: tract 104 and 107 JH Batts Subdivision and HWY 210 and Belt Road BP station. Finally in 2002, approximately 3 acres were annexed: NC SR 1612 A division of JH Batts and 12691 NC HWY 50 – Rivenbark.

Geography

Surf City is located in the southern portion of Pender County and the northern portion of Pender County. The Town is located in the lower coastal plain of the state with elevations ranging from sea level to approximately 24 feet. The Town of Surf City covers a land area of 5.28 square miles, which includes .40 square miles of land area in Onslow County, 3.80 square miles of land area in Pender County and 1.08 square miles of water area in Pender County (see *Basemap of Surf City, NC* Appendix E). According to the 2000 Census there were 1,393 full time residents in the Town. Of these 292 are in Onslow County and 1,101 were in Pender County. However, Town officials state that during the tourist season the population increases drastically with arrival of tourist.

Climate

The climate of Surf City in the summer is hot and humid with an average high temperature of 73.58 degrees and an average low temperature of 51.75 degrees. Land is frequently cooled during warm weather months by sea breezes. Rain occurs throughout the year and, at times, is considered to be fairly heavy. The average annual rainfall is approximately 54.07 inches, with 26 percent falling between June and September.

Soils

In April, 1991, the U.S. Department of Agriculture, Soil Conservation Service, in cooperation with the North Carolina Agriculture Experiment Station and the Pender County Board of Commissioners, published a *Soil Survey of Pender County, North Carolina.* The general soil map of that document showed the island portion of the Surf City planning area as within the Carteret – Newhan – Corolla soil association. These soils compose about 2 percent of Pender County. Of this 2 percent about 65 percent are Carteret soils, 15 percent Newhan soils, and 7 percent Corolla soils. Thirteen percent of this soil association is said to be composed of other soils or "soils of minor extent."

Carteret soils are nearly level and very poorly drained. They are on tidal flats bordering the sound. These soils are flooded by high tides daily. They are dominantly fine sand or sand

throughout. The Newhan soils are gently sloping to moderately steep and are excessively drained. They are on coastal ridges or barrier dunes. These soils are fine sand or sand throughout. The Corolla soils are nearly level and are moderately well drained or somewhat poorly drained. They are in depressions. These soils are also fine sand or sand throughout.

The mainland portion of the Surf City planning area is within either the Grifton – Meggett – Invershiel or Foreston – Autryville – Baymeade soils associations.

Water Resources

Surf City is bordered by the Atlantic Ocean, the Intracoastal Waterway, Becky's (Bishops) Creek and Batts Mill (Barlow) Creek. Adjacent to the shores of these bodies of water is a dense level of residential development. These bodies of water also provide for aquatic life propagation and survival, fishing, and secondary recreation.

No surface water is used as a water supply in the planning area. The Town secures its water from two wells located approximately one mile north of the Intracoastal Waterway bridge along NC 50 and NC 210. These well locations are adequately separated from the closed landfill site. In 1990, a town – wide wastewater collection and treatment system was put into operation. The treatment system and spray fields are located about 3 miles north of Surf City off HWY 50.

Natural Resources

According to the 1997 CAMA Land Use Plan Surf City contains classified Areas of Environmental Concern (AEC's).

- Coastal Wetland (AEC's) – These are predominately salt-water marshes that serve as a critical component in the coastal ecosystem.
- Estuarine Water (AEC's) – These waters are the dominant component and bonding element of the entire estuarine system, integrating aquatic influences from both land and sea.
- Public Trust Water (AEC's) – In Surf City these waters include the Atlantic Ocean, Intracoastal Waterway, and adjacent navigational canals. They support valuable commercial and sports fisheries, have aesthetic value, and are important resources for economic development.

According to the North Carolina Heritage Program, the Carolina Goldenrod is an extinct vascular plant that was once found on the island portion of Surf City. In addition, Surf City has 3 threatened species found in or near the waters of Surf City. The following are threatened species posted on the state and federal endangered list:

- American Alligator (Alligator mississippinesis)
- Loggerhead Seaturtle (Caretta caretta)
- Seabeach Amaranth (Amaranthus pumilus)

The North Carolina Heritage Program also identifies several species that are of special concern found in or near the waters of Surf City. The following are species of special concern posted on the state and federal endangered species list:

- Southern Hognose Snake (Heterodon simus)
- Carolina Diamondback Terrapin (Malaclemys terrapin centrata)
- Mimic Glass Lizard (Ophisaurus mimicus)

The North Carolina Heritage Program also identifies several significantly rare species found in or near the waters of Surf City. The following are significantly rare species posted on the state and federal endangered species list:

- Marked Goby (Gobionellus stigmaticus)
- Savana Milkweed (Asclepias pedicellata)
- Four – angled Flatsedge (Cyperus tetragonus)
- Torrey's Pinweed (Lechea torreyi)
- Small – flowered Buckthorn (Sageretia minutiflora)

In addition, there are several natural community or special habitat areas identified by the North Carolina Heritage Program, which are at risk of endangerment in the area of Surf City that are listed on the state and federal endangered list:

- Maritime Evergreen Forrest
- Colonial Waterbirds Nesting Site (Gull*Tern*Skimmer Colony)

Recreation

Surf city also has a vast array of recreational activities such as: fishing, shell-fishing, boating, and other water activities, which are associated with the Atlantic Ocean, Intracoastal Waterway, Becky's Creek and Batts Mill Creek. In addition, Surf City recently opened the new Southside Park which provides bike paths adjacent to the waterfront in the heart of Surf City. The park consists of 19.6 acres from a peninsula along and into Topsail Sound, adjacent to NC 50/210 in a location immediately south of the Surf City swing bridge.

Population Trends

Research shows that the growth in Surf City has been constant over the last 20 years. Table 2.1 shows that the population in Surf City is increasing at an increasing rate. During the decade between 1980 and 1990 the population grew by an additional 249 persons. At that time all categories saw an increase in population except the 6 – 17 Year category. In 2000, the U.S. Census counted 1,393 persons residing in Surf City which is 756 persons more than in 1990. During this decade all age categories saw an increase except the 21 – 24 Year category. The largest increase was in the 45 – 54 Year category with an additional 189 persons being added to the count. The median age in Surf city is 48.1 years. It is reasonable to assume that the Town will continue to see an increase in population. However, it is also reasonable to believe that this increase will continue to happen at a decreasing rate.

Table 2.1

Surf City 1980-2000 Population Change					
Age Composition	1980	1990	2000	Change 1980-1990	Change 1990-2000
TOTAL	388	637	1,393	249	756
0-5 Years	11	18	35	7	17
6-17 Years	53	35	140	-18	105
18-20 Years	13	34	36	21	2
21-24 Years	24	64	50	40	-14
25-44 Years	100	220	354	120	134
45-54 Years	67	78	267	11	189
55-59 Years	43	47	140	4	93
60-64 Years	23	43	144	20	101
65-74 Years	41	80	167	39	87
75-84 Years	11	16	50	5	34
85 & Over	2	2	10	0	8

Source: U.S. Census Bureau

Residential Development Trends

There are five districts identified on the *Zoning Map of Surf City, NC* (Appendix E) whose primary purpose is residential development.

The R-5 Residential District (R-5) is established as a district in which the principal use of land is for one-, two-, and multi-family dwellings excluding mobile homes and travel trailers. All lots are required to be consistent with the Ocean Hazard and Estuarine Shoreline AEC standards for development. The *Zoning Map of Surf City, NC* (Appendix E) identifies 493 acres within the R-5 district.

The Residential Mobile Home District (R-5M) is established as a district in which the principal use of land is for mobile homes and travel trailers. The *Zoning Map of Surf City, NC* (Appendix E) identifies 143 acres within the R-5M district.

The R-10 Residential District (R10) is established as a district to provide for single-family dwellings, two-family dwellings, multiple-family dwellings and townhouses, excluding mobile homes and travel trailers. The *Zoning Map of Surf City, NC* (Appendix E) identifies 107 acres within the R10 district.

The Mobile Home Subdivision District (MHS) is established as a district in which the principal use of land is for one-family dwellings including mobile homes. The regulations of this district permit intensive developments provided the necessary public and/or community water and adequate sewage disposal are available. The *Zoning Map of Surf City, NC* (Appendix E) identifies 245 acres within the MHS district.

The Rural Agriculture District (R-A) is established as a district in which the principal us of land is for low density single-family residential purposes. The regulations of this district encourage rural farming activities and the preservation of open space. This district is designed to promote exurban, low density residential development not requiring urban services while maintaining

prime farm land and a rural life style. The *Zoning Map of Surf City, NC* (Appendix E) identifies 506 acres within the R-A district.

Table 2.2 shows that the number of housing structures in Surf City has increased drastically over the 20-year period between 1980 and 2000, with an additional 2,369 units being added. In the decade between 1990 and 2000 the number of housing units increased by 343 total units with the largest difference being seen in the 1-unit-detached category. During that time the 2-4 units category, 5+ units category, and Mobile Home/Trailer Unit categories all saw a decrease in the number of units. However, the largest difference was seen in the 1980-1990 decade. In this decade there was extensive growth in all categories. The largest increase during that time was in the 1-unti-detached category. However, there was significant change in the Mobile Home/Trailer Unit category. The large number of mobile homes was a result of 2 factors: (1) Surf City has allowed the number of mobile homes to expand over its history and this freedom has allowed the beach community population to grow and has allowed vacation, rental, and ownership opportunities for citizens of all economic status to own homes at the beach; and (2) There has been a strong young age group component of the population, living in the vicinity, who find the generally less expensive mobile home to be an attractive alternative housing choice.

Table 2.2

Surf City Residential Structure Trends 1980-2000				
	1980	1990	2000	Change 1990 2000
Total	**216**	**2,242**	**2,585**	**343**
1-Unit-Detached	125	937	1,438	501
1-Unit-Attached	0	45	57	12
2-4 Units	41	205	170	-35
5+ Units	2	208	182	-26
Mobile Home & Trailer Units	48	847	738	-109

Source: U. S. Census Bureau

The most recent information on housing numbers was found in the Pender and Onslow County Tax Records. According to County Tax Records, as of December 2002 there were 2,765 taxable residential properties in Surf City that are contained within 1,494 acres. Residential property in Surf City has a current tax value of $489,681,500 (see Table 2.3).

Future Residential Development

Surf City is a thriving community based on family values and residential development. The community is in a constant state of development and redevelopment. However, at this time there are no permits before the board for new subdivision development.

Commercial & Industrial Development Trends

There are three districts identified on the *Zoning Map of Surf City, NC* (Appendix E) whose primary purpose is commercial development. There is currently no areas in Surf City zoned for industrial use.

The Central Business District (C-1) is intended to protect and promote suitable areas for business and commercial uses which benefit from proximity to each other including a variety of

sales and service facilities for the general public and to encourage the intense development of a centralized business center in Surf City. The *Zoning Map of Surf City, NC* (Appendix E) identifies 84 acres within the C-1 district.

The General Commercial District (C-2) is to provide and protect areas suitable for a mixture of uses providing retail goods, services, lodging, tourist services, entertainment and single-family dwellings. Its regulations are designed to encourage the formation of continuity among commercial uses locating along the Town's major roads and ensure adequate and properly designed methods of ingress and egress to commercial properties while providing for safe and adequate traffic flow along major roads. The *Zoning Map of Surf City, NC* (Appendix E) identifies 107 acres within the C-2 district.

The Extended Commercial District (C-3) is to provide for additional commercial uses which are suitable, particle, and appropriate for the mainland area of Surf City's planning and zoning jurisdiction. Its regulations are designed to encourage a continuity of uses along the main thoroughfare onto the island; enhance the landscaping of properties in the district; provide a commercial district with an expanded number of permitted uses; and limit access points on 50/21 to preserve the transportation capacity of the highway. The *Zoning Map of Surf City, NC* (Appendix E) identifies 172 acres within the C-3 district.

The Town of Surf City has a total of 363 acres zoned for commercial use and to date there is no property zoned for industrial use. According to the Town of Surf City Building Inspector, the Town of Surf City planning area contains 110 commercial buildings with a combined building and land value of approximately $53,054,105 (see Table 2.3). The Town boundary includes the mainland and island portions as seen on the *Base Map of Surf City, NC* (see Appendix E).

Future Commercial & Industrial Development

No commercial and industrial development is planned in the near future in the Town of Surf City (see Table 2.3).

Table 2.3

Town of Surf City Area Vulnerability Asssessment Worksheet - A						
Current Conditions				Potential Future Conditions		
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
Residential	2,765	$489,681,500	1,393	0	$0	0
Commercial & Industrial	110	$53,054,105	0	0	$0	0
Other	0	$0	0	0	$0	0
Subtotal	2,765	$542,735,605	1,393	0	$0	0

Source: Pender and Onslow Counties Tax Records 2002 and United States Census 2000.

Critical Facility and Community Infrastructure Development Trends

Critical facilities are those facilities that are necessary to the day-to-day operation of the Town and should they go down or should their services be interrupted they would hinder the continued operation of the Town. Many critical facilities such as the Police Department, Fire

Department, Public Works Department and the Town Hall also provide extensive recovery assistance following disasters. The following is specific information on the critical facilities found in Surf City.

The Government District (G-1) is established to provide proper location and setting for governmental operation, structures, and equipment necessary for providing services and the maintenance of public health and well-being, the Town Council has established the zoning district in this division and referenced as the government zone. The *Zoning Map of Surf City, NC* (Appendix E) identifies 15 acres within the G-1 district.

Town Hall
Town Hall is one of three Town owned governmental buildings located within the Town limits of Surf City. Town Hall is where all the communities' critical records are kept and having access to these records is pertinent in successful disaster recovery. As a result, Town Hall becomes a critical facility in regards to disaster recovery. Town Hall is located at 214 North New River Drive and houses the administrative offices for the Town of Surf City. There are 10 employees located in the Town hall. According to insurance records, the building has a value of $423,204 and the contents value is $163,831 (see Table 2.6).

Roads
Roads are critical infrastructure in a town as they provide a means of evacuation during a disaster. In Surf City, HWY 210/50 is the primary road providing this service. The Department of Transportation estimates the value of paved roads at $200,000 per mile. The Town of Surf City and the State of North Carolina maintains approximately 23 miles of road (8.4 State owned and 14.25 Town owned), which calculates to an estimated value of $4.6M dollars (see Table 2.6).

Schools
There are no schools within the Surf City planning jurisdiction.

Hospital
There is no public or private hospital or emergency medical facility located within the planning jurisdiction of the Town of Surf City. However, the Pender County hospital is located approximately 15 miles from the Town and provides the primary emergency care for residents of Surf City.

Police
The police department is the second critical facility owned by Surf City. The department provides immediate emergency response for the Town and is a primary force in disaster recovery operations. The Police Department for the Town of Surf City is located at 211 North Topsail Drive. The department employs 11 persons. The department currently owns 12 – patrol vehicles, 1 – truck, 2 – Motorcycles and 1 – 4 Wheeler at a total value of $ 253,439. The department services all areas within the municipal boundaries and has Memorandums of Understanding with the Burgaw Police Department, Pender County Sheriff's Department, Cumberland County Sheriff's Department, Town of Holly Ridge Police Department, Havelock Police Department, North Topsail Police Department, Lumberton Police Department, Warsaw Police Department, Jacksonville Police Department, Fayetteville Police Department, and Topsail Police Department. The current value of the department including all buildings and equipment is $477,578 (see Table 2.6).

Fire

The Surf City Fire Department is located on the mainland at 200 Wilmington Avenue. The Fire Department, as a whole, employs 4 full-time employees and has 20 volunteers. Currently the department services all areas within the municipal boundaries and has memorandums of agreement with surrounding communities, Pender County and Onslow County. According to insurance records, the current value of the department including the building and equipment is $256,000 (see Table 2.6). In addition, the Fire Department owns vehicles and equipment, which has a total value of $1,478,700 (see Table 2.4).

Table 2.4

Vehicles and Major Equipment Owned by the Surf City Fire Department

YEAR	VEHICLE	VALUE
1979	Chevrolet C-70 Tanker	$50,000.00
1999	Ford F-250 4W/D Pick Up	$30,000.00
1989	Chevrolet Truck	$150,000.00
1984	Ford/Grumman Pumper	$200,000.00
2001	E 1 Pumper	$250,000.00
2003	E 1 95ft Aerial Platform	$700,000.00
1990	Ingersoll Casade System	$50,000.00
1999	Generic Diesel 50KW Generator	$40,000.00
2001	5KW Protable Generator	$700.00
1995	Honda 6KW Portable Generator	$2,000.00
2000	Honda 550 Gallon Boat Pump	$6,000.00
	TOTAL VALUE	$1,478,700.00

Source: Tri-Beach Insurance Records 2002

Public Works Department

The Public Works Department is located on Juniper Trail outside the Town limits of Surf City. The department encompasses water, sewer, and streets. The department employs 6 full-time persons. According to insurance records, the Department has a total building value of $103,429; a vehicle value of $36,000 (see Table 1.5) and a building contents value of $78,047 (see Table 2.6).

Table 2.5

Vehicles Owned by the Surf City Public Works Department		
Year	**VEHICLE**	**VALUE**
1986	Ford Utility Truck	$2,500.00
2000	Trailer	$1,675.00
2001	Explorer Light	$21,400.00
1997	Explorer Light	$16,700.00
1998	F-150 Light	$19,036.00
1989	3/4 Ton Pickup	$2,500.00
1996	F-154 Pickup	$12,736.00
1993	Chevrolet Blazer	$1,500.00
	TOTAL VALUE	$78,047.00

Source: Surf City Insurance Records 2002

Future Critical Facility and Community Infrastructure Development

Police Department
The Surf City Police Department has a grant pending with the Governors Crimes Commission of North Carolina for two Mobile Data Computers. This technology grant will provide the Police Department the ability to decrease time in the field writing reports and increase time on community police programs. The Total amount of the grant is $10,528.

Fire Department
The Surf City Fire Department has a grant pending for $44,000 with the Assistance to Firefighters Program through FEMA and the US Fire Administration. The grant will be used to purchase 12 new self contained breathing apparatus and physical fitness equipment for the department.

Table 2.6

Town of Surf City Area Vulnerability Asssessment Worksheet - B						
Public Buildings and Critical Facilities						
Current Conditions				**Potential Future Conditions**		
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**
Public Works Department	1	$181,470.00	6	0	$0.00	0
Hospital	0	$0.00	0	0	$0.00	0
Schools	0	$0.00	0	0	$0.00	0
Infrastructure	23 miles	$4,600,000.00	0	0	$0.00	0
Police Station	1	$477,578.00	11	0	$0.00	0
Fire Station	1	$256,000.00	24	0	$0.00	0
Government Offices	1	$587,035.00	10	0	$0.00	0
Subtotal	4 buildings and 23 miles of road	$6,102,083.00	51	0	$0.00	0
Total (Worksheet A + B)						

Source: Pender and Onslow Counties Tax Records 2002, United States Census 2000, and Surf City Insurance Records 2002

SECTION 3: HAZARD VULNERABILITY ANALYSIS

In this section the past hazard events of Surf City are recorded and analyzed. This information is identified by using both primary and secondary research materials which will include but is not limited to reports from local, state, and national agencies, as well as, media accounts, state and local weather records, and conversations with key personnel and residents in the Town of Surf City. This analysis will include the possible severity and magnitude as well as the potential impact of damage within the Town from future hazards.

For the purpose of ranking hazards affecting the community in order of the importance for mitigating their effects, a hazard index has been assigned (see Table 3.1) that takes into account the anticipated Frequency of Occurrence (see Table 3.2) and specific Consequences of Impact (see Table 3.3). This is not meant to be a scientific process, but will serve as a way to prioritize mitigation measures based on the potential frequency and the likely extent of damage from hazards known to affect the community. This ranking will be considered when specific mitigation measures are prioritized for implementation, along with other factors, such as stated community goals, citizen concerns, on-going projects, and opportunities for funding.

Table 3.1

Hazard Index Ranking				
Impact → / **Frequency of Occurrence ↓**	**Catastrophic**	**Critical**	**Limited**	**Negligible**
Highly Likely				
Likely				
Possible				
Unlikely			1 *(Lowest)*	1 *(Lowest)*
Highly Unlikely		1 *(Lowest)*	1 *(Lowest)*	1 *(Lowest)*

Hazard Index Scale: 1-5, with 5 indicating the highest priority for considering mitigation measures and 1 indicating the lowest priority. (Highest, High, Medium, Low, Lowest)

Table 3.2

Frequency of Occurance	
Highly Likely	Near 100 percent probability in the next year.
Likely	Between 10 and 100 percent probability in the next year, or at least one chance in the next 10 years.
Possible	Between 1 and 10 percent probability in the next year or at least one chance in the next 100 years.
Unlikely	Less than 1 percent probability in the next year or less than one chance in the next 100 years.
Highly Unlikely	Little to no probability in next 100 years.

Source: NCDEM

Table 3.3

Consequences of Impact	
Catastrophic	Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50 percent of property is severly damaged.
Critical	Multiple severe injuries, complete shutdown of critical facilities for at least 2 weeks, more than 25 percent of property is severely damaged.
Limited	Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property severely damaged.
Negligible	Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.

Source: NCDEM

The criteria provided by FEMA for the development of the Hazard Mitigation Plan identifies 11natural hazards and states that, at a minimum, Surf City must address: Winter storms/Extreme Cold, Severe Thunderstorms/Tornadoes, Hurricanes/Coastal Storms, Floods, Riverine/Coastal Erosion, Drought/Heat Wave, Landslides/Sinkholes, Earthquakes, Tsunami Events, Volcanoes, Wildfires, and Dam/Levee Failure. It should be noted that, several of the hazards established under the minimum criteria were not relevant to the community and received a low hazard index ranking as a result. However, there are other hazards that were identified which are not in the minimum criteria established by FEMA that were added to the discussion.

The Mitigation Planning Committee decided to examine 16 natural hazards and 2 technological hazards. The hazards examined herein are divided into two categories: Natural Hazards which include Tropical Cyclones, Flooding, Nor'easters, Erosion, Severe Thunderstorms/Windstorms, Wildfires, Tornadoes, Waterspouts, Winter storms, Droughts, Extreme Heat, Earthquakes,

Volcanoes, Tsunamis, Landslides, Sinkholes and Technological Hazards which includes Hazardous Materials Events and Dam/Levee Failures.

In addition to the identification and ranking of each hazard, this section used the information identified in the community profile section of this plan and compared it to the hazards identified to determine the areas vulnerability to each hazard. This assessment provides detailed information on the number of structures and the potential population that could be affected by each hazard. In addition, this information is displayed in a series of GIS products found in Appendix E.

NATURAL HAZARDS

Natural hazards such as tropical cyclones, floods, tornadoes, winter storms, and the like are an enduring condition around the human environment. Natural hazards become disasters when they intersect with the human environment and in North Carolina, particularly; natural disasters have left a profound imprint causing devastating loss of life, property, economy and community. While most processes present little danger to human well being, some develop into hazardous situations that place life, property, economy, and community at higher risk. For the purpose of this plan natural hazards will be divided into 5 sub-sections: Atmospheric Hazards, Hydrologic Hazards, Geologic Hazards, Seismic Hazards, and Other Natural Hazards.

ATMOSPHERIC HAZARDS

The group "Atmospheric Hazards" includes weather-generated events. Each has its own natural characteristics, geographic location or aerial extent, seasonality, severity, and associated risks. Though these characteristics allow identification of each individual hazard many of these hazards are interrelated (FEMA 1997). For example, tornadoes can be a product of severe thunder storms or tropical cyclones and snow or ice can be a byproduct of nor'easters. These hazards may also be directly linked to other categories of natural hazards (i.e. excessive rain can cause the geologic hazard of landslides). In addition they can be interlinked with Technological Hazards as well (i.e. excessive rains can cause dam/levee failure which can lead to flooding) These linkages make it difficult to attribute damage to one hazard or to access the risk one hazard has on the planning area but mitigation strategies quite often have beneficial effects on several types of hazards.

In this sub-section 5 atmospheric hazards were addressed: winter storms, severe thunderstorms/ windstorms, tropical cyclone, tornadoes, and extreme temperatures. Each category has a general description of the hazard, a vulnerability summary for the planning area, and specific hazard information for the area.

Winter Storms

Winters storms originate as mid-latitude depressions of cyclonic weather systems and can cause snowstorms, blizzards, and ice storms. Winter storms can paralyze a community by shutting down normal day-to-day operations and can produce an accumulation of snow and ice on trees and utility lines resulting in loss of electricity and blocked transportation routes. These storms can also lead to frozen water pipes, which when erupted, can lead to extensive property damage and the depletion of a natural resource. When communities have long term loss of utilities elderly and extremely young populations become more vulnerable to the effects of the extreme temperatures associated with these storms.

Winter Storm Vulnerability Summary

Because winter storms are not a constant phenomenon in the southeastern portions of North Carolina a shorter period (1983-2003) was evaluated for information on winter storms. Numerous sources were used in identifying the winter storm hazards that have occurred in Surf City since 1983 both primary and secondary. Primary sources used included the Fire Chief, Police Chief, and Emergency Management After Action Reports. Secondary sources included the Topsail Voice, Cable News Network, NOAA, National Climatic Data Center, the North Carolina Climate Center, and the Weather Channel.

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. Additionally, extremely cold temperatures can lead to frozen pipes, which, when erupted, can lead to extensive property damage and the depletion of a natural resource.

In the last 20 years there have been 10 storms which have impacted Surf City. These storms have produced power outages and traitorous road conditions which ultimately led to minor traffic accidents. In addition, they have produced wave action leading to beach erosion and flooding. This history supports the fact that, it is possible that winter storms will affect Pender and Onslow Counties and the Town of Surf City. For vulnerability to specific effects please refer to:

- wind vulnerability in Table 3.5;
- storm surge vulnerability in the tropical cyclone portion of this plan;
- flooding vulnerability in Table 3.9;
- *Flood Zones Map of Surf City, NC* (Appendix E);
- *Repetitive Loss Areas Due to Water Events of Surf City, NC* (Appendix E);
- *Storm Surge Inundation Areas (Fast) of Surf City, NC* (Appendix E);
- *Storm Surge Inundation Areas (Slow) of Surf City, NC* (Appendix E);
- *10-Year Flood History* map (Appendix E);
- erosion vulnerability in Table 3.11; and
- *Long – Term Average Annual Shoreline Change* Map (Appendix E).

In the past Surf City has lost use of critical facilities for several days as a result of winter storms. In addition, the storms have caused ice and snow buildup on roads and bridges which has led to treacherous road conditions. There has been minor structural damage in the form of shingle damage, roof damage and broken pipes. However, there has been no major injuries or deaths reported as a result of winter storms.

Future impacts will most likely be negligible meaning minor injuries may occur; critical facilities may be shut down for 24 hours or less and less than ten percent of the property in the community would be damaged. These factors suggest a hazard index ranking of 2 for winter storms in the Surf City area. This indicates that winter storms are not one of the most important considerations in determining the Town's mitigation strategies (see Table 3.14).

Winter Storm Individual Specifics

- *December 23, 1989*: Winter storms caused 18 inches of snowfall in Surf City. Eight foot snow drifts were reported in the area. Gale force winds, gusting up to 60 mph, produced

waves up to 30 feet high off the coast of Surf City and whipped the snow into drifts up to 6 feet high. Ice and snow caused traitorous conditions on the streets of Surf City. Power outages lasted several days. There was no major property damage reported nor were there any deaths or injuries as a result of the storm.

- *March 13, 1993*: Labeled "The Super Storm," it was among the worst non-tropical weather events in the USA. In addition, it was one of the most intense nor'easters to ever strike the eastern United States. For a more extensive discussion on this storm see the nor'easter section of this plan.
- *February 2, 1996*: Freezing rain occurred along the coast. Snowfall accumulations totaled 1 inch and temperatures went as low as the single digits. In Surf City there was no major property damage reported nor were there any deaths or injuries as a result of the storm.
- *February 10, 1997*: Snowfall occurred along the coast with accumulations totaling 1 inch. In Surf City there was no major property damage reported nor were there any deaths or injuries as a result of the storm.
- *January 27, 1998*: A winter storm produced seas between 14 and 18 feet along the North Carolina coast. The storm caused beach erosion and coastal flooding. However, there was no property damage reported in Surf City nor were there any injuries or deaths reported in the area.
- *February 3, 1998*: An intense coastal low moved along the immediate coastline producing strong winds and heavy rain. See the nor'easter section of this plan for more information on this storm.
- *January 17, 2000*: Winter storms caused 1 to 3 inches of snow, ice, and freezing rain across southeast North Carolina, causing treacherous road conditions, which led to many road accidents. However, there was no structural damage reported nor were any deaths or injuries reported.
- *January 25, 2000*: Winter storms caused 4 to 6 inches of snow across southeast North Carolina causing treacherous road conditions as well as the closing of schools and businesses for 2 to 3 days. There was no reported damage, deaths or injuries.
- *January 2, 2002*: Winter storms caused 1 to 3 inches of snow and ½ inch of freezing rain in Pender and Onslow Counties. There were numerous traffic accidents reported but no injuries or fatalities were reported. Many businesses and schools were closed and several places reported power outages.
- *January 23, 2003:* Winter storms caused 4-6 inches of snow in Surf City. Emergency Management did not close the bridge but salt was placed on the bridge and roads due to icing. There was no power lost on the island but the intense cold did freeze many water lines in homes, resulting in minor property damages to some homes.

Severe Thunderstorms/Windstorms

Severe thunderstorms/windstorms are generated by atmospheric imbalance due to the combination of unstable warm air rising rapidly into the atmosphere, sufficient moisture to form clouds and rain, and an upward lift of air currents caused by colliding waterfronts, sea breezes, or mountains. Thunderstorms/windstorms can produce damaging tornadoes, hailstorms, intense downburst and microburst winds, lightning, and flash floods.

Severe Thunderstorm/Windstorm Vulnerability Summary

To determine to Town's vulnerability to winter storms a time period from 1950 to 2002 was examined. Numerous sources were used in identifying the winter storm hazards that have

occurred in Surf City since 1950 both primary and secondary. Primary sources used included the Fire Chief, Police Chief, and Emergency Management After Action Reports. Secondary sources included the Topsail Voice, Cable News Network, NOAA, National Climatic Data Center, the North Carolina Climate Center, and the Weather Channel.

Severe Thunderstorms/Windstorms are common occurrences in Surf City and more often than not they are minor occurrences. Since 1950 there have been more than 100 severe thunderstorms/windstorms reported in the planning area. These storms can be wind events, water events, or lightning events and in general produce heavy rains which lead to flooding and erosion, strong winds, and lightning.

Heavy rains have led to flooding from stormwater pooling in many areas of the community. As with other types of water events the community experiences repetitive flooding on South Shore Drive, North Shore Drive, and North New River Drive. The areas on South Shore Drive are state maintained property and are currently undergoing stormwater drainage projects to correct the stormwater pooling problem that exists during heavy precipitation events. For vulnerability to specific effects of heavy precipitation refer to:

- wind vulnerability in Table 3.5;
- storm surge vulnerability in the tropical cyclone portion of this plan;
- flooding vulnerability in Table 3.9;
- *Flood Zones Map of Surf City, NC* (Appendix E);
- *Repetitive Loss Areas Due to Water Events of Surf City, NC* (Appendix E);
- *Storm Surge Inundation Areas (Fast) of Surf City, NC* (Appendix E);
- *Storm Surge Inundation Areas (Slow) of Surf City, NC* (Appendix E);
- *10-Year Flood History* map (Appendix E);
- erosion vulnerability in Table 3.11; and
- *Long – Term Average Annual Shoreline Change* Map (Appendix E).

In addition to heavy rains, these storms can also produce strong winds, which have historically averaged 59 knots. In some instances these storms have also led to tornado events in the area (see the Tornado portion of this section). The winds from these storms have caused damage to roofs and shingles and often cause debris from trees to fall on homes and businesses which not only has led to damage to property (averaging $35,000). The most widespread damage with strong winds and the debris they produce is the blockage of primary and secondary road systems which interrupts the flow of traffic that can lead to serious ramifications for emergency vehicles. Additionally, the breakage of power lines from fallen debris often leads to power outages across the County. In the past power outages have lasted up to 72 hours.

The final aspect of severe thunderstorms/windstorms addressed here is lightning. The Fire Departments located in Surf City respond to all reported lightning incidences and have provided after action reports that have assisted in accessing the damage and locating where strikes have historically occurred in Surf City (see *5 – Year Lightning Strike History Map*, Appendix E). In the past 5 years there has been 6 reported incidences of lightning strikes in Surf City. These lightning strikes associated with severe thunderstorms/windstorms have caused an average of $10,000 in property damage. According to Emergency Management Records, there have been no injuries or deaths reported as a result of these strikes.

Severe thunderstorms/windstorms have been a common occurrence in Surf City in the past and it is highly likely they will continue to be so in the future. Though some storms have resulted in moderate damage, on average, the damage from these storms is minor in nature. In the past Surf City has had minimal loss of critical facilities (72 hours being the most extensive period). In addition, there have been reports of property damage most being the result of flooding or wind. There have been no major injuries or deaths reported as a result of severe thunderstorms/ windstorms. Future impacts will most likely be negligible meaning minor injuries may occur; critical facilities may be shut down for 24 hours or less and less than ten percent of the property in the community would be damaged. These factors suggest a hazard index ranking of 2 for severe thunderstorms/windstorms in the Surf City area. This indicates that winter storms are not one of the most important considerations in determining the Town's mitigation strategies (see Table 3.14).

Tropical Cyclones

Hurricanes, tropical storms and typhoons are collectively known as tropical cyclones. These cyclones are defined by FEMA (1997) as low-pressure areas of closed circulation winds that originate over tropical waters. For the purpose of understanding tropical storms within the context of this plan it should be understood that tropical storms have stained surface wind speed that ranges from 39 to < 74 mph and that hurricanes have a minimum sustained surface wind speed of at least 74 mph. For a more detailed breakdown of hurricane intensity classifications this plan will reference the Saffir-Simpson Hurricane Scale (see Table 3.4).

Table 3.4

Saffir-Simpson Hurricane Scale					
Scale Number (Category)	**Central Pressure**		**Wind Speed (mph)**	**Storm Surge (ft)**	**Potential Damage**
	(mbar)	**(in)**			
1	≥ 980	≥ 28.94	74 - 95	4 - 5	Minimal
2	965 - 979	28.50 - 28.91	96 - 110	6 - 8	Moderate
3	945 - 964	27.91 - 28.47	111 - 130	9 - 12	Extensive
4	920 - 944	27.17 - 27.88	131 - 155	13-18	Extreme
5	< 920	< 27.17	> 155	> 18	Catostrophic

Source: FEMA, 1997.

Tropical Cyclone Vulnerability Summary

The period from 1900-2002 was studied for information on tropical cyclone events. Numerous secondary sources were employed including: Barnes, Jay, 1998 and 2001; The Topsail Voice; the Sunday Star News; Wilmington Morning Star; Cable News Network; Emergency Management records; NOAA; National Climatic Data Center; and The Weather Channel. In addition several primary sources were utilized including: Public Information Updates, Local Damage Reports, the Division of Coastal Management, North Carolina Climatic Center, Town Manager, Fire Chief, Police Chief, and Public Works Director.

The Period from 1996-1999 was the most active, four consecutive years on record with 5 named storms, 4 major storms (Bertha, Fran, Bonnie, and Floyd) making landfall and having significant effects on the area. This was the most active period since the period 1954-1958 when 4

significant storms (Hazel, Connie, Diane, and Helene) hit the area causing devastating effects. As seen in the bullet list above, the principal effects tropical cyclone events have had on the area include extensive beach erosion, flooding, and high wind damage. These effects have led to the destruction of the dune system, primary and secondary transportation routes, catastrophic structural damage (losses in many cases), the loss of critical facilities, and extended evacuations from the island.

Tropical Cyclones can either be wind events or water events. As a result, tropical cyclones can cause extensive wind damage, storm surge damage, flooding damage, and erosion. The vulnerability of wind and storm surge is discussed in this portion of the plan. Whereas the vulnerability to flooding is discussed in the flooding portion of the plan and the vulnerability to erosion is discussed in the erosion portion of this plan.

As seen on the *Wind Zone Map of Surf City, NC* map (see Appendix E) the area of the Town most vulnerable to the effects of strong winds is the first row, beach front area (Zone 1). This, in large part, is contributed to the fact that structures located on a beach are no sheltered or protected from the elements and are left in a higher state of vulnerability. A comparison of the *Wind Zone Map of Surf City, NC* map (see Appendix E) and the *Zoning Map of Surf City, NC* map (see Appendix E) shows that this area is primarily zoned for high density residential use with periodic zones of multi-family residential use and commercial use dispersed within. Table 3.5 shows the approximate vulnerability Zone 1 has to the effects of wind. Clearly, the highest vulnerability is to residential structures within wind zone 1. Wind zone 2 encompasses the second and third rows of development. The Towns fire department is located within this zone and is, therefore, more susceptible to mind damage than other critical facilities in the area..

Table 3.5

Approximate Vulnerability to the Effects of Wind in Zone 1

Type of Development	Number of Existing Private Buildings	Current Value	Current Number of People
Residential	344	$78,373,201	619
Commercial & Industrial	7	$5,000,000	0
Critical Facilities	0	$0	0
Total	351	$83,373,201	619

As seen on the *Storm Surge Inundation Areas of Surf City, NC* map (Appendix E) the level of storm surge is directly related to the category of hurricane. Surf City is a coastal Town and with a Category 5 hurricane could be 95 percent inundated on the mainland and 100 percent inundated on the island, with storm surge leaving catastrophic losses in the area. When compared to the *Repetitively Damaged Areas Due to Water Events in Surf City, NC* map (Appendix E) the properties identified as repetitively damaged are primarily located within the Category 1 and 2-storm surge (fast and slow) zone. According to the National Flood Insurance Program (NFIP) there are 238 structures located within the areas of repetitive damage which have a replacement building and contents value of $5,280,827.

A comparison of *Potential Technological Hazards in Surf City, NC* map (Appendix E) against the *Storm Surge Inundation Areas (fast and slow) of Surf City, NC* map (Appendix E) reveals that three of the petroleum distribution sites located within the Town limits of Surf City are within the

Category 1 and Category 2 Hurricane Storm Surge (fast and slow) Flooding area and that the other two are located within outside the Hurricane Storm Surge (fast and slow) Flooding area.

Historical records indicate that tropical cyclones have repetitively affected the Town of Surf City. In the past 102 years, the Town has been in the path of 23 tropical cyclone events. That on average is 1 event in every 4.4 years. However, in the last 10 years tropical cyclone events have increased in frequency. The area has suffered the effects of 10 events meaning they average 1 event a year. As a result, it is highly likely a tropical cyclone event will affect Pender and Onslow Counties and the Town of Surf City.

In the past, the Town has lost the use of critical facilities for up to 2 weeks and has suffered critical damage to property and crops. There have been several reported injuries and 1 fatality due to tropical cyclones and mandatory evacuations have lasted more than 7 days. Due to the geographic location and the history of tropical cyclones in Surf City it is highly likely that they will be affected by tropical cyclones in the future. Impacts will most likely be critical meaning multiple injuries may occur, critical facilities may be shut down for a minimum of 2 weeks and over 25 percent of the property in the community would be damaged. These factors suggest a hazard index ranking of 5 for tropical cyclones in the Surf City area. This indicates that tropical cyclones should be one of the most important considerations in determining the Town's mitigation strategies (see Table 3.14).

Tropical Cyclone Incident Specifics

- *September 1916:* Tropical Storm – due to the era of the storm no statistical data is available.
- *September 1920:* Tropical Storm – due to the era of the storm no statistical data is available.
- *August 1944:* Tropical Storm – due to the era of the storm no statistical data is available.
- *August 1944:* (Category 1) No Name – hit the North Carolina coast bringing with it winds of 80 mph.
- *October 1954:* (Category 4) Hurricane Hazel – hit North Carolina the North Carolina coast causing the greatest storm surge in the history of North Carolina. The Town of Surf City was not yet incorporated so there are no specifics regarding the property damage to the area now known as Surf City. Surf City Road was completely washed away in 12 places along an 18 mile stretch and the dune system in the area was completely washed away.
- *August 1955:* (Category 3) Hurricane Connie: Hit the North Carolina near Cape Lookout but the fridge of the storm hit Surf City. Tides in Surf City were reported to be 7 feet above normal and erosion was worse than that caused by Hazel.
- *August 1955:* (Category 2) Hurricane Diane: Crossed the North Carolina Coast 5 days after Hurricane Connie. Diane's punch was exacerbated by the residual floodwaters, which soaked the ground from Connie. As a result, extensive flooding caused catastrophic destruction in twenty-two counties in North Carolina. In Surf City, most of the dune system was destroyed leaving oceanfront properties at risk for flood damage due to storm surge. Property owners were evacuated from the island and not allowed back on until the Thursday after the storm. However, most of the damages were seen in the inland counties not along the coastline.

- *September 1955:* (Category 1) Hurricane Ione – came ashore near the vicinity of Morehead City, North Carolina. However, in Surf City the winds registered 92 mph. The storm produced tides that were 8 – 10 feet above normal which caused extensive damage to the local dune system. In addition, the storm dropped approximately 6 inches of rain causing stormwater pooling which led to the flooding of several local properties.
- *September 1958:* (Category 4) Hurricane Helene – passed near the North Carolina Coast at the Cape Fear Region. Though it did not make landfall winds of up to 130 mph were reported in Surf City. Because the storm arrived during low tide there was little flooding and little damage as a result of floodwaters. However, in North Carolina wind damage was approximately $11M.
- *September 1960:* (Category 3) Hurricane Donna – Donna came ashore near Topsail Island. Winds gusted in excess of 120 mph and tides registered 8 feet above normal. The Town lost six of it's fishing piers. Among those was the Barnacle Bill Pier and the Surf City Pier that was missing a 15' section. Three mobile homes were blown over and destroyed. Several sound front homes were flooded and washed into the sound as floodwaters undermined their construction. The roads in Surf City were covered with 6" of sand and the dunes were leveled in most places. The monetary damage in Surf City was approximately $1M. Thus began more than a decade of silence and a reprieve from tropical cyclones for the eastern part of North Carolina.
- *September – October 1971* (Category 1) Hurricane Ginger – Wind gusts were reported at 58 mph along the coast near Topsail Beach. Tides were about 4 feet above normal for the Surf City area. Because the storm was a minor incident for the area there were few affects on the community.
- *September 1984:* (Category 2) Hurricane Diana – Because the storm hit at low tide the effects of the storm surge on the dune system were minor and thus, there was very little damage to ocean front homes in Surf City. However, winds from the storm caused shingle and roof damage to many of the homes in the area.
- *September 1989:* (Category 1 at landfall in North Carolina) Hurricane Hugo – Though Hugo came ashore in South Carolina; it still had an impact on the beaches of Pender and Onslow Counties. In Surf City storm surge caused 2 to 4 feet of erosion along the ocean front. However, there was no major property damage reported nor were there any deaths or injuries associated with the storm in Surf City.
- *June 1996:* Tropical Storm Arthur – hit the North Carolina coast with winds of 48 mph and 6 – 8 foot seas. The storm caused excessive rip currents in the area. There was no power outage reported for the area. Residents stated that the storm packed less of a punch than most summer storms in the area. There were no reported damages in Pender and Onslow Counties.
- *July 1996:* (Category 2) Hurricane Bertha – came ashore in North Carolina between Wrightsville Beach and Topsail Island. There were unconfirmed wind gusts of up to 144 mph on Topsail Beach but most verified measurements were below 100 mph. The Barnacle Bill Fishing Pier lost 40' off the end of the pier and the rest of the piers in Town received minor damage. The highest storm surge, estimated at 8 feet, struck Pender and Onslow Counties and caused extensive beach erosion and severe structural damage at Surf City. Forty homes on the oceanfront were completely undermined as 20 foot waves leveled the dune system leaving the structures exposed to storm surge. There was 4 feet of sand on South Shore Drive which had to be removed following the storm. The Town lost power, water, and sewer as a result of the storm which prevented citizens

from returning to the Town until the Sunday after the storm. A major issue for Surf City was the 50 people who chose not to evacuate the area prior to the storm. As the storm worsened the Surf City police had to rescue all of them placing rescue workers at high risk. In total there was $7M in damages to structures and infrastructure as a result of the storm.

- *September 1996:* (Category 3) Hurricane Fran – came ashore near Bald Head Island. Because the strength of the hurricane was concentrated on the eastern side of the storm, the beaches of Pender and Onslow Counties were hit with the worst winds and tides. According to reports, the most amazing destruction inflicted by Fran fell upon the helpless communities of Topsail Island (Barnes, 1998). The most extensive property damage was caused by the storms 10 – foot storm surge as the dunes that would normally provide protection were previously washed away by Hurricane Bertha. Nearly all of the first – row homes were destroyed. In fact, along NC 50, in Surf City, 200 homes out of 500 had roofs and walls missing, foundations crumbled, or windows blown in. "In many locations, splintered stubs of pilings and half-exposed septic tanks were the only recognizable features that remained where houses had once stood" (Barnes, 1998). On 4th Street the only evidence of previous structures was the pilings sticking up from the ground. There were vacant lots between Scotch Bonnet Pier and 1st Street where oceanfront homes had previously stood. More than 30 homes on North Shore Drive were destroyed. The Surf City Fire Station was leveled. The downtown business district sustained severe damage to its structures. In total more than 300 homes in Surf City incurred damages that exceeded half their value. One death resulted in Surf City as a result of the storm when a 75 year old woman refused to leave her home during evacuations. As the mobile home was demolished during the storm leaving her floating on a mattress in the marsh. She died from hypothermia the next day at the local hospital. Total damages in Surf City were approximately $7M.
- *July 1997:* Tropical Storm Ana – affected Surf City. Strong Rip Currents associated with this storm resulted in several emergency rescues at Surf City. There were no reported crop damages or property damages. There was no loss of critical facilities.
- *July 1997:* Tropical Storm Claudette – affected Surf City. Strong Rip Currents were reported but there were no emergency rescues, injuries or deaths reported. There were no reported crop damages, property damages or critical facility loss.
- *August 1998:* (Category 2) Hurricane Bonnie – The winds from this storm reached gusts between 90 and 100 mph and the storm surge was 9 – 11 feet. Two miles of berm line was destroyed south of the Surf City Condos. In total 775 homes and 28 businesses had some sort of damage though most of it was cosmetic in nature meaning shingles were blown off and windows were broken. In total there was $4.2M in damage to private structures in the Town and another $1M in damages to the dune system and infrastructure.
- *August 1999:* (Category 1) Hurricane Dennis – Hurricane Dennis cam ashore in North Carolina blowing winds north and west in Surf City. As a result, the Town gained several feet of sand to their dune system. Though the rainfalls from Dennis were approximately 5" in the area there was no flooding and no damage in the area. However, the storm laid the groundwork for the damage that was caused by Hurricane Floyd just days later.
- *September 1999:* (Category 2) Hurricane Floyd – Hurricane Floyd packed winds of approximately 90 mph, rains of approximately 20" and a storm surge of 8 feet. Storm

surge caused the destruction of the dune system between Barnacle Bills Fishing Pier and Scotch Bonnet pier. The canal street flooded and were impassable until the Friday following the storm. There was minor flooding damage to roads and other infrastructure, in general. The storm was mostly a wind event for the Town of Surf City. Approximately, 310 homes received wind damage in the area that was mostly cosmetic meaning shingles and siding were blown off and winds blew over trees on structures in the mainland area of the community. The metal building at the old fire station site that housed equipment was destroyed and the EMS building received minor damage. The Town lost water, sewer, and power until the Sunday after the storm though public pressure persuaded officials to allow citizens back onto the Island the Saturday after the storm. In total damages for the area were approximately $2.5M. Mostly needed for debris removal, replacement of street signs, dozing of the north end of the island roads, and the repair or replacement of two lift station pumps.

- *October 1999:* (Category 1) Hurricane Irene – hit Pender and Onslow Counties causing the floods from Hurricane Floyd to worsen. Surf City reported a loss of critical facilities for several hours and the length of evacuation was 1 day.
- *September 2002:* Tropical Storm Gustav – grazed the Northern parts of the Outer Banks. However, Surf City was at the tail end of the storm receiving higher than average seas (8' – 12' swells). There was no reported damage in Surf City from this storm.

Nor'easters

Nor'easters have effects on the landscape similar to those of a Tropical Cyclone event. However, nor'easters are extra-tropical storms that derive their strength from horizontal gradients in temperature (i.e. they form as a result of a drastic drop in temperature). This drastic drop in temperature creates instability above and an area of low pressure below. Large temperature differences create turbulence, which is further agitated by the earth's rotation that causes the air to circle around the center, similar to a hurricane. The season for nor'easters is October to April with February being the busiest month. Nor'easters can achieve wind gusts that exceed hurricane force in intensity and the storm can last up to a week and reach a size of up to 1,000 miles or more in diameter. In addition, nor'easters can create extreme winter conditions. This information will be discussed in the winter storm section of this plan.

Nor'easters are rated by the Dolan-Davis Nor'easter Intensity Scale (1993). This scale ranks nor'easters from a storm scale of 1 to 5 with 5 being the most severe (see Table 3.6).

Table 3.6

Dolan-Davis Nor'easter Intensity Scale (1993)

Storm Class	Beach Erosion	Dune Eroision	Overwash	Property Damage
1 (Weak)	Minor Changes	None	No	No
2 (Moderate)	Modest; Mostly to lower beach	Minor	No	No
3 (Significant)	Erosion extends across beach	Can be Significant	No	Loss of many structures at local level
4 (Severe)	Severe beach erosion and recession	Severe dune erosion or destruction	On low beaches	Loss of structures at community-scale
5 (Extreme)	Extreme beach erosion	Dunes Destroyed over extensive areas	Massive in sheets and channels	Extensive losses on a regional-scale

Source: FEMA, 1997.

Nor'easter Vulnerability Summary

The period from 1950-2002 was studied for information on nor'easters. Numerous secondary sources were employed including: Barnes, Jay, 1998 and 2001; The Topsail Voice; Cable News Network; Emergency Management records; NOAA; National Climatic Data Center; and The Weather Channel. In addition, several primary sources were utilized including: the Fire Chief, Police Chief, Public Works Director.

The frequency of nor'easters (Class 4 or 5) has increased in recent years. From 1987 to 1993 at least one class 4 or 5 storm occurred each year along the Atlantic seaboard. Though NOAA does not list any nor'easters for Pender and Onslow County history, through other sources such as The Weather Channel and the National Climatic Data Center information on several major storms that have affected the area in the form of property damage, beach erosion, salt intrusion, and the like was found.

The effects nor'easters have had on Surf City have resembled the effects of tropical cyclone events in that there is the potential for extreme hurricane force winds, extensive storm surge and erosion. In addition to these effects nor'easters often bring winter weather, as they are most prevalent during the coldest part of the year. For vulnerability to specific effects please refer to:

- wind vulnerability in Table 3.5;
- storm surge vulnerability in the tropical cyclone portion of this plan;
- flooding vulnerability in Table 3.9;
- *Flood Zones Map of Surf City, NC* (Appendix E);
- *Repetitive Loss Areas Due to Water Events of Surf City, NC* (Appendix E);
- *Storm Surge Inundation Areas (Fast) of Surf City, NC* (Appendix E);
- *Storm Surge Inundation Areas (Slow) of Surf City, NC* (Appendix E);
- *10-Year Flood History* map (Appendix E);
- erosion vulnerability in Table 3.11; and
- *Long – Term Average Annual Shoreline Change* Map (Appendix E).

Historical records indicate it is highly likely that a nor'easter will affect Pender and Onslow Counties and the Town of Surf City in the future. In the past, nor'easters have caused storm surge, severe flooding, and extensive erosion in Surf City. The Town has lost the use of critical facilities for more than 24 hours and has suffered significant damage to property. There have been no injuries or fatalities reported in Pender and Onslow Counties due to nor'easters. Due to the geographic location and the history of nor'easters in Surf City it is highly likely that they will be affected by nor'easters in the future. Future impacts are limited meaning some injuries may occur, critical facilities may be shut down for more than one week and over 10 percent of the property in the community would be damaged. These factors suggest a hazard index ranking of 4 for nor'easters in the Surf City area. This indicates that nor'easters should be one of the most important considerations in determining the Town's mitigation strategies (see Table 3.14).

Most Severe Nor'easter Individual Incident Specifics

- *March 1962:* (Category 5) The Ash Wednesday Storm of 1962" lasted more than 60 hours. The winds and raging surf caused the most damage for Pender County Beaches. According to the Army Corps of Engineers, the storm caused more erosional damage to oceanfront property than many hurricanes that preceded it. Along the Mid-Atlantic

States more than 1,800 houses were completely destroyed causing an estimated $234M in property damage.

- *March 1993:* (Category 5) "The Storm of the Century" lasted more than 8 hours. Hurricane force winds (between 75 and 90 mph sustained with gusts of up to 100 mph) uprooted trees and caused damage to many structures along the Pender County Beach area. The coast received very little precipitation because of the inland track of the storm. The salt deposited on power lines caused a disruption of power for more than 24 hours in parts of Surf City. This causing a more severe problem as the storm brought temperatures into the low twenties with it. The salt spray was also deposited on vegetation for miles inland causing the vegetation to be burned in many cases to the complete destruction of the plant. In addition, the surge associated with this storm over washed onto and across South Shore Drive and North Shore Drive causing the streets to be blocked and thereby impeding traffic.
- *February 1998:* (Category 4) A Nor'easter caused heavy surf and high tides two feet higher than normal with 4 feet of dune erosion and minor overwash. There was no property damage reported in Surf City nor were there any deaths or injuries reported for the area.

Extreme Temperatures

To accurately examine extreme temperatures a review of tow categories, extreme cold and extreme heat, was conducted. Each category was examined separately and given a separate likelihood occurrence, intensity rating, impact, and hazard index ranking.

Extreme cold/wind chill occurs when there are low temperatures combined with high winds. These issues are common in mountainous areas of North Carolina and can lead to high levels of frozen precipitation and severe winter storms (i.e. snow storms, ice storms, blizzards, and the like). In addition, these temperatures can affect the population by causing frost bite and hypothermia.

Extreme heat/heat waves occur when there are high temperatures combined with high humidity persist over an extended period of time. This can lead to overall issues of drought and extended dry spells. However, it can also affect the population in different ways as well and should have close attention paid to it.

According to FEMA (1997), extreme heat/heat waves can cause the following disorders:

1. *Heat Stroke:* The body is unable to control its temperature. It will rise rapidly. Sweating does not occur. This can cause permanent disability. Those at highest risk included outdoor laborers, elderly, children, and people in poor health.
2. *Heat Exhaustion:* occurs when there is an excessive loss of water and salt released in sweat. Those at highest risk include the elderly, people with high blood pressure, outdoor laborers, and those exercising outdoors.
3. *Heat Syncope:* results in a sudden loss of consciousness, which generally returns when the person lies down. There is little or no permanent harm as a result of heat syncope. This is associated with people who are not properly acclimated to the weather.
4. *Heat Cramps:* occurs as a result of a mild fluid and electrolyte imbalance and generally ceases to be a problem after acclimatization. This occurs in people who exercise outdoors when they are unaccustomed to the activity.

The National Weather Service categorizes heat index in relation to heat disorders (see Table 3.7).

Table 3.7

Heat Index in Relation to Heat Disorders		
Danger Category	**Heat Disorder**	**Apparent Temperature °F**
IV Extreme Danger	Heat Storke or Sunstroke Imminent	>130
III Danger	Sunstroke, heat cramps, or heat exhaustion likely; heat stroke possible with prolonged exposure and physical activity	105-130
II Extreme Caustion	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and physical activity	90-105
I Caution	Fatigue possible with prolonged exposure and physical activity	80-90

Source: National Weather Service, 1997.

Extreme Temperatures Vulnerability Summary

In an effort to examine temperatures in Surf City a period from 1948 – 2002 was examined. The data was compiled by the North Carolina State Climatology Office. According to Ryan Boyles, Assistant State Climatologist, there is 1 monitoring station at Hoffman Forrest and 1 in Wilmington. These are the closest stations to Surf City. The data collected from the two stations varied very little in comparison as a result the information from the Wilmington station was used for this discussion.

Extreme Cold

Data was compiled for extreme cold by reviewing 54 years of temperature, wind, and frozen precipitation data. Out of those years 2 years (1948 and 1981) had incomplete data. As a result, those years were excluded when conducting the assessment of extreme cold. To determine the Town's vulnerability to extreme cold the average number of days per year the wind chill was below freezing was determined. The results showed that on average there were 6 days per year where the temperature was between 31°F and 21°F, 4 days per year where the temperature was between 21°F and 11°F, and 2 days per year where the temperature was between 10°F and 0°F. Winter is from December 22 to March 19 and quite often these cold temperatures are associated with nor'easters. As mentioned in the winter storms section and nor'easter section of this plan, these phenomena can lead to property damage, power outages, high levels of debris, and injury or death if citizens do not take precautions to protect themselves and their property.

The hazard index ranking for extreme cold was a complicated determination as it is so closely associated to winter storms and nor'easters (see Table 3.14). It was determined that due to the geographical location and the number of nor'easters the area see on an annual basis, it is possible that Surf City will be affected by extreme cold in the future. The intensity rating for extreme cold temperatures is moderate as it is often associated with winter storms. Future impacts will most likely be negligible, which means that there will be minor injuries, minimal quality of life interruption, loss of critical services for 24 hours or less, and less than 10 percent of property would be damaged. These factors suggest a index ranking of 2 for extreme cold temperatures in Surf City (see Table 3.14). This indicates that extreme cold temperatures are not one of the most important considerations in determining the Town's mitigation strategies.

Extreme Heat

In an effort to examine extreme heat/heat waves for Surf City an examination of 54 years of data was conducted which provided the average monthly heat index. The data was compiled by the North Carolina State Climatology Office. According to Ryan Boyles, Assistant State Climatologist, there are no monitoring stations located within the town limits of Surf City. As a result the data was pulled from the closest station which is located at the Wilmington Airport. However, Mr. Boyles stated that because the Wilmington station is 40 miles inland of Surf City the numbers do not accurately represent the climate of Surf City. He continued by stating, that Surf City is a ocean front community and as a result their days are cooled by ocean breezes which ultimately reduces the average number of days the heat index is over 105°F.

The data results were compiled by reviewing 54 years of complete temperature, dew point and relative humidity data. The results showed that on average there were 2.06 days in June with a heat index over 104.5°F, 5.91 days in July with a heat index over 104.5°F, 4.55 days in August with a heat index over 104.5°F, and 2.17 days in September with a heat index over 104.5°F. However, as previously stated, because of the ocean breezes cooling the temperatures in Surf City the number of days are reduced. Therefore, the results actually represent a worst case scenario.

Historical records indicate that it is likely extreme heat/heat waves will affect Surf City in the future. According to Town officials, there has been no loss of critical facilities and there has been no damage to property as a result of extreme heat/heat waves. As a result, future impacts will most likely be negligible, which means that there will be minor injuries, minimal quality of life interruption, loss of critical services for 24 hours or less, and less than 10 percent of property would be damaged. These factors suggest a index ranking of 2 for extreme heat/heat waves temperatures in Surf City (see Table 3.14). This indicates that extreme heat/heat waves temperatures are not one of the most important considerations in determining the Town's mitigation strategies.

Tornadoes

A Tornado is a rapidly rotating vortex of air extending groundward from a cumulonimbus cloud. Tornadoes can reach wind speeds in excess of 300 mph causing various intensities of destruction within its path. Often tornadoes are related to larger vortex formations and, as a result, often form in convective cells such as thunderstorms or in the right forward quadrant of a hurricane, far from the hurricane eye. In addition, earthquake induced fires, fires from atomic bombs, and wildfires may produce tornadoes (FEMA, 1997).

The damage severity of a tornado is measured by the Fujita-Pearson Tornado Scale (see Table 3.8). This scale assigns numerical values to a tornado based on wind speeds and subsequently categorized the tornadoes from 0 to 5. Table 3.8 identifies the wind speed, intensity, and types of damage for each category of tornado.

Table 3.8

Fujita-Pearson Tornado Scale			
Scale Value	**Wind Speed (mph)**	**Intensity**	**Type of Damage**
F0	40 - 72	Light Damage	Some damage to chimneys; tree branches broken off; shallow-rooted trees pushed over, sign boards damaged.
F1	73 - 112	Moderate Damage	Roof surfaces peeled off; mobile homes pushed off foundations or overturned; moving automobiles pushed off roads.
F2	113 - 157	Considerable Damage	Roofs torn from houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
F3	158 – 206	Severe Damage	Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207 – 260	Devastating Damage	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown; large missiles generated.
F5	261 – 318	Incredible Damage	Strong frame homes lifted off foundations and carried considerable distances to disintegrate; automobile-size missiles fly through the air in excess of 100 yards; trees debarked.
F6	> 318	Inconceivable Damage	These wind speeds have rarely been recorded. The area of damage would be completely obliterated and unrecognizable. Large missiles would be thrown in excess of 100 yards.

Source: FEMA, 1997.

Tornado Vulnerability Summary

The period from 1950-2002 was studied for information on tornadoes. Numerous secondary sources were employed including: The Topsail Voice; Cable News Network; Emergency Management records; NOAA; National Climatic Data Center; and The Weather Channel. In addition, several primary sources were utilized including: the Town Manager, Fire Chief, and Public Works Director.

Pender and Onslow Counties has had few tornadoes reported within the County limits. In fact, NOAA does not report any tornadoes affecting the Town of Surf City during the time period examined. In the past, the Town has not lost use of critical facilities and have had no reported injuries or fatalities. Thus, it was determined that, in the past, tornadoes have had negligible impacts on the Town of Surf City.

The history of tornadoes in Surf City is not significant but tornadoes are often a side effect of tropical cyclones and severe thunderstorms/windstorms. As a result, it was determined that it is possible that the Town will be affected by tornadoes in the future. It was further determined that future impacts will most likely continue to be negligible meaning minor injuries may occur; critical facilities may be shut down for 24 hours or less and less than ten percent of the property in the community would be damaged. These factors suggest a hazard index ranking of 2 for tornadoes in the Surf City area. This indicates that tornadoes are not one of the most important considerations in determining the Town's mitigation strategies (see Table 3.14).

Waterspouts
A waterspout is a column of rotating wind that develops downward from a line of cumulus clouds to a body of water. A Cumulus cloud must be present for a waterspout to occur. The contrast of cold air overlying warm water provides a critical element leading to a waterspout event. Spouts can pack winds up to 200 miles per hour and will move across the water up to 10 to 15 miles per hour. They have been observed to reach heights of up to 10,000 feet.

Waterspouts are small funnels that may only be a few feet in diameter, but sometimes much larger spouts are generated. The big ones feature higher rotation speeds and large funnel diameters, sometimes as large as tornadoes. And just as tornadoes pack enough power to pose a threat to people and property, so too can large waterspouts produce damage and death, although this is rare.

Waterspout Vulnerability Summary
Because waterspouts generally remain in the water the potential for property damage is less than that of a tornado, as a result, a shorter period (1995-2002) was studied for information on waterspouts. Numerous secondary sources were employed including: The Topsail Voice; Cable News Network; Emergency Management records; NOAA; National Climatic Data Center; and The Weather Channel. In addition, several primary sources were utilized including: the Fire Chief, Police Chief, Public Utilities Director and Public Works Director.

The Town has not lost use of critical facilities and has not suffered damage to property as a result of waterspouts. In addition, there have been no reported injuries or fatalities due to waterspouts. The history of waterspouts in Surf City, the fact that waterspouts can (though rarely) move onto land, and the fact that waterspouts are often a result of tropical cyclones or tornadoes indicates that it is possible that the Town will be affected by waterspouts in the future.

Historical records indicate that it is possible a waterspout will affect the Town of Surf City. Future impacts will most likely be negligible meaning minor injuries may occur; critical facilities may be shut down for 24 hours or less and less than ten percent of the property in the community would be damaged. These factors suggest a hazard index ranking of 2 for waterspouts in the Surf City area. This indicates that waterspouts are not one of the most important considerations in determining the Towns mitigation strategies (see Table 3.14).

Waterspouts Incident Specifics
- *September 1997:* A waterspout was reported by the Pender County Emergency Manager, 1 mile off the cost of Surf City. No damages, deaths or injuries reported and no loss of critical facilities.

HYDROLOGIC HAZARDS
The group "Hydrologic Hazards" includes water related events. Each has its own natural characteristics, geographic location, severity, seasonality, and associated risks. Hydrologic hazards include floods, storm surges, erosion, and droughts. As with atmospheric hazards, many hydrologic hazards are interrelated. For example erosion can be acerbated by extreme flooding. Additionally these hazards are often intertwined with other natural and technological hazards. For example winds from a tropical cyclone can exacerbate storm surge and coastal erosion or

excessive rains can cause dam/levee failure which leads to flooding. These linkages make it difficult to attribute damage to one hazard or to access the risk one hazard has on the planning area.

In this sub-section 3 hydrologic hazards were addressed: floods, Riverine erosion, and drought. Each category has a general description of the hazard, a vulnerability summary for the planning area, and specific hazard information for the area.

Floods

According to FEMA (1997) flooding is defined as "the accumulation of water within a water body and the overflow of excess water onto adjacent floodplains." There are numerous types of flooding all being created by different circumstances and all having different effects on an area which can be by development in the floodplain. For the purpose of the purpose of this plan an examination of Riverine flooding, flash flooding, and dam/levee break flooding.

Riverine flooding is caused by an overflow of rivers and streams and is the most common type of flooding. Large-scale weather systems are usually the cause of flooding in large rivers as they generate prolonged rainfall over wide areas (FEMA, 1997). Whereas, more localized weather systems that cause intense rainfall over small areas are the general reason for the flooding of small rivers and streams.

Flash floods are characterized by a rapid rise in water level, high velocity, and large amounts of debris (FEMA, 1997). Flash floods may be a direct result of dam/levee failure or the breakup of an ice jam (which is not discussed here). However, in more urban areas (i.e. cities and towns) flash flooding is a serious problem due to the decrease or removal of vegetation, the use of impervious surfaces which increase runoff of stormwater, and the construction of drainage systems that increase the speed of runoff and are often inadequate to handle the amount of runoff necessary.

Dam/Levee break flooding occurs as a result of structural failures, such as progressive erosion of an embankment or overtopping and breaching by a severe flood. These floods are associated with a large amount of water moving at a high velocity and are most often unexpected.

Flooding Vulnerability Summary

The period from 1900 – 2002 was studied for information flooding events. Numerous secondary sources were employed including: Barnes, Jay, 1998 and 2001; The Topsail Voice; the Sunday Star News; Wilmington Morning Star; Cable News Network; Emergency Management records; NOAA; National Climatic Data Center; and The Weather Channel. In addition several primary sources were utilized including: Public Information Updates, Local Damage Reports, the Division of Coastal Management, North Carolina Climatic Center, Town Manager, Fire Chief, Police Chief, and Public Works Director.

The *Flood Zone Map of Surf City, NC* (see Appendix E) identifies flood zones "A," "AE," and "VE." These zones cover approximately 90 percent of the Town showing that the Town has a high vulnerability to flooding. The largest portion (85 percent) of this percentage lies in the "AE" zone with the rest lying in the "VE" zone. Table 3.9 identifies the values of property in each of the flood zones identified by the *Flood Zone Map of Surf City, NC* (see Appendix E).

According to the table, there are no properties located within zone "A," but zone "AE" has a building vulnerability of $72,660,034 which is the zone with the highest vulnerability.

Table 3.9

Vulnerability to Flooding			
Q3 Flood Zone	**Total Property Value**	**Building Value**	**Land Value**
VE	$14,913,535	$6,340,509	$8,573,026
AE	$193,510,081	$72,660,034	$120,850,047
A	$0	$0	$0
X500	$75,921,599	$34,634,184	$41,287,415
TOTAL	**$284,345,215**	**$113,634,727**	**$170,710,488**

The *Repetitively Damaged Areas Due to Water Events in Surf City, NC* map (Appendix E) the properties identified as repetitively damaged are primarily located within the "VE" zone. According to the National Flood Insurance Program (NFIP) there are 238 structures located within the areas of repetitive damage which have a replacement building and contents value of $5,280,827.

The *10 – Year Flood History Map of Surf City, NC* (see Appendix E) identifies the areas within the Town that have been flooded over the last ten years. According to the Inspections Department, the 1500,1700, 2100, 2300, 2600 blocks of South Shore Drive; 400 block of North Shore Drive; and the 100 and 1100 blocks of New River are the areas that have the largest issue with flooding. The areas on South Shore Drive are owned and maintained by the State of North Carolina and are currently being examined for stormwater drainage problems. According to the Inspections Department, these areas will undergo drainage rectification by the Department of Transportation.

Historical records indicate that tropical cyclones have repetitively affected the Town of Surf City. In the past 52 years, the Town has been in the path of 14 flooding events mostly related to tropical cyclone events. That on average is 1 event in every 3.7 years. However, in the last 10 years tropical cyclone events have increased in frequency. The area has suffered the effects of 11 events meaning they average 1.1 events a year. As a result, it is highly likely a flooding will affect Pender and Onslow Counties and the Town of Surf City in the future.

In the past, the Town has lost the use of critical facilities for up to 2 weeks and has suffered critical damage to property and crops. There have been several reported injuries and mandatory evacuations have lasted more than 7 days. Due to the geographic location and the history of tropical cyclones, nor'easters, and severe thunderstorms/windstorms in Surf City it is highly likely that they will be affected by tropical cyclones in the future. Impacts will most likely be critical meaning multiple injuries may occur, critical facilities may be shut down for a minimum of 2 weeks and over 25 percent of the property in the community would be damaged. These factors suggest a hazard index ranking of 5 for flooding in the Surf City area. This indicates that flooding should be one of the most important considerations in determining the Town's mitigation strategies (see Table 3.14).

Significant Flooding Incident Specifics

- *October 1954:* (Category 4) Hurricane Hazel – See the tropical cyclone section of this plan for specifics.
- *August 1955:* (Category 3) Hurricane Connie – See the tropical cyclone section of this plan for specifics.
- *August 1955:* (Category 2) Hurricane Diane – See the tropical cyclone section of this plan for specifics.
- *September 1955:* (Category 1) Hurricane Ione – See the tropical cyclone section of this plan for specifics.
- *September 1958:* (Category 4) Hurricane Helene – See the tropical cyclone section of this plan for specifics.
- *September 1960:* (Category 3) Hurricane Donna – See the tropical cyclone section of this plan for specifics.
- *September 1989:* (Category 1 at landfall in North Carolina) Hurricane Hugo – See the tropical cyclone section of this plan for specifics.
- *July 1996:* (Category 2) Hurricane Bertha – See the tropical cyclone section of this plan for specifics.
- *September 1996:* (Category 3) Hurricane Fran – See the tropical cyclone section of this plan for specifics.
- *August 1998:* (Category 2) Hurricane Bonnie – See the tropical cyclone section of this plan for specifics.
- *August 1999:* (Category 1) Hurricane Dennis – See the tropical cyclone section of this plan for specifics.
- *September 1999:* (Category 2) Hurricane Floyd – See the tropical cyclone section of this plan for specifics.
- *October 1999:* (Category 1) Hurricane Irene – See the tropical cyclone section of this plan for specifics.
- *September 2000:* Flash Flood – Law enforcement reported flooding on the secondary roads in the mainland sections of the Town.

Erosion

Erosion is a process that involves the wearing away, transportation, and movement of land. Erosion rates can vary significantly as erosion can occur quite quickly as the result of a flash flood, storm, or other natural event. It can also occur slowly as the result of long-term environmental changes and can be exacerbated by human activity. In this sub-section an examination of two types of erosion are examined: Riverine erosion and coastal erosion.

Riverine Erosion Vulnerability Summary

Riverine erosion occurs in various ways. Most often it is initiated by high sediment loads or heavy rainfall. This generates high volume and velocity run-off which will concentrate in the lower drainages within the river's catchment area. When stress applied by these river flows exceeds the resistance of the riverbank material, erosion will occur. As the sediment load increases, fast-flowing rivers will erode their banks downstream. Eventually the river becomes overloaded or velocity is reduced, leading to the deposition of sediment further downstream or in dams and reservoirs (Strahler and Strahler, 1997). Riverine erosion rarely causes death or injury but does cause the destruction of property, development, and infrastructure.

Surf City does not have a river that runs through the Town limits. As a result, it is highly unlikely that they will be affected by erosion in the future. These factors suggest a hazard index ranking of 1 for riverine erosion in the Surf City area. This indicates that erosion should be one of the most important considerations in determining the Town's mitigation strategies (see Table 3.14).

Coastal Erosion Vulnerability Summary

Coastal erosion is a hydrologic hazard defined as the wearing away of land and loss of beach, shoreline, or dune material as a result of natural coastal processes (Skaggs and McDonald, 1991). These natural coastal processes that cause coastal erosion include the actions of prevailing winds, waves and currents. However, human activities such as the development of seawalls, groins, jetties, navigation inlets, and boat wakes often heighten the effects of the aforementioned natural processes. The actual erosion rate within an area may vary within estuarine systems and over time, depending upon individual site conditions and the frequency of storms or other causes of erosion (Rogers and Skrabal 1999). Erosion is measured as the rate of change in the position or horizontal displacement of a shoreline over a specific period of record, measured in units of feet or meters per year. It is a quantitative assessment of annual change for a given beach cross-section or profile or volumetric change for continuous segments of a shoreline (FEMA, 1997).

Coastal Erosion Vulnerability Summary

The period from 1900-2002 was studied for information on erosion events. Numerous secondary sources were employed including: Barnes, Jay, 1998 and 2001; The Topsail Voice; Cable News Network; Emergency Management records; NOAA; National Climatic Data Center; and The Weather Channel. In addition, several primary sources were utilized including: Jason Dale, Specialist at the Division of Coastal Management; Andy Coburn, Duke University; the Fire Chief; Police Chief; and Public Works Director.

The *Topsail Island at Surf City Long – Term Average Annual Shoreline Study & Erosion Factors* map (Appendix E) identifies the areas of Surf City that are considered to be erosional "hot spots." The island erosion rate has been remained at a consistent rate of 2 feet per year as most of the area has been influences by beach nourishment either for beach protection or dredge disposal. Beach nourishment artificially lowers the erosion rate for that area..

Surf City has been a proactive community in mitigating the hazard of coastal erosion. In fact, they have been actively participating in beach nourishment projects since 1982 and have spent in excess of $1,698,234 as seen in Table 3.10. Table 3.10 reflects the actual amount of money spent on projects at the time of nourishment. Wherever possible, the cost of a nourishment project was accurately established by documentation. Nourishment projects for which no documented cost could be obtained were assigned a cost based on the average cost (per cubic yard of fill) of other nourishment projects within the same funding category and/or same geographical area.

Table 3.10

Surf City Nourishment Experience					
Beach Location	**Date**	**Funding Type**	**Volume (cy)**	**Length (ft)**	**Actual Cost**
Topsail Island	1982	Federal: Navigation	51,715		$557,830
Topsail Island	1988	Federal: Navigation	151,017		$423,256
	1992	Federal: Navigation	75,519	755	$177,830
	1993	Federal: Navigation	80,162	802	$269,659
	1995	Federal: Navigation	38,883	389	$269,659
			397,296	**1,946**	**$1,698,234**

Source: www.nicholas.duke.edu/psds/nourishment.htm

In a review of tropical cyclones, nor'easters and flooding it was shown that the Town has suffered significant damage to property as a result of erosion. However, there have been no injuries or fatalities reported in Surf City due to erosion. The areas most vulnerable to the effects of erosion are the first row, beach front areas. The *Zoning Map of Surf City, NC* map (see Appendix E) shows that this area is primarily zoned for high density residential use with periodic zones of multi-family residential use and commercial use dispersed within. Table 3.11 shows the approximate vulnerability to the effects of erosion.

Table 3.11

Approximate Vulnerability to the Effects of Erosion			
Type of Development	Number of Existing Private Buildings	Current Value	Current Number of People
Residential	344	$78,373,201	619
Commercial & Industrial	7	$5,000,000	0
Critical Facilities	0	$0	0
Total	351	$83,373,201	619

As previously stated erosion is a common everyday occurrence in the coastal region but, in the past, has been exacerbated by tropical cyclone events, nor'easters, storm surge, and strong current action in Surf City. Due to the geographic location and the history of tropical cyclone events and nor'easters in Surf City it is highly likely that the Town will be affected by erosion in the future. However, the Town is dedicated to the preservation of the beach and are continuing their proactive approach to it's renourishment.

Future impacts are limited in terms of injuries and the shut down of critical facilities. However, in terms of property damage the ranking is raised to critical meaning the town could see more than 25 percent of property damaged as the beach front property has a higher tax value than non-beach front property. These factors suggest a hazard index ranking of 4 for erosion in the Surf City area. This indicates that erosion should be one of the most important considerations in determining the Town's mitigation strategies (see Table 3.14).

Drought

Drought is defined by FEMA (1997) as being a water shortage caused by a deficiency of rainfall. During severe droughts, agricultural crops do not mature, wildlife and livestock are undermined, land values decline, and unemployment increases. Droughts can cause a shortage of water for

human and industrial consumption, hydroelectric power, recreation and navigation. Water quality may decline and the number of wildfires may increase.

There are four types of droughts (FEMA, 1997):

1. Meteorological Drought – This is a reduction of precipitation over time. This definition is regionally based. In the United States, this is indicated by less than 2.5 mm of rainfall in 48 hours, which is the first indication of drought.
2. Agricultural Drought – This happens when soil moisture cannot meet the demands of a crop. This type of drought happens after a meteorological drought but before a hydrological drought.
3. Hydrological Drought – This refers to reduction in surface and subsurface water supplies. This is measured through stream flow and lake, reservoir, and ground water levels.
4. Socioeconomic Drought – This occurs when water shortages affect people, either in terms of water supply or economic impacts (i.e. loss of crops so price increases).

It is difficult to determine when a drought is approaching because of slowly accumulating effects and because there is no commonly accepted approach for measuring drought risk. However, there are several indices that can be helpful in determining the risk. The Palmer Drought Severity Index is especially well known. This index is used to measure drought impact on agriculture and water supplies. However, the National Drought Mitigation Center is using a newer index, the Standardized Precipitation Index, to monitor moisture supply conditions. Distinguishing traits of this index are that it identifies emerging drought months sooner than the Palmer Index and that it is computed on various time scales.

The period from 1933-2002 was studied for information on drought. Emergency Management records; NOAA; National Climatic Data Center; and The Weather Channel. In addition, several primary sources were utilized including: Ryan Boyles, Assistant State Climatologist; the Fire Chief; Police Chief; Public Works Director.

Historical records indicate that it is possible that droughts and extreme dry spells will affect Pender and Onslow Counties and the Town of Surf City. The Town has not lost the use of critical facilities and there has been no damage to property reported. Additionally, there have been no reported injuries or fatalities due to droughts. Future impacts will most likely be negligible meaning minor injuries may occur; critical facilities may be shut down for 24 hours or less and less than ten percent of the property in the community would be damaged. These factors suggest a hazard index ranking of 2 for droughts in the Surf City area. This indicates that, in the large scheme, droughts are not one of the most important considerations in determining the Town's mitigation strategies (see Table 3.14). However, the potential excessive depletion of the Town's water supply could lead to more severe problems than those from the past and as a result strategies for drought will receive special attention.

Drought Research Specifics

In an effort to examine the severity of drought as a result of a lack of precipitation a table was produced which provides the average monthly inches of precipitation for Surf City for the last 69 years (see Table 3.12). Out of those 69 years, 1 year (1948) had incomplete data. As a result that year was excluded when conducting an assessment of climate patterns. The data in Table

3.12 was compiled by the North Carolina State Climatology Office. According to Ryan Boyles, Assistant State Climatologist, there are no monitoring stations located within the town limits of Surf City. As a result the data was pulled from the Wilmington station, and the Haywood Forest station. Mr. Boyles stated that the Wilmington station and Haywood Forrest stations did have the extensive data required but suggested that the Wilmington data be used in place of the Haywood Forrest data.

The average annual rainfall from 1933 -2001 was 54.12 inches. Over the years there have been many dry spells. During the period from 1933-2003, the six driest years were in 1933 (43.18"), 1941 (39.06"), 1954 (40.89"), 1967 (42.16"), 1968 (37.77"), and 2001(37.98") (see Table 3.12). The most severe dry year was in 1968, with an extremely low precipitation level of 37.77 inches. In August 1999 Pender and Onslow Counties were declared a Federal Disaster Areas due to hot and dry conditions, which had continued since July. Relief from this drought came with the arrival of several tropical events that year and in September. Surf City received an unprecedented 23.41 inches of precipitation. As a result, 1999 was the wettest year in the time period examined, with a total average annual precipitation of 72.51 inches, which was 49.10 inches above the average annual precipitation level (see Table 3.12). However, in November 2001 the National Weather Service declared North Carolina in a moderate drought. It was noted that Surf City was 16.14 inches below normal precipitation levels to date for the year. Subsequently, in July 2002, Governor Easley requested that 54 North Carolina counties be declared a federal disaster area. Though Pender and Onslow Counties were not one of these 54 counties they would still be affected by the water restrictions, which were implemented.

In summary, drought and extended dry spells are a normal part of the climate in Pender and Onslow Counties and surf City and can be aggravated by other factors such as: high temperatures, high winds, and low relative humidity. The severity of droughts not only depends on its duration, intensity, and geographic location but also on regional water supply demands made by human activities and vegetation.

Table 3.12

Monthly/Annual Climate Data Results

Sum of Daily Precipitation from 1933-2002

WILMINGTON WSO AIRPORT, NC (UCAN: 14407,COOP: 319457)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
1933	2.22	5.83	2.88	4.5	3.15	1.61	7.63	6.45	8.27	0.07	0.38	0.19	43.18
1934	1.15	3.51	4.46	1.16	5.58	3.42	3.09	5.28	7.06	0.77	7.7	3	46.18
1935	2.89	1.74	1.88	1.89	0.97	2.33	15.97	10.02	5.44	0.19	3.74	5.01	52.07
1936	4	5.07	10.43	1.56	0.2	3.57	4.95	4.32	4.25	7.15	3.03	6.51	55.04
1937	4.26	5.18	1.87	6.74	2.29	3.93	6.45	4.64	2.13	1.78	6.17	2.14	47.58
1938	2.26	0.93	1.98	4.69	3.78	5.07	11	5.84	16.28	1.48	0.92	3.15	57.38
1939	3.23	5.97	2.8	1.82	4.64	4.78	7.43	7.21	2.67	3	0.79	1.56	45.9
1940	3.16	5.69	1.9	2.39	3.24	5.06	1.38	14.14	1.96	1.44	1.86	2.93	45.15
1941	1.62	3.22	3.03	2.65	0.86	5.51	7.79	6.15	1.07	0.65	0.31	6.2	39.06
1942	2.05	4.69	5.44	0.87	6.03	4.76	3.63	10.02	3.89	5.17	0.93	2.99	50.47
1943	4.7	0.69	4.73	2.11	3.61	5.44	10.32	5.87	2.2	0.02	1.25	3.75	44.69

1945	2.08	3.38	0.26	3.1	1.84	11.74	11.92	9.56	8.96	2.06	2.43	6.62	63.95
1946	3.85	3	2.08	3.52	4.22	4.27	19.14	10.33	12.26	4.52	2.76	2.1	72.05
1947	3.18	0.67	6.13	3.72	2.83	6.13	10.35	6.11	11.99	6.19	7.15	5.5	69.95
1948	6.17	4.01	4.75	2.42	5.22	3	5.05	--	--	--	--	--	30.62
1949	1.41	3.52	1.5	3.99	4.51	4.98	7.94	10.73	4.93	2.52	2.72	1.84	50.59
1950	2.4	1.57	4.12	1.87	4.42	8.56	18.05	5.78	4.9	4.96	1.86	3.45	61.94
1951	0.66	1.91	3.78	6.53	1.53	2.53	10.45	7.48	5.84	2.11	7.1	3.7	53.62
1952	1.91	5.22	5.06	1.5	1.66	2.91	4.94	8.82	5.47	3.15	5.36	2.11	48.11
1953	4.56	4.43	4.14	2.81	2.6	4.63	4.28	7.04	8.91	0.17	4.79	5.67	54.03
1954	3.34	1.54	4.97	3.44	5.73	1.36	4.18	3.29	2.87	5.57	1.76	2.84	40.89
1955	3.34	1.91	2.37	2.54	3.62	3.17	9.25	12.29	15.51	1.43	3.29	0.48	59.2
1956	1.55	4.36	2.13	2.67	9.12	4.36	3.31	5.01	2.31	7.25	0.52	1.3	43.89
1957	2.32	2.31	5.54	0.33	3.29	4.54	3.59	5.08	13.25	1.26	3.75	4.84	50.1
1958	3.73	3.3	4.98	6.2	4.21	6.44	4.34	8.26	10.1	5.68	0.89	5.31	63.44
1959	2.11	5.04	6.48	2.74	1.36	1.41	10.9	7.58	3	5.11	4.72	3.28	53.73
1960	3.63	4.75	7.44	3.15	5.52	3.24	10.28	4.53	9.06	2.03	1.85	2.64	58.12
1961	2.12	2.99	4.52	8.21	3.7	11.79	1.65	9.21	4.25	1.19	1.85	0.78	52.26
1962	5.98	2.27	5.01	5.12	2.35	12.87	5.86	4.98	5.48	0.76	5.01	1.99	57.68
1963	2.54	4.2	0.94	1.22	8.68	3.86	11.74	2.73	4.02	3.87	4.83	2.72	51.35
1964	7.08	6.17	2.89	1.32	5.11	5.02	7.4	3.69	3.58	9.81	1.17	4.54	57.78
1965	1.29	4.83	5.72	2.4	2.76	9.38	12.09	10.58	2.9	3.44	1.12	0.81	57.32
1966	6.32	5.54	2.89	1.48	7.5	9.78	15.12	5.67	6.09	1.1	0.7	3.44	65.63
1967	3.89	4.14	0.93	1.15	2.58	6.03	5.78	8.13	1.55	1.07	2.24	4.67	42.16
1968	3.71	1.44	0.97	3.5	2.3	2.52	9.31	1.66	1.24	4.46	4.4	2.26	37.77
1969	2.8	2.53	4.6	3.41	7.32	9.31	13.46	4.69	2.59	0.95	5.23	3.86	60.75
1970	1.98	2.45	7.19	1.37	3.92	4.48	5.71	13.98	2.23	4.12	2.22	3.22	52.87
1971	4.97	3.51	4.57	3.46	2.29	5.6	8.08	10.42	5.04	6.05	2.22	1.49	57.7
1972	4.27	4.57	3.36	0.78	3.5	3.5	6.36	4.91	6.73	0.69	7.87	5.29	51.83
1973	4.37	4.85	3.48	5.32	3.48	10.7	9.33	6.42	5.6	1.52	0.49	5.6	61.16
1974	2.81	4.23	2.3	2.18	5.15	5.37	8.36	13.33	5.09	1.12	3.14	3.72	56.8
1975	5.06	5.09	3.15	3.9	3.11	7.11	9.76	4.52	6.06	3.14	3	5.2	59.1
1976	2.93	1.01	2.57	0.91	4.33	12.74	8.28	9.53	4.79	3.31	2.14	5.37	57.91
1977	2.94	1.83	5.66	1.43	6.75	4.26	3.25	5.85	4.88	5.73	6.33	2.83	51.74
1978	6.68	1.33	2.94	3.82	3.46	2.34	7.38	4.77	1.58	1.01	3.71	4.68	43.7
1979	6.23	4.21	4.82	5.6	5.27	4.74	2.82	2.48	15.17	0.38	2.01	2.35	56.08
1980	4.16	1.52	6.03	1.33	4.65	2.46	5.95	3.21	5.97	1.62	1.87	5.81	44.58
1981	1.09	3.08	3.02	1.43	5.02	2.45	5.23	14.06	1.07	1.39	0.78	5.76	44.38
1982	5.5	6.67	1.84	4.03	2.04	7.59	8.59	3.67	7.08	2.56	1.32	6.57	57.46
1983	4.9	8.74	8.09	2.09	1.13	6.71	5.53	5.63	5.59	1.02	4.49	5.2	59.12
1984	2.58	4.82	4.43	3.23	6.45	0.89	9.01	4.79	18.94	0.49	1.16	1.32	58.11
1985	2.01	5.08	1.66	0.71	2.76	4.56	10.34	3.63	2.75	2.43	6.74	1.35	44.02
1986	2.12	2.52	4.13	0.48	7.09	5.58	11.28	11.44	0.7	3.35	4.44	6.28	59.41
1987	6.49	4.42	2.7	2.96	0.95	5.24	5.19	9.35	6.42	0.51	5.67	1.35	51.25
1988	5.41	2	4.05	3.56	7.54	2.93	14.49	9.61	2.8	1.81	3.14	0.59	57.93
1989	1.6	2.64	6.7	7.6	3.58	7.55	9.93	3.93	9.54	4.61	1.91	7.06	66.65
1990	2.34	2.31	5.11	2.21	8.04	2.17	6.59	11.42	1.4	7.1	2.09	2.65	53.43
1991	10.22	1.65	6.52	3.35	1.75	2.57	13.35	8.65	3.31	4.19	2.98	2.17	60.71
1992	5.75	3.45	5.65	3.12	7.55	7	3.18	13.56	2.23	3.09	7.14	4.48	66.2

1993	5.83	2.96	6.34	5.78	2.82	3.7	7.04	5.66	8.09	8.29	2.58	2.67	61.76
1994	7.03	3.26	8.27	0.8	2.67	2.75	4.76	6.03	7.09	8.53	3.27	6.91	61.37
1995	4.93	4.47	4.35	0.16	6.47	12.03	8.74	4.08	6.92	9.31	1.56	2.09	65.11
1996	3.09	1.12	4.7	2.5	3	8.02	13.42	5.19	13.35	6.06	1.22	2.75	64.42
1997	3.38	3.86	2.55	3.02	1.61	5.81	6.15	2.86	8.94	1.33	5.25	4.83	49.59
1998	7.29	11.22	2.06	2.8	7.58	4.31	3.79	13.48	5.38	1.36	0.97	3.96	64.2
1999	5.25	2	3.07	5.02	8.16	3.91	4.54	8.35	23.41	3.81	3.58	1.41	72.51
2000	4.66	1.31	2.61	4.64	3.7	6.23	7.83	8.38	7.77	0.38	4.67	1.64	53.82
2001	0.68	2.28	8.26	0.9	3.08	4.15	7.26	5.62	3.04	0.45	0.95	1.31	37.98
2002	1.82	1.97	5.62	0.53	2.42	4.21	7.78	12.09	4.95	2.34	3.06	2.53	49.32
AVG	3.65	3.58	4.16	2.96	4.04	5.23	7.86	7.26	6.13	3.09	3.05	3.44	

Source: North Carolina State Climate Office

GEOLOGIC HAZARDS

The group "Geologic Hazards" include non-seismic ground failures. These failures include landslides, land subsidence, and expansive soils. The occurrence of geologic hazards is often interrelated with other natural phenomena such as heavy rains, earthquakes, flooding, droughts, and the like.

In this sub-section 2 geologic hazards were addresses: sinkholes and landslides. Each category has a general description of the hazard, a vulnerability summary for the planning area, and specific hazard information for the area.

Sinkholes

Sinkholes are surface depressions in a region of cavernous limestone (Strahler and Strahler, 1996). There are three general types of sinkholes: subsidence, solution, and collapse and they generally correspond to the thickness of the sediments overlying the limestone (Goudie et.al., 1994).

Collapse sinkholes form with little warning and leave behind a deep, steeply sided hole. They occur because of weakening of the rock of the aquifer by erosion and is often triggered by changes in water levels in the surficial aquifers. The development of collapse sinkholes can be triggered by natural conditions as well as human interference such as dredging, constructing reservoirs, diverting surface water, and pumping groundwater.

Subsidence sinkholes occur when rainwater percolates through overlying sediments and reaches the limestone, dissolving the rock and gradually weakening its structural integrity. Gradually subsiding sinkholes commonly form where slow dissolution takes place, mostly along the joints of the limestone. Subsidence sinkholes tend to form naturally and are not greatly affected by human activities.

Solution sinkholes occur where the limestone surface is bare or thinly covered by soil or permeable sand. Solution is most active at the contact between the limestone surface and the overlying soil, and is usually concentrated at the intersection of a set of joints where fracturing of the limestone permits water to move easily to the surface (http://fga.freac.edu).
According to the USGS, the most damage in the United States from sinkholes tends to occur in Florida, Texas, Alabama, Missouri, Kentucky, Tennessee, and Pennsylvania. As a result, Surf City has a low incidence and nonexistent susceptibility to sinkholes. Thus, they are given a

Hazard Index ranking of 1 and are not an important consideration in the Town's mitigation efforts.

Landslides

Landslides are described as the downward and outward movement of slope forming materials reacting under the force of gravity (FEMA, 1997). Landslide usually start on steep slopes and move downward by the force of gravity, accelerating to speeds of 35 miles per hour. The principal factors, which play a role in landslide potential, are topography, geology, and precipitation. For example, areas with steep slopes are more susceptible to landslides than flat areas and areas which have a higher level of precipitation are more susceptible than other areas. Colluvium, a loose type of sediment composed of silt, sand, gravel, and cobble stones is the material most prone to landslides (NOAA). Human factors also play a great role in inducing landslides. The major human induced factors are mining, forestry, construction of highways and railroads. There are four major types of landslides:

- Slides: slides are characterized by the downward movement of material along one or more failure surfaces (NOAA).
- Flows: flows are similar to slides but differ in the fact that they are characterized by high water content and move similar to fluids (NOAA).
- Lateral Spreads: lateral spreads are usually associated with loose, sandy soils with high liquefaction potential and can occur on very gentle slopes (NOAA).
- Falls and Topples: falls and topples are movements in which masses of rock or other material fall from cliffs or other steep slopes (NOAA). These are commonly triggered by earthquakes.

Though landslides are a consideration for the mountainous areas of North Carolina, Surf City lies in the coastal area. According to the United States Geological Survey, Surf City has a low incidence and non existent susceptibility to landslides (Rodbruch-Hall, et. al. 1982). Due to the geology and practically flat topography of the area, landslides are given a Hazard Index ranking of 1 and are not an important consideration in the Town's mitigation efforts.

SEISMIC HAZARDS

The group "Seismic Hazards" includes earthquakes and tsunamis. In general, these events are a result of sudden ground motion caused by a release of accumulated strain acting on the tectonic plates that comprise the earths crust (FEMA, 1997). Seismic hazards often trigger other hazards which can have devastating results. For example earthquakes cause landslides and can damage dams/levees which can lead to extensive flash flooding. In addition tsunamis can lead to extensive coastal erosion and flooding of inland property for up to a mile from the coast line.

In this section 2 seismic hazards were addressed: earthquakes and tsunamis. Each category has a general description of the hazard, a vulnerability summary of the planning area, and specific hazard information for the area.

Earthquakes

Earthquakes are seismic events that involve movement or shaking of the earth's crust. Earthquakes are usually caused by the release of stress accumulated as a result of a rupture of

rocks along opposing fault planes in the earth's outer crust. These fault planes are typically found along borders of the earth's 10 tectonic plates.

The areas of greatest tectonic instability occur at the perimeters of the slowly moving plates, as these locations are subjected to the greatest strains from plates traveling in opposite directions and at different speeds. Deformation along plate boundaries can cause strain in the rock and the consequent buildup of stored energy. When the built-up stress exceeds the rock's strength, a rupture occurs. The rock on both sides of the fracture is snapped, releasing the stored energy and producing seismic waves, generating an earthquake.

Earthquakes are measured in terms of their magnitude and intensity. Magnitude is measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude. Each unit increase in magnitude on the Richter Scale corresponds to a 10-flod increase in wave amplitude. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale. It is a 12-level scale based on direct and indirect measurements of seismic effects. A detailed description of the MMI of earthquake intensity (and it's correspondence to the Richter Scale) is given in Table 3.13.

Table 3.13

Modified Mercalli Scale of Earthquake Intensity

Intensity	Description of Effects	Maximum Accelleration (mm/sec)	Corresponding Richter Scale
Instrumental	Detected only on seismographs	<10	
Feeble	Some people feel it	<25	<4.2
Slight	Felt by people resting; like a truck rumbling by	<50	
Moderate	Felt by people walking	<100	
Slightly Strong	Sleepers awake; church bells ring	<250	<4.8
Strong	Trees sway; suspended objects swing, objects fall off shelves	<500	<5.4
Very Strong	Mild alarm; walls crack; plaster falls	<1000	<6.1
Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged	<2500	
Ruinous	Some houses collapse; ground cracks; pipes break open	<5000	<6.9
Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread	<7500	<7.3
Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards	<9800	<8.1
Catastrophic	Total destruction; trees fall; ground rises and falls in waves	>9800	>8.1

Source: FEMA, 1997.

Earthquake Vulnerability Summary

North Carolina's vulnerability to earthquakes decreases from west to east in relation to the Eastern Tennessee Seismic Zone. Generally, there are three different zones of seismic risk in North Carolina that correspond to different effective peak velocity-related accelerations of ground movement. Since 1811 there have been 21 earthquakes that caused damage in North Carolina. However, the eastern portion of the state faces minimal effects from seismic activity.

Historical records indicate that it is possible earthquakes will affect Pender and Onslow Counties and Surf City. The Town has not lost use of critical facilities and has suffered no damage to property. There have been no reported injuries or fatalities due to earthquakes. Future impacts will most likely be negligible meaning minor injuries may occur; critical facilities may be shut down for 24 hours or less and less than ten percent of the property in the community would be damaged. These factors suggest a hazard index ranking of 2 for earthquakes in the Surf City area. This indicates that earthquakes are not one of the most important considerations in determining the Town's mitigation strategies (see Table 3.14).

Seismic Events for the southeastern portions of North Carolina: Incident Specifics

- *August 31, 1886:* Most violent earthquake (7.3 Richter) to affect New Hanover County. The earthquakes initial tremors occurred at 9:50 PM, with aftershocks at 10:00 PM, 10:12 PM, and 10:25 PM. The epicenter was in Charleston South Carolina, 150 miles south of New Hanover County. Though the MMI scale is an 11 and would list this event as a very disastrous event, the damage reported in New Hanover County was minimal. A few Chimneys crumbled, plaster fell, and china broke. The most prevalent sign of the quake is where the damage to the Old Cotton Exchange was repaired. Though the earthquake was felt and caused damage in New Hanover County, there was no damage reported in Pender County, Onslow County or the Town of Surf City.
- *August 6, 1994:* Most recent earthquake (3.6 Richter) to affect New Hanover County. The epicenter for this earthquake was located in New Bern, NC, (Craven County) 85 miles northeast of the county. The MMI scale is a 1 and would list this event as instrumental. Though the earthquake was felt and caused damage in New Hanover County, there was no damage reported in Pender County, Onslow County or the Town of Surf City.

Tsunami Events

A Tsunami is defined as a large seismic wave, impulsively generated by shallow-focus, underwater earthquakes. A Tsunami wave can travel unnoticed across the ocean at speeds of up to 500 mph and, upon connection with a coastline, can cause significant damage to shore protection structures, buildings, as well as, severe erosion, extensive inland flooding and loss of life (FEMA 1997). Significant damage as a result of Tsunamis has been identified in the Western States of Alaska, Hawaii and American Samoa. In the Atlantic Ocean and Caribbean Sea, events have occurred in the vicinity of Puerto Rico and the U.S. Virgin Islands, but are much less frequent.

According to FEMA (1997), Surf City does not lie in an area frequented by Tsunamis. Thus, Tsunamis are given a Hazard Index ranking of 1, as it is highly unlikely they will affect the area and are not the most important consideration when determining mitigation strategies.

OTHER NATURAL HAZARDS

There are hazards that are naturally occurring events but that do not fit well into any specific category. As a result the "Other Natural Hazards" category was formed. Each hazard within this category has its own natural characteristics, geographic location or aerial extent, severity and associated risks. However these hazards are a result of other hazards. For example seismic activity is often the driving force behind volcanic eruptions and lightning or human negligence is often the driving force behind wildfire ignition.

In this subsection 2 "other natural hazards" were addressed: volcanoes and wildfires. Each category has a general description of the hazard, a vulnerability summary for the planning area, and specific hazard information for the area.

Volcanoes

Volcanic eruptions are classified as nonexplosive or explosive. Nonexplosive eruptions are caused by an iron- and magnesium-rich magma that is relatively fluid and allows gas to escape. Explosive eruptions are violent and are derived from a silica-rich magma that is not fluid. However, both types of eruption can produce debris flows and surges, floods, lava flows and domes, ash falls and gases, and lateral blasts (FEMA 1997). All of which can lead to the destruction and endangerment of people, buildings, and infrastructure.

Strahler and Strahler (1997) show that, Surf City does not lie in an area known for volcanic activity. As a result volcanoes are given a Hazard Index ranking of 1 and are not an important consideration to the County's mitigation efforts.

Wildfire

A wildfire is the uncontrolled burning of woodlands, brush, or grasslands. According to FEMA (1997) there are 4 categories of wildfires that are experienced throughout the United States:

- *Wildland Fires*: are fueled by natural vegetation. They typically occur in national forests and parks, where Federal agencies are responsible for fire management and suppression.
- *Interface or Intermix Fires*: are urban/wildland fires in which vegetation and the built-environment provide fuel.
- *Firestorms*: are events of such an extreme intensity that effective suppression is virtually impossible. They occur during extreme weather and generally burn until conditions change or the available fuel is exhausted.
- *Prescribed Fires and Prescribed Natural Fires*: are fires that are intentionally set or selected natural fires that are allowed to burn for beneficial purposes.

Wildfires can be a result of naturally occurring influences such as lightning, extreme drought, and heat, as well as human influences such as a discarded cigarette butt, improperly extinguished campfire or a stray spark from nearby railroad tracks. The potential for threat of wildfires is dependent upon topography and slope, surface fuel characteristics, recent climate conditions, current meteorological conditions, and fire behavior. Once a wildfire threatens a community, it's often too late to protect nearby structures and populations have to be evacuated for their own safety.

Wildfire Vulnerability Summary

The period from 1993 – 2002 was studied for information on wildfire events. Numerous sources were used in identifying the wildfire occurrences in Surf City since 1993 both primary and secondary. Primary sources used included the North Carolina Forestry Service, Surf City Fire Department, and Emergency Management After Action Reports. Secondary sources included the Brunswick Beacon, and the Cable News Network.

The *Potential Areas of Wildfire Surf City, NC* (Appendix E) identifies the areas which has vegetative cover prone to wildfires. A comparison this map to the *Zoning Map of Surf City. NC* (Appendix E) shows that this area contains the R-A zone, C-2 zone, MHS zone, R-10 zone, and the R-5M zone on the mainland area of the community. As a result, residential and commercial structures and populations are put at risk if a wildfire were to breakout.

According to the Fire Chief, Surf City has a large amount of natural fuel (Pine Trees) which are relatively dense in many areas of the mainland portion of the community. In addition, the Town backs-up to the wildland interface. There has been few incidences of wildfire in the Town but the Surf City Fire Chief believes that if a wildfire were to occur and if it were to cross the wildland interface it would be very difficult to extinguish prior to it engulfing the entire community. According to the Fire Chief and the Fire Department Incident Reports, there have been 24 brush fires in the last 10 years. Most of the fires were a result of human error and none caused personal property damage or spread out of control. However, there has been one incident of a wildfire in the mainland portions of the community (see *5 – year Wildfire History of Surf City, NC* Appendix E). The fire was contained in open space and as a result, there was no damage to structures, loss of life or injury.

The community lies in an area prone to tropical cyclone events, nor'easters and severe thunderstorms all of which produce lightning that can lead to fires. According to the Surf City Fire Department, in the last 5 years there has been several incidences of lightning striking in the Surf City area (see *5 – Year Lightning Strike Map of Surf City, NC* Appendix E). However, all of the strikes reported have been in the beach area of the community. As a result, it can be concluded that lightning has not been a major factor in fire ignition in the past.

Based on these factors it is possible that wildfires will affect the community in the future. In the past there has been no injuries or deaths resulting from wildfires. There has been no damage to property and infrastructure or a loss of utilities. However, as the County continues to develop and as the population density begins to increase the potential for damage to property and the potential for injuries and deaths from wildfire increases. In addition, the local Fire Chief believes the entire community is at risk from wildfires. As a result, it was determined that there is a potential for wildfire to have limited effects on the area in the future. Meaning some injuries may occur, there will be a minimal quality-of-life impact, a shutdown of critical facilities and services for an extended period, and 10 percent of property severely damaged. These factors suggest a hazard index ranking of 2 for wildfires in Surf City (see Table 3.14).

TECHNOLOGICAL HAZARDS

All hazards do not fall in the natural hazard category but can still have a negative impact on life, property, economy and community. Some hazards originating from within the human

environment and resulting from man-made conditions such as dam failures, nuclear events, and hazardous materials events are classified as technological hazards. Technological hazards can affect localized areas, are frequently unpredictable and can cause property damage, loss of life, economy and community.

In this section 2 technological hazards were addressed: dam/levee failure and hazardous materials events. Each category has a general description of the hazard, a vulnerability summary for the planning area, and specific hazard information for the area.

Dam/Levee Failures

FEMA (1997) defines a dam/levee as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. They are typically constructed of earth, rock, concrete, or mine tailings. According to the North Carolina Dam Safety Program (NCDSP), there are 8 types of dams/levees in North Carolina.

- *Earth Dams:* are the majority of the dams/levees in North Carolina; are safe if properly designed, constructed, and maintained; and are not designed to be overtopped.
- *Concrete Gravity:* use their mass to resist sliding and shape to resist overturning; used where a strong foundation is present; relatively resistant to overtopping and seismic events.
- *Arch Dams:* used to narrow sites with strong abutments; use less concrete than gravity dams and increase over the top spill capacity; more difficult to design and construct than gravity dams.
- *Gravity Arch:* conservative design but uses more concrete.
- *Buttress:* requires a strong foundation but resistant to sliding, overturning, and overflowing; conserves concrete but difficult to design and construct.
- *Arch and Buttress*
- *Stone Masonry*
- *Combinations*

In addition to the different types of dams, the NCDSP identifies three hazard classifications for dams in North Carolina.

- *Low Hazard (Class A):* The failure of the dam would not be expected to result in loss of life but may damage uninhabited low value non-residential buildings, agriculture land, or low volume roads.
- *Intermediate Hazard (Class B):* The failure of a dam would not be expected to result in loss of life but may damage moderately traveled roads, interrupt use or service of public utilities, and may cause minor damage to isolated homes, commercial or industrial buildings in back water areas.
- *High Hazard (Class C):* The failure of a dam would likely cause loss of life or serious damage to homes, industrial and commercial buildings, important public utilities, and heavily traveled roads.

Dam/Levee Vulnerability Summary

As see on the *Potential Technological Hazards for Surf City, NC* map (Appendix E) there are no constructed Dams or Levees in the Surf City Town Limits. Thus, the Hazard Index ranking for Dam/Levee Failure is a 1, as it is not possible for failure to occur (see Table 3.14).

Hazardous Materials Events

HAZMAT events can include incidents caused by everything from hazardous waste and hazardous materials storage, to hazardous materials transport and chemical fire. These incidents could include explosions, hazardous material spills, and hazardous material leaks. These events may cause immediate injury or long-term harm through the release of toxins into the environment. Within Surf City there are several areas of HAZMAT concern.

HAZMAT Vulnerability Summary

The *5 – Year Technological Hazard History Map of Surf City, NC* (Appendix E) identifies several sites that have been subject to some form of HAZMAT event in the last five years. These incidences have been the result of propane tanks or LPG tanks leaking which were next to structures, gas spills, and diesel spills. None of the incidents caused major property damage and none of them required the evacuation of the community.

Historical records indicate that it is possible HAZMAT events will affect Surf City. The Town has not lost use of critical facilities and has not suffered damage to property. Additionally, there have been no reported injuries or fatalities. Future impacts will most likely be negligible meaning minor injuries may occur; critical facilities may be shut down for 24 hours or less and less than ten percent of the property in the community would be damaged. These factors suggest a hazard index ranking of 2 for HAZMAT events in the Surf City area. This indicates that fires are not one of the most important considerations in determining the Town's mitigation strategies (see Table 3.14).

HAZMAT Specifics

- The *Potential Technological Hazards Map of Surf City, NC* (Appendix E) identifies 5 fuel distribution sites within the Town limits of Surf City. Three of these sites are located on the island portion of the community and the last two are located on the mainland area.
- HWY 210/50 is the major road in and out of the community and all fuel traveling through the area comes by that route.
- According to the Inspections Department, there are approximately 200 propane tanks in the Town limits. The Inspections Department, stated that a major concern with these tanks is that they are not being tied down properly and during tropical cyclone events or significant flooding events they often break loose and become floating bombs.

Table 3.14

Surf City, North Carolina
Hazard Identification and Analysis Worksheet

Type of Hazard and Associated Elements	Likelihood of Occurrence	Intensity Rating (mild, moderate, severe)	Impact	Index Ranking
[illegible]				
Winter Storms	Possible	Mild	Negligable	2
Severe Thunderstorms/windstorms	Highly Likely	Mild	Negligable	2
Tropical Cyclones	Highly Likely	Severe	Critical	5
Nor'easters	Highly Likely	Moderate	Negligable	4
Extreme Temperatures	N/A	N/A	N/A	N/A
Extreme Cold	Possible	Mild	Negligable	2
Extreme Heat	Likely	Mild	Negligable	2
Tornadoes	Possible	Mild	Negligable	2
Waterspouts	Possible	Mild	Negligable	2
[illegible]				
Flooding	Highly Likely	Severe	Critical	5
Erosion	N/A	N/A	N/A	N/A
Riverine Erosion	Highly Unlikely	Mild	Negligable	1
Coastal Erosion	Highly Likely	Severe	Limited	4
Drought	Possible	Mild	Negligable	1
[illegible]				
Sinkholes	Highly Unlikely	Mild	Negligable	1
Landslides	Highly Unlikely	Mild	Negligable	1
[illegible]				
Earthquakes	Possible	Mild	Negligable	2
Tsunami Events	Highly Unlikely	Mild	Negligable	1
[illegible]				
Volcanoes	Highly Unlikely	Mild	Negligable	1
Wildfire	Possible	Moderate	Limited	2
[illegible]				
Dam/Levee Failures	Highly Unlikely	Mild	Negligable	1
Hazardous Materials Events	Possible	Mild	Negligable	2

SECTION 4: COMMUNITY CAPABILITY ASSESSMENT

The capability assessment helped analyze the Town's current capability to mitigate the threats hazards pose. To conduct a complete and thorough assessment of the county/municipal capability an examination of the legal, institutional, technological, political, and fiscal capability was conducted.

First an assessment of the county/municipal legal capability was conducted. During this step all county and municipal governing documents (i.e. Zoning Ordinance, Land Use Plan, Sub-Division Ordinance, Flood Damage Prevention Ordinance, and the like) were reviewed (see reference section for specifics on documents reviewed during this process). That review identified existing policies, practices, programs, regulations, and activities currently in place and determined if they promote or hinder the mitigation process.

Subsequently, the institutional capability of the area was examined with a review of the various local departments, agencies, and organizations. This step helped identify if adequate personnel is available to assist in the implementation of the mitigation strategies determined necessary to reduce the vulnerability of the planning area.

Following the institutional capability assessment a political capability assessment was conducted. In this process the county and municipal governing body's were examined to determine if they were organized, responsive to the needs of the county/municipality, educated about the hazards prevalent tot heir area, and if they understood, supported, and promoted the mitigation process.

Additionally, the technological capability of the area was examined. In this process a review of the county/municipal current technology was conducted. This was accomplished by examining if the county/municipality has primary and secondary phone systems, internet and/or a county/municipal sponsored website, and if they have a geographic information system and trained staff to use said system. In addition, a review of the individual departments was conducted to determine if they had the appropriate equipment to conduct their day to day activities and assist in the implementation of the mitigation process.

Finally, the fiscal capability of the community was assessed. Here the ability of the planning area to financially afford the implementation of the mitigations strategies herein was determined. In addition, the ability of the municipality to research and seek alternate sources of funding was examined, as well as, the ability of the municipality to integrate funding sources.

LEGAL CAPABILITY

General Authority

Enabling legislation in North Carolina delegates' legal authority to local governments to implement regulatory measures. The basis for much of this authority is the police power designed to protect public health safety and welfare. This authority enables local officials to enact and enforce ordinances and to define and abate nuisances. As hazard mitigation is a form of protecting public health, safety and welfare, it falls under the general regulatory powers of local governments. Enabling legislation also extends to building codes and inspections, land use, acquisition, taxation and floodway regulation.

Building Codes and Inspections
Building codes and inspections provide local governments with the means to maintain Town structures that are resilient to natural hazards. The North Carolina State Building Code prescribes minimum standards for building construction. Local governments are permitted to adopt additional codes as long as the regulations are at least as stringent as the state standards. State-enabling legislation authorizes local governments to carry out building inspections to ensure local structures adhere to the minimum state building standards. Surf City officials, including provisions in the codes for flood-proofing measures, enforce the state building code regulations for the Town of Surf City.

Land Use Planning
Through land use regulatory powers granted by the state and local governments can control the location, density, type and timing of land use and development in the community. The North Carolina Coastal Areas Management Act (CAMA), designed to protect the state's coastal resources through a combination of local land-use planning and state regulations, requires each of the state's twenty coastal counties to prepare land use plans in compliance with guidelines outlined in the law. The Act established the Coastal Resources Commission, a body whose duties include oversight and approval of the land use plans. CAMA guidelines require the following issues be incorporated into the land use plans: resource protection, resource production and management, economic and community development, continuing public participation, as well as storm hazard mitigation, post-disaster recovery and evacuation plans. Provisions of the land use plans are implemented through regulatory tools that include zoning and subdivision ordinances, land acquisition and taxation.

The Town of Surf City prepared a *CAMA Land Use Plan* in 1992. This plan includes mitigation measures to address Resource Protection, Resource Production and Management, Economic and Community Development, Public Participation, Storm Hazard Mitigation, Post Disaster Recovery, and Evacuation Plans. The plan is scheduled to be revised in 2003 to define and refine community policies and issues, and to describe existing uses of land and future desired growth patterns. This revision will assist in the promotion of hazard mitigation through the development of new and the continuation of old land use policies that will reduce the Town's vulnerability to different hazards.

Zoning
Within its zoning authority, a local government is authorized to divide the planning area into districts. For each type of district, as defined in a written ordinance and by zoning maps, the local government may "regulate and restrict construction, reconstruction, alteration, repair or use of buildings, structures of land" (N.C.G.S. 160A-382).

The Town of Surf City has had a *Zoning Ordinance* continuously in effect since 1984. The code identifies zones for commercial, industrial, residential, central business, general business, conservation, mobile home subdivision and rural agriculture which are all identified in the community profile section of this plan (see *Zoning Districts of Surf City, NC* map, Appendix E). The ordinance includes Flood Zone Provisions, CAMA Provisions and Development Standards. The Building Inspector is given authority to administer the ordinance. Variances and appeals are received and processed by the Town's Board of Adjustment.

Subdivision Ordinance
Local governments are authorized under N.C.G.S. 160A-371 to regulate the subdivision of land within their jurisdiction. Subdivision regulations apply when land is divided into parcels that are ten acres or smaller.

Surf City has a *Subdivision Ordinance* in place for numerous years. The purpose of the ordinance is to establish procedures and standards for the development and subdivision of land within the territorial jurisdiction of Surf City. The ordinance provides restrictions on the subdivision of land in identified hazard areas, limits and mitigates the flow of stormwater on development projects, and provides setback requirements. The ordinance does not, however, regulate the amount or type of impervious surface used by developers. The subdivision ordinance authorizes the Planning Board to use all available resources to ensure that lots are suitable for development. The Town Council administers the ordinance.

Acquisition
Under the North Carolina General Statutes (160A-240.1), local governments have the power to acquire property "by gift, grant, devise, bequest, exchange, purchase, lease, or any other lawful method," pursuant to state eminent domain laws (N.C.G.S. 40A). This regulatory tool may be used by local governments to reduce community vulnerability to natural hazards by directly controlling development and use of areas especially vulnerable to hazards. The option of acquisition is a strategy that has been applied in other areas and has been deemed successful in reducing the level of vulnerability to specific hazards. This option is available to the Town but at this time the Town consider this option only after the potential for elevation prospects have been exhausted.

Taxation
Taxation can be a powerful mitigation tool by providing local governments with a way to guide development. Tax abatements may be used to encourage landowners and developers to integrate mitigation measures into the process of building new developments and retrofitting existing properties in the floodplain. These tools can be especially effective at encouraging the mitigation of existing structures. Incentives have been applied in other areas for storm proofing, flood proofing, wind mitigation and seismic retrofitting programs and have been deemed successful in reducing the level of vulnerability to specific hazards. This option is available to the Town but at this time the Town does not consider it a priority in reducing the vulnerability in Surf City.

Floodplain Regulation
According to state statute, the channel and part of the floodplain of each stream are to be designated as a floodway in order to limit flood disaster as much as possible. Within the floodway, local governments, through permitting, are to prevent obstructions that may increase the height of floods and the extent of flood damage. The Town of Surf City last updated their Flood Damage Prevention Ordinance in 1992. The purpose of this ordinance is to promote public health and general welfare and to minimize public and private losses due to flood conditions. The Ordinance is specifically tied into the North Carolina State Building Code used by the Town, the and the CAMA Land Use Plan.

National Flood Insurance Program and Community Rating System
The National Flood Insurance Program (NFIP) provides flood insurance to individuals in communities that are members of the program. Membership in the program is contingent on the community adopting and enforcing floodplain management and development regulations. Part of the NFIP is the Community Rating System (CRS), a program that adjusts flood insurance premiums in relation to a community's investment in flood damage mitigation. To be included in the system, a community's floodplain management procedures must be reported and evaluated. There are ten classes within the CRS system, with 1 providing the greatest premium reduction and 10 providing no reduction.

The Town of Surf City has been a member of NFIP since May 2, 1977. The Town does not currently participate in the CRS program. The Inspections Department is trained and authorized to administer and enforce the NFIP in Surf City.

FEMA's Floodplain Map Modernization Program:
The North Carolina Floodplain Mapping Program

This information is courtesy of NCFMP, as adapted from FEMA Floodplain Management Bulletin 1-98, "Use of Flood Insurance Study (FIS) Data as Available Data."

The President's Budget of the U.S. Government for the Fiscal Year 2003 recognizes that,

> *"Flooding stands out as the single most pervasive disaster hazard facing the nation. It causes an estimated $6 billion in property damages annually. In the past, many of the nation's efforts to avert flood disasters have focused on structural changes to waterways – for example, building dams and levees. Focusing flood reduction efforts on identifying the areas at risk for flooding and steering development way from those areas can be a less costly long-term approach to mitigation. Modernizing the nation's flood maps is critical to that effort. Many of the nation's Flood Insurance Rate Maps (FIRM's) are out of date and inaccurate –63 percent of the maps are more than 10 years old [50 percent in North Carolina are more than 13 years old]. A third of the maps are more than 15 years old. About 2,700 communities [125 in North Carolina] are not mapped at all. New and updated FIRM's can provide crucial guidance for future building, development, and flood mitigation efforts-determining how and where individuals, private developers, and local governments build."*

Background of The North Carolina Floodplain Mapping Program

The State of North Carolina, through the Federal Emergency Management Agency's (FEMA's) Cooperating Technical Partners initiative, is the nation's first Cooperating Technical State (CTS). As a CTS, the State will assume primary ownership and responsibility of the FIRM's for all North Carolina communities. Under the CTS agreement, the State of North Carolina, FEMA, and numerous other Federal, State, and local agencies have partnered to conduct a statewide mapping program. The program involves producing updated, digital Flood Insurance Rate Map (FIRM) panels for the entire State of North Carolina, implementing a state-of-the-art, dynamic Information Technology infrastructure, and developing a real-time flood forecasting and inundation mapping system. There are several reasons why the State initiated this program, including:

- Accurate floodplain maps are needed to understand flood risk;
- Knowing the flood risk helps communities manage development to dramatically reduce long-term flood losses;
- Most flood maps in the State are outdated and lack sufficient detail to effectively assess and manage flood risk, as demonstrated by the flood losses experienced during Hurricane Floyd; and
- FEMA's mapping budget is finite and many counties and communities have indicated that they do not have the resources to take on the responsibility of generating new flood maps.

The statewide effort will occur in three phases. Phase I started in 2000 and includes the six river basins in eastern North Carolina, which were most impacted by Hurricane Floyd. Phase II will encompass six river basins in the middle of the State and begin in February 2003. Phase III will address the five remaining basins in the western part of the State. The goal is to have the entire State remapped by the end of 2007.

The preliminary maps for Surf City, Pender County and Onslow County are expected in August of 2003. The maps will become effective six months after the preliminary maps are issued. Preliminary flood hazard maps contain valuable information that can be used for floodplain management before they become effective.

New flood hazard information is released to the public as a preliminary Flood Insurance Study (FIS) Report and FIRM for review and comment during a statutory 90-day appeal period. The preliminary BFE and floodway data are subject to change until a notice of final flood elevation determination is provided in a Letter of Final Determination (LFD) to the community.

A Flood Insurance Study (FIS) uses detailed hydrologic and hydraulic analyses to model the 1% annual chance flood event, determine the Base Flood Elevations (BFEs), and designate floodways and flood risk zones (e.g., Zones AE and VE). The flood hazard data are shown in tables in a FIS Report, shown graphically as flood profiles, and portrayed planimetrically on a Flood Insurance Rate map (FIRM).

Most communities participating in the NFIP have a FIRM depicting areas expected to be inundated during the 1% annual chance flood (i.e., Special Flood Hazard Areas [SFHAs] determined by using one of two types of engineering methods: 1) detailed studies which determine BFEs, and 2) approximated studies which do not determine BFEs and are designated as Zone A.

When land has been designated as being located in the SFHA on a community's Flood Hazard Boundary Map (FHBM) or FIRM, and no BFEs or floodway have been identified, communities are required to apply the provision contained in Subparagraph 60.3(b)(4). This provision requires that communities, "obtain, review and reasonably utilize any base flood elevation and floodway data available from a Federal, State, or other source..."

Communities should use preliminary flood data as criteria to require that new construction and/or substantial improvement projects are built such that the lowest floor is elevated to or above the BFE. Communities should also prohibit any encroachment in the floodway that

would result in any increase in base flood levels during the occurrence of a base (1% annual chance) flood discharge event. Subparagraph 60.3(b)(4) also states that BFE or floodway data obtained should be used as long as they, "reasonable reflect flooding conditions expected during the base flood; are not known to be scientifically or technically incorrect; and represent the best data available. Data from a preliminary FIS constitute available data."

Use of Preliminary FIS Data

Land Currently within Zone A

For areas currently identified within a Zone A on the community's effective FHBM or FIRM, the BFE and floodway/non-encroachment data from a preliminary FIS Report constitute available data under Subparagraph 60.3(b)(4). The requirement in Subparagraph 60.3(b)(4) is an important floodplain management tool for reducing flood damage in areas currently designated as Zone A. Communities are required to reasonably utilize the data from a preliminary FIS Report or FIRM under the section of their ordinance that applies to this Subparagraph.

When all appeals have been resolved and the LFD is issued, communities are required to use the new BFE and floodway/non-encroachment data; these data are considered to be the best data available for regulating floodplain development in accordance with Subparagraph 60.3(b)(4). This includes meeting the standards of Subparagraphs 60.3(c) and (d), such as the requirement that new construction, substantial improvements, and other development have the lowest floor elevated to or above the BFE. Communities must regulate floodplain development using the data in the preliminary FIS Report and FIRM under Subparagraph 60.3(b)(4) even before the community has officially adopted the new FIS Report and FIRM into its floodplain management ordinance.

In Zone A areas, the requirement for using BFE and floodway/non-encroachment data in a preliminary FIS Report makes sense because there is no other BFE or floodway data. Further, communities need to protect new or substantially improved structures from flood damage until the appeal period ends and the data are incorporated into local ordinances. The use of the qualifier "reasonable, "contained in Subparagraph 60.3(b)(4), reflects FEMA's statutory obligation to provide the public with an opportunity to appeal proposed elevation data.

If a community decides not to use the BFE or floodway/non-encroachment data in the preliminary FIS Report and FIRM because it is questioning the data through a valid appeal, the community must continue to ensure that buildings are constructed using methods and practices that minimize flood damage in accordance with the floodplain management requirements under Subparagraphs 60.3(a)(3) and (4):

- Review of Permit Applications: Subparagraph 60.3(a)(3) requires communities to review permit applications to determine whether proposed building sites are reasonably safe from flooding. If a proposed building site is floodprone, communities must require that new construction and substantial improvements be adequately anchored, use flood-resistant materials, are constructed to minimize flood damages, and protect utilities during a flood.
- Review of Proposals for New Development: Subparagraphs 60.3(a)(4) requires communities to review subdivision proposals and other proposed new development,

including manufactured home parks or subdivisions, to determine whether proposed developments will be reasonably safe from flooding. Communities are required to review such proposals for floodprone areas to ensure that potential flood damage is minimized, utilities are constructed to minimize or eliminate damage, and adequate drainage is provided to reduce the exposure to flood hazards.

Land Currently within Zones AE, A1-30, VE, and V1-30

The NFIP floodplain management criteria do not require communities to use BFE and floodway data from a preliminary FIS Report or FIRM in areas designates as Zones AE, A1030, VE, and V1030 in lieu of using the BFE and floodway data contained in an existing effective FIS Report and FIRM. Because communities have the opportunity to appeal BFE data from a restudy, a presumption of validity is given to existing effective BFE data that have been through the formal statutory appeals process and adopted by the community. However, communities are strongly encouraged to refer to the preliminary FIS Report and FIRM and the existing effective FIS Report and FIRM when reviewing proposals for new development and permit applications, as described below, around land currently within Zones AE, A1-30, VE, or V1-30 that has been restudied.

- Increase in BFEs/Wider Floodways: When BFEs increase and/or floodways widen in the restudied area, communities have the responsibility of ensuring that new or substantially improved structures are protected. FEMA cannot require a community to use BFE and floodway data in a preliminary FIS Report or FIRM as available data or to use the data at the time FEMA issues the LFD. However, FEMA encourages communities to reasonably use this information in instances where BFEs increase and floodways are revised to ensure that citizen's health, safety, and property are protected.
- Decrease in BFEs/Narrower Floodways: When BFEs decrease or floodways narrow, the community should not use the preliminary FIS Report or FIRM to regulate floodplain development until the LFD has been issued. If the preliminary FIS Report or FIRM provides information that BFEs are decreasing when compared with the current FIS Report or FIRM, but an appeal actually results in higher BFEs, the community could place its citizens at greater flood risk by using the preliminary FIS Report or FIRM to regulate floodplain development. Also, structures could be subject to increased flood insurance premiums if built using data from a preliminary FIS Report or FIRM that is revised to show increased BFEs or wider floodways.

In communities where floodways have not been designated for all or some of the flooding sources, but BFEs have been provided, communities are required to apply the criteria contained in Subparagraph 60.3(c)(10). This provision requires that, "Until a regulatory floodway is designated, no new construction, substantial improvements, or other development shall be permitted unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water-surface elevation of the base flood more than 1.0 foot at any point with the community."

However, if a preliminary FIS Report and FIRM have designated floodways and/or non-encroachment areas where none had previously existed, communities should reasonably use this best available data in lieu of applying the encroachment performance standard contained in Subparagraph 60.3(c)(10). By using the floodway/non-encroachment data from a preliminary

FIS Report, communities avoid the expense of conducting the hydraulic analysis necessary to demonstrate compliance with Subparagraph 60.3(c)(10). In addition, communities can minimize flood damage by ensuring that the flood-carrying capacity of the floodway is preserved because obstruction of floodways can significantly increase potential for flooding upstream.

Land Currently within Zones B, C, and X
The NFIP floodplain management criteria do not require the use of BFE and floodway/non-encroachment data from a preliminary FIS Report or FIRM under Subparagraph 60.3(b)(4) for an area or areas within Zones B, C, or X on the community's FIRM that are being revised to Zone AE or VE. FEMA cannot mandate or require a community to use the information contained in the preliminary FIS Report or FIRM pertaining to areas designated as Zone B, C, or X as available data or use the data at the time FEMA issues the LFD to the community. However, FEMA encourages communities to reasonably use this information to ensure that their citizens' health, safety, and property are protected.

Ordinance Requirements – Adoption of the Data

Land Currently within Zones A, AE, A1-30, VE, V1-30, B, C, and X
Communities have several months from the date of the LFD to adopt the revised FIS Report and FIRM. FEMA is required to provide a reasonable amount of time for the community to adopt floodplain management ordinances that are consistent with the final flood elevation determinations. Subparagraph 59.24(a) provides for a 6-month compliance period in which the community must adopt the effective FIS Report and FIRM and amend existing ordinances to incorporate any additional requirements under Paragraph 60.3. Under the North Carolina Floodplain Mapping Program, this 6-month period typically starts when a preliminary FIS Report and FIRM are issued.

Floodplain management ordinances generally contain a section titled "Basis for Establishing the Areas of Special Flood Hazard" in which the current effective FIS Report and FIRM are cited. Language in the ordinance may adopt by reference any subsequent revisions (i.e., a revised FIS Report and FIRM) without a subsequent formal adoption procedure. However, this wording should not be used as the basis for a community to use the preliminary FIS Report prior to the issuance of the LFD. If a community uses preliminary BFE and Floodway/non-encroachment data, it is advised that the community formally adopt this information.

Insurance Implications

Land Currently within Zone A
For a new or substantially improved structure, communities can use information from a preliminary FIS Report to complete the Elevation Certificate in Zone A areas. When this is the case, "other" in Block 10 of the Elevation Certificate is checked and the preliminary FIS and FIRM panel and date are noted. THE flood insurance policies for new or substantially improved structures in Zone A that are rated using BFE data from a preliminary FIS Report will often qualify for significantly lower insurance rates than policies that are rated without a BFE.

Land Currently within Zones AE, A1-30, VE, and V1-30
For flood insurance rating purposes in Zones AS, A1-30, VE, or V1-30, new or substantially improved structures are rated based on the BFE and FIRM zone in effect on the date of

construction until the revised FIRM becomes effective. This is the case regardless of whether the preliminary FIS Report indicates that the proposed BFEs will increase or decrease.

If a community chooses to use proposed BFEs from a preliminary FIS Report for a new or substantially improved structure, the flood insurance rate is still based on the BFE and FIRM zone in effect on the date of construction. The flood insurance rate will be based on the difference between the elevation of the lowest floor and the BFE and FIRM zone in effect. Therefore, if a new or substantially improved structure is built to the proposed FE from a preliminary FIS Report and FIRM and this BFE is higher than the BFE in effect, the flood insurance rate may be significantly lower. However, a new or substantially improved structure built to the proposed BFE that is lower than the BFE in effect may result in a higher flood insurance rate. In this case, the insured will qualify for a premium pro rata refund once the revised FIRM is effective.

Land Currently within Zones B, C, and X

For flood insurance rating purposes, new or substantially improved structures are rated based on the FIRM zone in effect (i.e., Zone B, C, or X) on the date of start of construction. If a community chooses to use proposed BFEs from a preliminary FIS Report and FIRM for a new or substantially improved structure, the flood insurance rate is still based on the FIRM zone in effect (i.e., one B, C, or X) on the date of construction. Structures in Zones B, C, or X may be eligible for Preferred Risk Policies until the New FIRM is effective.

Stormwater Management

The Division of Environmental Management is authorized to administer the requirements set forth in 15A NCAC 2H.1003. This section of the administrative code regulates the density of developments and mandates standards for engineered stormwater controls. Surf City does not currently have a Stormwater Management Ordinance but the adoption of such an ordinance would assist the community in regulating existing developments, future developments, and construction activities. In addition it could be used to institute mandatory requirements to prevent careless pollution to surface waters. A stormwater management study was conducted in July 2000 for the Town which identifies areas of poor stormwater drainage. The study provides available alternatives that are available to the community to assist in solving their stormwater management issues.

Emergency Management

In case of emergency, the *Town of Surf City Emergency Management Ordinance,* made effective in 1984, takes effect. However, if the emergency is a Hurricane event the *Surf City Hurricane Plan* is the primary source for guidance. Under the authority of relevant portions of North Carolina General Statutes, Chapters 160A, 14 and 166, the Emergency Management Ordinance and Hurricane Plan sets guidelines for the dissemination of information and resources. The Town has entered into a Mutual Aid Agreement with the Pender and Onslow County Sheriffs Dept.'s, Pender and Onslow County E.M., Town of Topsail Beach, and the Town of North Topsail Beach.

Strategic Planning

The Town of Surf City update their strategic plan in September 2001. This plan was designed to assist the community in continuing their path to development of a wholesome, family – oriented community for residency and for tourism. The plan is designed to improve community

appearance in all seasons of the year; improve the availability of business services for residents and visitors; encourage high valuation development, in order to establish and maintain a substantial tax base to support public services; improve the state and municipal transportation system for the convenience of residents and visitors and for support of economic growth; maintain and improve a municipal water and sewer utility system that will sustain continued growth; maintain a high level of safety protection for residents and visitors; and improve health and medical services to residents and visitors.

INSTITUTIONAL CAPABILITY

Surf City is comprised of a highly responsive, highly trained staff who is capable in implementing the strategies identified herein. In addition, they are capable of promoting the mitigation process and educating the public about the hazards prevalent to their area and the mitigation process necessary to mitigate those hazards. The Town's core local government is comprised of:

- Mayor
- Town Council (currently a 6 – member board)
- Planning Board (currently a 6 – member board with 2 alternates)
- Board of Adjustments (currently a 5 – member board)
- Water/Sewer Committee (currently a 8 – member committee)
- Beach Renourishment Study Committee (currently a 14 – member committee)
- Economic Development Committee (currently a 7 – member committee)
- Recreation Advisory Committee (currently a 6 – member committee)
- Beautification and Appearance Committee (currently a 4 – member committee)
- Citizens' Hurricane Re-entry Committee (currently a 8 – member committee)
- Town Hall
    - Town Manager who oversees multiple departments
    - Town Clerk
    - Finance Director
    - Finance Clerk
    - Administrative Assistant
    - (2) Seasonal Employees (part-time)
- Planning Department
    - Planner
- Public Works Department
    - Public Works Director
    - Utilities Clerk
- Sewer Department
    - (2) General Laborer
- Water Department
    - (1) General Laborer
- Streets Department
    - (3) General Laborer
- Police Department
    - Police Chief

- Assistant Police Chief
- Police Corporal
- (2) Police Sergeants
- (4) Patrol Officers
- Administrative Assistant (full-time)
- Administrative Assistant (part-time)
- (6) Reservists (part-time)

➢ Fire Department
- Fire Chief (Volunteer)
- Assistant Fire Chief (Full-Time)
- (2) Captains (Full-Time)
- (1) Fire Fighter (Full-Time)
- (20) Fire Fighters (Volunteer)

POLITICAL CAPABILITY

Surf City is responsive to the needs of its residents and through memorandums of understanding or memorandums of agreement provides services to its municipalities. The Surf City governing board is well educated on the hazards that threaten the Community and have advisory boards that specialize in specific areas of hazard reduction. The residents of Surf City actively participate in public hearings, board meetings, and workshops relevant to the continues growth and development of the Community. In addition, there are boards, committees, and commissions that are established with the specific purpose of receiving and evaluating citizen comments and advising the governing board on said comments and information. The Community (it's governing board, staff, and citizenry) appear highly capable and willing to promote the economic efficiency and social utility of the mitigation measures contained in this plan..

TECHNICAL CAPABILITY

Surf City is secured with basic technology needed to mitigate and respond to natural disasters.

➢ The Town is equipped with telephone and fax lines.

➢ All primary Town personnel are equipped with cellular phones and radios, which can act as a backup to land lines in case service is lost.

➢ The Town is connected to the Internet, which is a valuable source of information on approaching hazards, as well as, mitigation measures. The Town sponsors a website at http://www.surfcity.govoffice.com where they display information relating to hurricanes.

➢ The Town does not have GIS capabilities currently but partners with the Cape Fear Council of Government for further GIS capabilities. However, as one of the strategies identified in this plan the Town will work towards the development of a local GIS system.

FISCAL CAPABILITY

Surf City is not unique in the trials and tribulations felt by small governments to retain the staff and resources necessary to accomplish the strategies necessary to mitigate the hazards in their area. However, Surf City realizes that there are a large number of diverse funding sources

available to communities to assist in the fiscal responsibility required to implement local hazard mitigation plans, including both government and private programs (see Appendix H for details).

While federal and state programs carry out the bulk of disaster relief programs that provide funds for mitigation, local governments are encouraged to open the search field as widely as possible, and include alternative funding sources to supplement the local hazard mitigation budget. Surf City is staffed with persons educated in the project planning area which includes fiscal planning and the identification of multiple funding sources to ensure the success of said project. In addition, the Town realizes that before effective mitigation strategies can be applied, stable funding sources and effective incentives must be established on a per project basis to encourage participation by the private and public sectors.

ANALYSIS CONCLUSION

The Surf City Existing Community Goals provides an analysis of the current goals identified by the Town. Many of the Town's goals are specific in nature and address a specific hazard. It is suggested that the Town continue this path and make the goals in this plan specific in nature and ensure that they too address specific hazards.

The Town continues addressing specific hazards in the Town's Existing Community Capability Assessment, which provides an analysis of the Towns current hazard mitigation capabilities. A review of this worksheet reveals that, the Town of Surf City can be a proactive community in terms of mitigation. The community is a member of the NFIP and but does not extended that membership to include participation in the CRS program. The Town's 1992 CAMA Land Use Plan outlines community strategies for development and provides the framework for the Zoning Ordinance and Subdivision Regulations. The plan specifically identifies strategies, which address storm hazard mitigation, post-disaster recovery, and evacuation plans. The Zoning Ordinance and Subdivision Regulations provide detailed land use and building policies that address many aspects of mitigation planning, as does the Flood Damage Prevention Ordinance. The Emergency Management Ordinance and Hurricane Preparedness Plan provide detailed descriptions of duties and responsibilities in the event of a disaster and identifies the level of community/county coordination necessary for a successful recovery.

In addition to the strong governing documents, the Town of Surf City has a strong institutional capability for dealing with disasters. They have many departments all of which are staffed with persons capable of assisting during times of disaster and during the implementation of the strategies identified in the plan.

Because the Town of Surf City has worked towards mitigation in the past by identifying community goals and strategies that are specific to certain hazards, have continuously kept their governing ordinances and regulations up to date, kept well staffed departments, and because they have expressed the need for mitigation measures through the development of this Community-Based Hazard Mitigation Plan, implementation of the identified mitigation strategies should be high.

SECTION 5: MITIGATION STRATEGIES

This section contains a detailed strategy that promotes the current achievement of hazard mitigation, impact reduction and other community goals. This section will address mitigation strategies for natural hazards such as: tropical cyclones, flooding, tornados, winter storms, severe thunderstorms, wildfires and the like. However, it will also contain strategies for technological hazards such as HAZMAT Events.

This section is organized with general goals that are to be met by accomplishing the accompanying objectives and subsequent strategies. The action plan provides a quick reference for each governing jurisdiction during the implementation process. It identifies each goal, objective, and strategy. It further identifies the hazards addressed by each strategy, type of strategy, target completion date, responsible party/organization for implementation, potential funding source, as well as, monitoring and evaluation indicators. Specific information on potential funding sources are found in Appendix F of this plan.

As discussed in the mitigation planning section of this plan, the goals, objectives, and strategies identified herein were developed through a multi-step process. Following the hazard identification and analysis which identified the hazards most prevalent to the area and following the area vulnerability assessment which identified the portions of the planning area most vulnerable to the previously identified hazards a planning area capability assessment was conducted. The planning area capability assessment identified what steps the community had already taken towards reducing their vulnerability to hazards by reviewing the legal, institutional, political, technical, and fiscal capability of each governing jurisdiction in the planning area. In addition, this step identified their capability to implement future mitigation measures. Following this, an acceptability assessment was conducted which included the residents participation in a public hearing. In this step, citizens, the governing board, as well as, others were given an opportunity to provide input on the results of the hazard identification and analysis, area vulnerability assessment, and the planning area capability assessment. It also provided a forum for the governing board to determine the level of mitigation planning they felt the wanted to develop. Based on the already proactive approach the community has taken towards mitigation in the past and based on the current level of development and population increase it was decided to use the mitigation plan as an avenue to make Surf City less vulnerable to all hazards that could potentially affect the area and that a high level of planning was needed to continue the proactive approach the planning area had already taken. Subsequently a community goals assessment was conducted. This step involved a review of all the governing documents in the planning area, as well as, interviews and meetings with key informants. Here the current goals and strategies already adopted by the community were identified and examined to determine if they promoted or hindered the mitigation process. During this step the mitigation planning committee met and reviewed all comments provided by the governing board and citizens at the public hearing.

The primary step in the development of the goals, objectives, and strategies identified herein was the mitigation workshop. The governing board, staff, residents/property owners, business owners, as well as, county emergency management personnel and planning staff, local academics and surrounding county/community leaders were invited to participate. Invitations were sent out three weeks prior to the workshop and subsequent phone calls were made to encourage those invited to attend. Additionally, a posting was placed in all public areas of the community

administrative building. Subsequently, an announcement was made at the previous public hearing and posted in the local newspaper to encourage residents/property owners and local business owners to attend. The workshop was well attended by the governing board and staff employed by Surf City. The preliminary strategies previously identified by the mitigation committee were reviewed and new strategies were identified based on information previously discussed in the public hearing. The following is the list of goals, objectives, and strategies identified and agreed upon at the mitigation workshop

Mitigation Goal 1

Improve Public Awareness/Education: Public awareness/education is a strategy that addresses all hazards. The list of strategies to achieve the goal of public awareness/education is unlimited. However, it is important in the process of education that as many people as possible are reached and provided information. Thus, it is best to identify multiple strategies that can be used to accomplish this goal.

First, sponsoring a seminar based on hazards and mitigation activities to address those hazards reaches large amounts of people at one time. In addition it provides a forum for citizens to interact with persons about the best way to reduce their personal vulnerability to hazards. A seminar would provide illiterate persons the opportunity to hear the necessary information that quite often is dispersed in written format only. However, a seminar alone is not an effective way for a county/community to provide public awareness as there are many citizens incapable of attending such an event. Because a seminar is a proven way of reaching large numbers of persons at one time Surf City has chosen to hold a community sponsored seminar as on of their strategies.

In addition, the dispersment of written materials is another way of reaching the largest number of residents in the community, as well as, business owners, specifically those involved in the development and construction process of new structures in the area. It also provides people with written materials for future reference. However, the cost of dispersing written materials can be costly and could reach an illiterate population who can not use it. Nonetheless, providing written materials to citizens has been a proven way of conducting public awareness/education strategies. These strategies could include displaying the information on an information board at the community administrative office, handing out information to those applying for permits or to new home buyers, sending out inserts in local gas/utility bills or water bills, and posting information on community sponsored website. Because Surf City has a highly literate population and because there is a high level of personal computer ownership and utility usage in the area the community has chosen to implement all the aforementioned strategies in an effort to provide the public with the necessary information.

Public awareness/education can serve two major points in the mitigation efforts of the planning area. First, in an education capacity, the seriousness of the potential for disaster as a result of hazards can be communicated. Here the saying "knowledge is power" is an adequate statement, for the more knowledge the public has on the potential hazards that affect Surf City, the more likely they are to take appropriate steps in securing their property and protecting their families against the dangers associate with said hazards. Second, citizens and visitors alike can be made aware of evacuation routes, which physically remove people from the path of danger. Many lives have been saved through public awareness/education during pending emergencies. Since

new residents and seasonal visitors in Surf City may be unaware of coastal hazards, public awareness should be implemented on an ongoing basis.

Mitigation Objective 1.1
Launch a public awareness/education campaign in the planning area.

Mitigation Implementation Measures

1.1.1 Hold a community sponsored hazard mitigation seminar for the community residents, including information on preparedness for all hazards significant to Surf City.
Hazards Addressed: All
Type of Strategy: Public Information
Responsible Party/Organization: Town Manager
Target Completion Date: One year from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the mitigation seminar has been held.

1.1.2 Educate contractors about principles for quality redevelopment and safe housing development through written materials or a community sponsored workshop.
Hazards Addressed: Flooding, Tornadoes, Severe Thunderstorms, Hurricanes, and Nor'easters
Type of Strategy: Public Information
Responsible Party/Organization: Building Inspector
Target Completion Date: One year from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the mitigation seminar has been held or if the Town has displayed information on the subject in a common area easy for contractors to see.

1.1.3 Provide new home and property buyers with information on quality redevelopment and safe housing development. The information is probably most efficiently dispersed at the community administration buildings.
Hazards Addressed: Flooding, Tornadoes, Severe Thunderstorms, Hurricanes, and Nor'easters
Type of Strategy: Public Information
Responsible Party/Organization: Building Inspector
Target Completion Date: July 2004 and continuous thereafter
Monitoring & Evaluation Indicators: Determine if the Town has displayed information on the subject in a common area easy for property owners to see or if the information is being provided when permits are being applied for.

Mitigation Objective 1.2
Publicize the documents associated with mitigation.

Mitigation Implementation Measures

1.2.1 Manually disperse and have a website posting which provides information about the Community-Based Hazard Mitigation Plan for Surf City and relevant mitigation measures the public can take. In addition, provide a response/reply section where residents can comment on the effectiveness of the current plan and where they can make suggestions for future revisions on the plan.

Hazards Addressed: All
Type of Strategy: Public Information
Responsible Party/Organization: Town Manager
Target Completion Date: July 2004 and continuous thereafter
Monitoring & Evaluation Indicators: Determine if the Town website has been updated with the information required.

1.2.2 Manually disperse and have a website posting which provides information about the Multi-Hazard Recovery Plan for Surf City.
Hazards Addressed: All
Type of Strategy: Public Information
Responsible Party/Organization: Town Manager
Target Completion Date: One year from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the Town website has been updated with the information required.
Approximate Cost: $500.00

Mitigation Goal 2

Improve the Town's Technical Capability to Prepare for, Respond to, and Mitigate All Hazards: Improving a town's technical capability can include ensuring the town has an appropriate primary communication system, as well as, a backup system. It is important during hazardous situations for primary town personnel to have a backup communication system in case the primary system is lost and there is an emergency. However, a backup system can be costly and can require training by the primary staff in its use. Surf City is in need of a backup system. This system could include radios that would ensure communication between Town personnel in emergency situations. The Town considers this to be a primary issue.

Additionally, this improvement can include the town has the ability to produce their own GIS products or that they have the ability to contract with another party to obtain GIS in a completed format. Owning a GIS system is a costly project to setup and maintain. In addition, there are significant educational requirements necessary for a staff person to be able to function within the system which can also be a costly endeavor. In the past the Town has contracted with the county and other regional agency's to provide technical capability where the Town fell short. This sort of contract can be costly and can delay the receipt of information that may be needed on an immediate basis. By implementing a local GIS the Town will have the ability to organize and continuously update its own database. As a result, the Town can provide information, to Town leaders, that has the most up-to-date and accurate data available. Thereby ensuring that Town leaders have all information necessary to make appropriate, well informed decisions. Surf City believes that the implementation of a local GIS system will ultimately pay for itself and will allow the local government to make decisions with the most up-to-date information possible. As a result, the Town has chosen the implementation of a GIS to be a significant project for the community.

The Town can also improve its technical capability by insuring that all repetitive loss properties are identified, placed in a database and mapped. This provides the Town with the ability to have a quicker response during recovery activities. In addition, it allows the Town to pre-develop

grants for disaster recovery. Developing such a database can be a costly and time consuming project. This type of project will require grant funding and has the potential to require the procurement of an outside consulting company for its implementation. Regardless of the cost and the time required to implement this strategy Surf City officials believe the data collected will provide them with invaluable information and will be a primary strategy in mitigating multiple hazards. In an effort tot accomplish this task the Town intends to secure two interns who will use a GPS to plot the latitude and longitude of all the structures in the community, paying special attention in identifying the repetitive loss properties.

Technical improvements also include the implementation of computers to all staff persons in the community and ensuring that the community has access to the internet. The internet is a valuable source in gathering information and can also be used by the community to disseminate information. Computer equipment can be expensive and requires the staff to have primary education, as well as, continued education in its use which can also be costly. Surf City has already provided it's staff with computers, training, and the internet. In addition they have a Town sponsored website that provides pertinent information to its citizens.

During a disaster and following a disaster it is imperative for the Town to ensure that recovery takes place as soon as possible. In an effort to ensure this happens the Town believes that critical facilities must be operating as close to normal as possible. This can be accomplished by ensuring that all critical facilities have continuous power. Portable generators would provide such power and could be removed from the island during a disaster and then returned for the recovery process. A Command Mobile Unit (CMU) would also assist Town officials in ensuring that recovery operations begin immediately following a disaster. A CMU is expensive but if the Town were to work with other surrounding communities a CMU could be beneficial for the entire island.

Mitigation Objective 2.1
Improve the level of equipment that assist the Town in preparation, response, and mitigation to emergencies.

Mitigation Implementation Measures

2.1.1 Purchase a complete GIS/plotter setup and provide training on said set up to all pertinent Town personnel.
Hazards Addressed: All
Type of Strategy: Preventative
Responsible Party/Organization: Planning Department
Target Completion Date: One and a half years from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the a GIS/plotter system has been purchased. Determine if personnel has been trained on that system.
Approximate Cost: $25,000

2.1.2 Purchase a GPS system for the Public Works Department, Police Department, and Community Development Department.
Hazards Addressed: All
Type of Strategy: Preventative

Responsible Party/Organization: Public Works Department, Police Department, and Community Development Department
Target Completion Date: One and a half years from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the GPS system has been purchased. Determine if personnel has been trained on that system.
Approximate Cost: $5,000

2.1.3 Secure the services of two interns to assist in plotting latitude and longitude of all community structures to develop a data base of structures that could potentially be damaged by a disaster. This will ensure data is immediately available and accurate in order to apply to FEMA funding in the future.
Hazards Addressed: All
Type of Strategy: Preventative
Responsible Party/Organization: Community Development Department
Target Completion Date: One year from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the interns have been secured and if they have created the database discussed.
Approximate Cost: $ 8,000

2.1.4 Purchase a Command Mobile Unit (CMU) for use by the Police Department and Fire Department during and following a disaster.
Hazards Addressed: All
Type of Strategy: Preventative
Responsible Party/Organization: Fire Department, Police Department, and Town Manager
Target Completion Date: Two years from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the CMU has been purchased.
Approximate Cost: $20,000

2.1.5 Purchase a loader for the Public Works Department in an effort to remove sand from the roads (thereby reopening them) and to replace sand back on the beach (lessening the potential for additional berm damage) in a more timely fashion after a severe disaster.
Hazards Addressed: Erosion, Flooding, Tropical Cyclones, Nor'easters, and Severe Thunderstorms/Windstorms
Type of Strategy: Preventative, Property Protection, Natural Resource Protection
Responsible Party/Organization: Public Works Department
Target Completion Date: One year from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the loader has been purchased.
Approximate Cost: $60,000 already identified as a line item in the 2005 FY budget

2.1.6 Purchase a hand held radio for the Public Works Department in an effort to continue communications between primary town personnel during and following a disaster.
Hazards Addressed: All
Type of Strategy: Preventative
Responsible Party/Organization: Public Works Department
Target Completion Date: One year from the date of plan adoption

Monitoring & Evaluation Indicators: Determine if a hand held radio has been purchased.
Approximate Cost: $1,000

2.1.7 Purchase backup generators for 3 sub-stations (15kw) in an effort to mitigate the potential for overflow during a flooding event and to ensure continued service following a disaster.
Hazards Addressed: Flooding
Type of Strategy: Preventative
Responsible Party/Organization: Public Works Department
Target Completion Date: One year from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the loader has been purchased.
Approximate Cost: $45,000

2.1.8 Purchase a generator for the Police Department (50KW) to ensure communications equipment remains in operation during and following a disaster.
Hazards Addressed: All
Type of Strategy: Preventative
Responsible Party/Organization: Police Department
Target Completion Date: One and a half years from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the generator has been purchased.
Approximate Cost: $15,000

2.1.9 Install System Control and Data Acquisition (SCADA) System to assist in keeping the water and sewer systems in working order before, during, and following a disaster.
Hazards Addressed: All
Type of Strategy: Preventative
Responsible Party/Organization: Public Works Department
Target Completion Date: Two years from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the SCADA has been purchased and installed.
Approximate Cost: $38,000 already identified as a line item in the FY 2005 budget

Mitigation Goal 3:
Reduce the Impacts of Flooding in Surf City. As previously discussed the Town of Surf City has suffered flooding on numerous occasions. This type of damage has often been a result of storm surge and excessive precipitation from tropical cyclones, nor'easters, and severe thunderstorms. Not only has there been damage to private structures but also to infrastructure, public buildings such as Town Hall, the Fire Department, and Police Department. The Fire Department received damage in 1999 during Hurricane Floyd. The building was subsequently rebuilt on the mainland area of the Town outside the floodplain.

The Police Department has been flooded by 3-feet of water during every major hurricane event in Surf City. To this point the building has always been repaired and no mitigative action has been undertaken to ensure the building is no longer flooded. In addition to the flood damage, the building has suffered severe wind damage as a result of numerous high wind events. To date the building inspector has stated that no more money should be put into the current building

housing the Police Department as it is no longer cost beneficial. As a result, the Town considers the rebuilding of the Police Department out of the flood plain to be a high priority.

There is not an extensive history of the Town Hall flooding, though it was flooded by 2-feet of water during Hurricane Fran. The Building Inspector has stated that it is cost beneficial to elevate the structure as it is still in good condition and is in a prime location on the island. As a result, the Town feels it is important to take steps to protect the current Town Hall from further damage. At this time, replacement of the Town Hall is not an option the Town wishes to consider. Instead they choose to elevate the current structure above base flood elevation.

The National Flood Insurance Program has identified 238 structures located in the areas identified as being repetitively damaged. As a result it is imperative that the Town of Surf City address the issue of repetitive damage in this mitigation plan. There are numerous ways this can be done and in an effort to examine all possible methods of addressing repetitive damage the community should become a member of the Community Rating System program through the NFIP. As a part of that membership the community should develop a CRS plan which specifically addresses possible actions that can be taken to reduce the number of repetitively damaged structures in the area. These actions should include elevation and acquisition of these structures. To date, the Town feels that elevating structures that are in these areas is more particle especially those structures that are located on the island portion of the Town as most of the island is in the areas of repetitive damage.

There are numerous areas in the community that are flooded by stormwater pooling. In 2000 the community funded the development of a Stormwater Management Study. This study recommends several projects that will reduce the potential for stormwater pooling that leads to flooding within the community. The Town is dedicated to ensuring the recommendations in this study are implemented. Additionally, the Town recognizes the limited capabilities of the Town to implement all the recommendations in the study. As a result, the Town is dedicated to researching and applying to every funding source related to stormwater management in an effort to improve the capabilities of the Town to implement the recommendations.

Mitigation Objective 3.1
Reduce the impacts of flooding on public structures.

Mitigation Implementation Measures

3.1.1 Replace the Police Department.
Hazards Addressed: Flooding, Tropical Cyclones, Nor'easters
Type of Strategy: Preventative
Responsible Party/Organization: Police Department, Town Manager and Town Council
Target Completion Date: Four years from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the Police Department has been replaced into a non-flood prone area.
Approximate Cost: $495,000 already identified as a line item in the FY 2005 budget

3.1.2 Elevate Town Hall.
Hazards Addressed: Flooding, Tropical Cyclones, Nor'easters
Type of Strategy: Preventative

Responsible Party/Organization: Community Development Department, Town Manager and Town Council
Target Completion Date: Five years from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the ~~Police Department~~ Town Hall has been elevated above base flood elevation.
Approximate Cost: $150,000

Mitigation Objective 3.2
Develop a plan for reducing the number of private structures in the areas identified as repetitively damaged areas.

Mitigation Implementation Measures

3.2.1 Participate in the CRS program and develop a CRS plan to assist in mitigating repetitive losses in Surf City.
Hazards Addressed: Flooding, Tropical Cyclones, Nor'easters
Type of Strategy: Preventative
Responsible Party/Organization: Community Development Department
Target Completion Date: Two years from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the Town is participating in the CRS program and if a CRS plan has been developed.
Approximate Cost: $25,000 for development of CRS plan

3.2.2 Develop a stand-by application for submission to the Hazard Mitigation Grant Program for elevation of structures in the identified areas of repetitive damage.
Hazards Addressed: Flooding, Tropical Cyclones, Nor'easters, Erosion
Type of Strategy: Preventative
Responsible Party/Organization: Community Development Department
Target Completion Date: Two years from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the Town has developed a stand-by application for elevation of properties in the known areas of repetitive damage.

3.2.3 Develop a stand-by application for submission to the Hazard Mitigation Grant Program for acquisition of structures in the identified areas of repetitive damage.
Hazards Addressed: Flooding, Tropical Cyclones, Nor'easters, Erosion
Type of Strategy: Preventative
Responsible Party/Organization: Community Development Department
Target Completion Date: Two years from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the Town has developed a stand-by application for acquisition of properties in the known areas of repetitive damage.

Mitigation Objective 3.3
Reduce the potential for stormwater pooling.

Mitigation Implementation Measures

3.3.1 Implement the recommendations set forth in the Stormwater Management Study and any subsequent amendments that will reduce the potential for damage as a result of improper stormwater drainage.

Hazards Addressed: Flooding, Tropical Cyclones, Nor'easters, Severe Thunderstorms/Windstorms
Type of Strategy: Preventative
Responsible Party/Organization: Community Development Department
Target Completion Date: July 2004 and continuous until all recommendations are completed
Monitoring & Evaluation Indicators: Determine if the recommendations of the Stormwater Management Plan and any subsequent amendments have been implemented.
Approximate Cost: $100,000 already a line item in the FY 2005 Budget

3.3.2 Continue to seek alternate funding sources to implement the recommendations set forth in the Stormwater Management Study from 2000 and any subsequent amendments.
Hazards Addressed: Flooding, Tropical Cyclones, Nor'easters, Severe Thunderstorms/Windstorms
Type of Strategy: Preventative
Responsible Party/Organization: Community Development Department
Target Completion Date: July 2004 and continuous until all recommendations are completed
Monitoring & Evaluation Indicators: Determine if funding has been sought in an effort to provide extended capability to implementing the recommendations of the Stormwater Management Plan and any subsequent amendments.
Approximate Cost: Varies depending on actual recommendation. This will be more specifically assessed as recommendations are considered for implementation.

Mitigation Goal 4:
Improve the Town's legal capability: During the community capability assessment the mitigation planning committee found that the Town did not have the most effective legal capability to control development in hazard areas as many of their ordinances were dated. Specific information on the existing ordinances and plans governing the development of Surf City can be found in the Community Capability Assessment Section of this plan.

Mitigation Objective 4.1
Improve the Town's legal capability to control land development in an effort to limit development in identified hazard areas.

Mitigation Implementation Measures
4.1.1 Update and revise the Zoning Ordinance and its subsequent maps.
Hazards Addressed: Flooding, Tropical Cyclones, Nor'easters, Severe Thunderstorms/Windstorms, Erosion
Type of Strategy: Preventative
Responsible Party/Organization: Planning Department
Target Completion Date: 6 Months from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the Zoning Ordinance has been updated.
Approximate Cost: $24,000 in process

4.1.2 Update and revise the local Subdivision Ordinance.
Hazards Addressed: Flooding, Tropical Cyclones, Nor'easters, Severe Thunderstorms/Windstorms, Erosion
Type of Strategy: Preventative
Responsible Party/Organization: Planning Department
Target Completion Date: One and a half years from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the Subdivision Ordinance has been updated.
Approximate Cost: $20,000 already a line item in the FY 2005 Budget

4.1.3 Update and revise the CAMA Land Use Plan.
Hazards Addressed: Flooding, Tropical Cyclones, Nor'easters, Severe Thunderstorms/Windstorms, Erosion
Type of Strategy: Preventative
Responsible Party/Organization: Planning Department
Target Completion Date: 1 year from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the CAMA Land Use Plan has been updated.
Approximate Cost: $25,000 in process

Mitigation Objective 4.2
Improve the Town's legal capability to respond to multiple hazards.

Mitigation Implementation Measures
4.2.1 Develop a Multi-Hazard Disaster Recovery Plan to replace the existing Hurricane Plan.
Hazards Addressed: All
Type of Strategy: Preventative
Responsible Party/Organization: All Departments Together
Target Completion Date: 1 year from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the Multi-Hazard Disaster Recovery Plan has been developed.
Approximate Cost: $35,000

Mitigation Goal 5:
Minimize the Impact of Natural Hazard Events on built structures: There are several strategies that can be implemented which would accomplish the task of minimizing the impact of natural hazard events on built structures.

Enforcing strict building codes is the most important step. The Town of Surf City has inspected past development under the North Carolina Building. Building Codes can be an effective way to ensure that development is built to with stand natural hazards. In Surf City Building Codes apply primarily to new construction or buildings undergoing substantial alteration or reconstruction. When structures are not built to appropriate standards they are at risk of damage from many hazards. In addition, they place other structures at risk by becoming debris that can be thrown around by wind and water. There are no cons in strictly enforcing the North Carolina State Building Code as a result the Town has chosen to adopt this as a strategy in an effort to continue an existing policy.

Mitigation Objective 5.1
Improve the resistance of structures in the community against natural hazards

Mitigation Implementation Measures

5.1.1 Continue to enforce the North Carolina Building Code. Require that new structures or structures undergoing significant renovation meet code requirements for coastal areas in accordance with the International Building Codes.
Hazards Addressed: Tropical Cyclones, Tornadoes, Waterspouts, Nor'easters, Severe Thunderstorms, Flooding, and Earthquakes
Type of Strategy: Preventive
Responsible Party/Organization: Building Inspector
Target Completion Date: July 2004 and Continuous thereafter
Monitoring & Evaluation Indicators: Determine if the structure has passed inspection by the local Building Inspector
Approximate Cost: $35,000 for employee. Already a line item in the FY 2005 budget.

5.1.2 Reduce the potential for wind bourn missals by taking a proactive approach to investigating and condemning structures that are substantially damaged and unsuitable for habitation.
Hazards Addressed: High Wind Events
Type of Strategy: Preventive
Responsible Party/Organization: Building Inspector
Target Completion Date: July 2004 and Continuous thereafter
Monitoring & Evaluation Indicators: Determine if the substantially damaged and unsuitable for habitation structures have been condemned.

Mitigation Goal 6
Minimize the Impact of Drought: In a review of the Town's documents to determine Community Capability it was found that Surf City does not have any strategies currently in place which address the issue of drought. As previously noted, however, drought is a problem for Pender and Onslow Counties and for Surf City. As a result, the Town should begin addressing the issue of drought from a policy development standpoint. In addition they should model appropriate water conservation methods while educating the public on said methods.

Mitigation Objective 6.1
Minimize the impact of drought through policy development

Mitigation Implementation Measures

6.1.1 Develop local Water Shortage Response Guidelines (in different phases) as a part of the *Surf City Multi-Hazard Disaster Recovery Plan* as it relates to the expectations of the Town's water supplier.
Hazards Addressed: Drought
Type of Strategy: Preventive
Responsible Party/Organization: Public Works Department
Target Completion Date: Two years from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the water shortage response guidelines have been developed.
Approximate Cost: $5,000

Mitigation Goal 7

Minimize potential for damage or injury due to hazardous materials: Although there are no hazardous materials processing plants, manufacturing or storage within Surf City, there are many propane tanks located within the Town which are privately owned and there is an ammunitions facility located within 15 miles of the Town. As a result, contamination from Hazardous Materials is possible.

Mitigation Objective 7.1

Maintain a current action plan for hazardous materials event response.

Mitigation Implementation Measures

7.1.1 Maintain hazardous materials event preparedness. The Town should develop a plan of action to maintain the materials and knowledge base for addressing such a spill, or develop preliminary measures to assist the county till the representatives arrive. This responsibility must be supported by provision of adequate funding for materials and trainings necessary to maintain this preparedness.
Hazards Addressed: HAZMAT Events
Type of Strategy: Preventive
Responsible Party/Organization: Fire Department and Building Inspector
Target Completion Date: Two years from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the Building Inspector and the Fire Department have received continuing education in responding to HAZMAT Events.

Mitigation Objective 7.2

Decrease the Town's potential exposure to hazardous material

Mitigation Implementation Measures

7.2.1 The Town must inspect all propane tanks located within the town limits of Surf City to ensure they are secured as established through state regulations. Town officials have identified their concern is primarily related to tanks floating through town during high water events. However, this strategy will also prevent said tanks from being blown over due to high wind events.
Hazards Addressed: HAZMAT Events
Type of Strategy: Preventive
Responsible Party/Organization: Building Inspector
Target Completion Date: One year from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the all the propane tanks have been examined for tie downs.

7.2.2 The Town should annually inspect all propane tanks located within the town limits of Surf City to ensure there are adequate valve systems.
Hazards Addressed: HAZMAT Events
Type of Strategy: Preventive
Responsible Party/Organization: Building Inspector
Target Completion Date: One year from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the all the propane tanks have been examined for adequate valve systems.

7.2.3 Secure interns to identify, via GPS, properties with privately owned propane tanks.
Hazards Addressed: HAZMAT Events
Type of Strategy: Preventive
Responsible Party/Organization: Building Inspector
Target Completion Date: 6 months from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the all interns have been secured and if they have identified all the privately owned propane tanks in the Town limits.

Mitigation Goal 8

Improve the Town's ability to respond to and mitigate wildfire hazards: As identified in the hazards section of this plan Surf City has had wildfire breakouts in the past. Additionally, Surf City has a large amount of natural fuel which is relatively dense in many areas or the mainland portion of the Town.

Many of the difficulties experienced during large emergencies fall under the responsibility of the Fire Department. Additional staffing will ensure the ability to perform these tasks. Due to the growth experienced since original staffing of the Fire Department an additional paid firefighting staff position is necessary to maintain the Departments ability to handle response during large emergencies. Although the Department is staffed with many qualified volunteers, only paid members can be mandated during long emergencies. Additional, staffing will help maintain the ability to complete pre-incident preparations and planning for response to large scale emergencies. Additionally, improved staffing can help shorten the re-entry process and provide greater safety for all those involved. As a result, the Town has believes adding an additional staff position to the Fire Department is completely justified and can benefit the community in many ways.

Mitigation Objective 8.1

Improve the staffing of the Fire Department to assist in mitigating and responding to wildfires and other large disasters.

Mitigation Implementation Measures

8.1.1 Increase the number of paid staff positions by adding one additional position.
Hazards Addressed: All
Type of Strategy: Preventive
Responsible Party/Organization: Fire Department and Town Council
Target Completion Date: Two years from the date of plan adoption
Monitoring & Evaluation Indicators: Determine if the Fire Department has received approval for one additional paid staff person and if that person has been hired.
Approximate Cost: $33,000 already a line item in the FY 2005 budget

SECTION 6: PRIORITIZATION SCOPE

The strategies identified herein are organized with a responsible party, target completion date, type of hazard addressed, potential funding source, and monitoring and evaluation indicators. In addition, a prioritization table is included to identify what order project strategies should be implemented in. The prioritization of strategies is critical to the implementation of a Community-Based Hazard Mitigation Plan. A community can only implement the measures adopted in a manner consistent with the resources available to that community. Therefore, the mitigation measures in the Surf City Community-Based Hazard Mitigation Plan are prioritized in accordance with the community's capability and the likelihood of implementation.

The Hazard Mitigation Planning Committee used the following criterion for prioritization of the mitigation strategies within the plan.

1) cost-benefit review, which was given special emphasis, in light of its possible use in environmental reviews for HMGP, FMA and other federal hazard mitigation projects
2) results of Hazard Identification and Analysis,
3) results of Vulnerability Assessment,
4) results of the Community Capability Assessment,
5) effectiveness in meeting past hazard mitigation goals,
6) political and community willingness, and
7) potential funding.

Once this was done the strategies were prioritized under two categories: short-term and long-term. Short-term strategies are those that can be implemented within existing resources and authorities and should be completed within a time frame of 6 months to 2 years. Short-term activities also include those activities that should be implemented immediately following the adoption of this plan and should be implemented on a continuous basis. Long-term strategies may require new or additional resources or authorities and should be organized to be implemented within a time-frame of 3 – 5 years. Many strategies, especially those that will take multiple years to complete, will require the project manager to establish an individual timeline where benchmarks can be used to monitor the progression of the strategy.

Table 6.1 provides a breakdown of the Town's project strategies and how they are prioritized. The following are notes of explanation for the reason some strategies are taking precedence over others.

- Strategy 4.2.1 was completed as part of the development of the Town's Community-Based Hazard Mitigation Plan. However, it is a task that should be redone as a part of the revision stage.
- All strategies that are marked continuous should be implemented upon the adoption of this plan and should continue through to its date of evaluation.
- 1.1.1 and 1.1.3 Can be completed concurrently.
- 1.2.1 and 1.2.2 can be completed concurrently.
- 2.1.1 and 2.1.2 can be completed concurrently.
- 2.1.5, 2.1.9, 3.1.1, 4.1.2, 5.1.1, and 8.1.1 already identified as a line item in the FY 2005 budget.
- 4.1.1 and 4.1.3 are already in process.

Table 6.1
Surf City Prioritization Scope Worksheet

Strategy #	Completed	Continuous	Annually	Short-Term (6 Months-2 Years)	Long-Term (3-5 Years)
4.2.1	X				
2.1.5				X	
2.1.9				X	
3.1.1				X	
3.3.1		X			
3.3.2		X			
8.1.1				X	
4.1.1				X	
4.1.2				X	
4.1.3				X	
3.2.2				X	
3.2.3				X	
2.1.1				X	
2.1.2				X	
2.1.3				X	
7.2.3				X	
5.1.1		X			
1.1.1				X	
1.1.3		X			
1.1.2				X	
1.2.1		X			
1.2.2		X			
2.1.6				X	
2.1.7				X	
2.1.8				X	
4.2.1				X	
2.1.4					X
5.1.2		X			
7.2.1				X	
7.2.2				X	
3.1.2					X
6.1.1				X	
7.1.1				X	

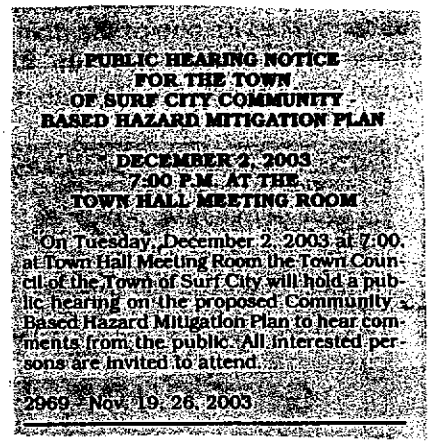
Appendix A:

- **Surf City Public Hearing Advertisement for December 2, 2003**
- **Surf City Public Hearing Meeting Agenda December 2, 2003**

AFFIDAVIT
OF
PUBLICATION

The Pender Chronicle

110 Courthouse Avenue
P.O. Box 726 • Burgaw, NC 28425



PUBLIC HEARING NOTICE
FOR THE TOWN
OF SURF CITY COMMUNITY
BASED HAZARD MITIGATION PLAN

DECEMBER 2, 2003
7:00 P.M. AT THE
TOWN HALL MEETING ROOM

On Tuesday, December 2, 2003 at 7:00, at Town Hall Meeting Room the Town Council of the Town of Surf City will hold a public hearing on the proposed Community Based Hazard Mitigation Plan to hear comments from the public. All interested persons are invited to attend.

2969 - Nov. 19, 26, 2003

State of North Carolina }
County of Pender }

Personally appeared before me the undersigned principle clerk of the above indicated newspaper published in the City of Burgaw, County and State aforesaid, who, being duly sworn, says that the advertisement of

(copy attached)

appeared in the issues of said newspaper

on the following day(s): November 19, 26, 2003

PAID
Check # 24249
Date 1-6-04
G. Wear

Subscribed and sworn to
before this 26th day
of November
A.D. 20 03

Gary G. Wear
(Principle Clerk)

ANNTILLA O. WEAVER NOTARY PUBLIC PENDER COUNTY, NC

Anntilla O Weaver
NOTARY PUBLIC

My Commission Expires October 01, 2008

SURF CITY TOWN COUNCIL AGENDA
December 2, 2003 – 7:00 P.M.

A. Call to Order

B. Invocation – Rev. Tom Greener
C. Pledge of Allegiance – Councilman Curley

D. Approval of November 5 Regular Meeting Minutes

E. Introduction of Judge Fred G. Morrison Jr.

F. Oaths of Office of Recently Elected Members

G. Council Organization
1. Election of Mayor Pro Tempore
2. Council Liaison Assignments

Meeting Recess and Reception

H. New Business
1. **Approval of Regular Meeting Schedule for 2004**
2. **Atkinson Point Road speed limit**
3. **Division of Coastal Management Grant Resolution R-03-12-01**

I. Public Hearing
1. Hazard Mitigation

J. Adjournment

Appendix B:

- **Surf City Workshop Advertisement December 18, 2003**
- **Surf City Workshop Attendance Sheet December 18, 2003**
- **Surf City Workshop Minutes December 18, 2003**

Invitation to Hazard Mitigation Workshop

Dec 18

As a result of the Disaster Mitigation Act of 2000 (DMA2K) and Senate Bill 300 (SB300), the Town of Surf City has taken a pro-active approach to hazard mitigation by developing a Community-Based Hazard Mitigation Plan.

The Town began development of it's Plan in March 2003. An extensive Hazard History was compiled and subsequently analyzed. We also analyzed the Town's vulnerability to different hazards and it's capability to mitigate these hazards. Finally, we have made a preliminary attempt at identifying initial mitigation strategies to reduce the level of vulnerability to said hazards.

You or your representative are invited to attend a WORKSHOP on December 18th at 9:00 a.m. (approximately 20 hours) at the Town Hall Meeting Room for the purpose of reviewing and commenting on the Community-Based Hazard Mitigation Plan and for identifying and discussing potential mitigation strategies that will reduce the loss of property or life as a result of identified hazards.

We look forward to seeing you there.

Lucy City Workshop Participation

12-18-03

Name	Affiliation	Phone
Gina White	GWC-CFCOG	(919) 833-0054
Steve Padgett	Building Ins,	910-328-4131
Ken Bogan	Fire Dept. & Fire Inspector	(910) 328-0175
Buddy Fowler		910-328-3576
Mike Curran	Town Commissioner	910-328-5804
Dean Wise	DPW	910-328-3921
Todd Rademacher	Planning/Zoning	910-328-4131

Prepared by Gina White
December 18, 2003

Surf City Workshop
Goals and Strategies Development

1. Improve the Town's Technical Capability to prepare for, respond to, and mitigate all hazards.
   A. Purchase a complete GIS/Plotter setup and provide training on said setup to all pertinent town personnel.
   B. Purchase a GPS system for the Public Works Department, Police Department, and Community Development Department.
   C. Purchase a Command Mobile Unit (CMU) for use by the Police Department and Fire Department during and following a disaster.
   D. Purchase a loader for the Public Works Department in an effort to remove sand from the roads (thereby reopening them) and to replace sand back on the beach (lessening the potential for additional berm damage) in a more timely fashion after a severe disaster.
   E. Purchase a hand held radio for the Public Works Department in an effort to continue communications between primary town personnel during and following a disaster.
   F. Purchase backup generators for 3 sub-stations (15kw) in an effort to mitigate the potential for overflow during a flooding event and to ensure continued service following a disaster.
   G. Purchase a generator for the Police Department (50KW) to ensure communications equipment remains in operation during and following a disaster.

NOTES:

→ Secure 2 interns to plot lat + lon of all community structures.

→ Install system Control + DATA Acquisition (SCADA) system to assist in ~~the~~ keeping the Water + Sewer System up + running + monitored.

2. Improve Public Awareness. community
   A. Hold a ~~County~~ sponsored hazard mitigation seminar for the county residents, including information on preparedness for all hazards significant to ~~Henderson County.~~
   B. Educate contractors about principles for quality redevelopment and safe housing development through written materials or a community sponsored workshop.
   C. Provide new home and property buyers with information on quality redevelopment and safe housing development. The information is probably most efficiently dispersed at the community administration buildings.
   D. Manually disperse and have a website posting which provides information about the Community-Based Hazard Mitigation Plan for Surf City and relevant mitigation measures the public can take. In addition, provide a response/reply section where residents can comment on the effectiveness of the current plan and where they can make suggestions for future revisions on the plan.

NOTES:

3. Reduce the Impacts of Flooding on Surf City.
   A. Replace the Police Department. The Police Department has been flooded by 3-feet of water during every major hurricane that has hit Surf City. The building has suffered not only water damage, but wind damage. The building inspector has stated that no more money should be put into the current building as it is no longer cost beneficial to do so.
   B. Elevate Town Hall. The Town Hall was flooded by 2-feet of water during Hurricane Fran. The building inspector has stated that it is cost beneficial for the Town Hall to be elevated.
   C. Participate in the CRS program and develop a CRS plan to assist in mitigating repetitive losses in Surf City.

NOTES:

→ Develop language for
Primary – Elevation
Secondary – Acquisition

In interim program ensure that these properties are identified.

4. Reduce the potential for stormwater pooling in Surf City.
   A. Implement the recommendations set forth in the Stormwater Management Study that will reduce the potential for damage as a result of improper stormwater drainage.
   B. Continue to seek alternate funding sources to implement the recommendations set forth in the Stormwater Management Study from 2000. and any subsequent amendments.

NOTES:

5. Improve the Town's legal capability to control land use and development.
   A. Update and revise the local Zoning Ordinance.

NOTES:

B. Update + revise the local Sub-div Ordinance ~~plan~~ last revised June 1990.
C. Update + revise the CAMA land use Plan.

6. Improve the Town's legal capability to respond to multiple hazards.
   A. Develop a Multi-Hazard Disaster Recovery Plan to replace the Hurricane Plan.
   B. Post the Multi-Hazard Disaster Recovery Plan on the community sponsored website. (this will go under public awareness and outreach.)

NOTES:

7. Minimize the impacts of Drought.
   A. Develop local water shortage response guidelines. This could be done as a part of the Multi-Hazard Recovery Plan.

NOTES:

8. Minimize the impacts of high wind events on structures in Surf City.
   A. Continue to enforce the North Carolina Building Codes.
   B. Reduce the potential for windborne missals by taking a proactive approach to investigating and condemning structures that are substantially damaged and unsuitable for habitation.

NOTES:

9. Reduce the potential for HAZMAT Events.
   A. Revise the Zoning Ordinance to mandate tie downs for propane tanks in the Town limits.
   B. Develop a schedule for inspection of all propane tanks within the Town limits for leaks, adequate valve systems, and tie downs.

NOTES:

→ Use interns to ID properties w/ privately owned propane tanks -

10. Improve the Town's ability to respond and mitigate wildfire hazards.
    A. Increase the number of paid firefighters in the community.

NOTES:

Appendix C:

- **Carolina Shores Public Hearing Notice August 3, 2004**
- **Carolina Shores Public Hearing Meeting Minutes August 3, 2004**

04101648
15026535
1 of 1

Affidavit of Publication
Jacksonville Daily News
Jacksonville, NC

Personally appeared before me, a Notary Public of the County of Onslow, State of North Carolina, on this the 3rd day of August, 2004

of The Daily News, who being duly sworn, states that the advertisement entitled **COMMUNITY - BASED HAZARD MITIGATION PLAN** a true copy of which is printed herewith, appeared in The Daily News, a newspaper published in the City of Jacksonville, NC, County of Onslow, State of North Carolina, 1 day a week for 2 weeks on the following dates:

July 27, 2004
August 3, 2004

NORTH CAROLINA
ONSLOW COUNTY

PUBLIC NOTICE

Notice is given that the Town of Surf City will meet at 7:00 p.m. on Tuesday, August 3, 2004, in the Council Chamber at Town Hall to hold a public hearing on the proposed Community - Based Hazard Mitigation Plan to hear comments from the public.

The public is invited to attend this important meeting and make oral comments. You may request an accommodation for a disabling condition in order to attend the meeting. If you have not already made a request, you may to do by contacting Patricia Arnold at 910-328-4131. Such request should be made at least 24 hours prior to the meeting.

Patricia E. Arnold
Town Clerk

July 27, 2004
August 3, 2004

Subscribed and sworn to this 3rd day of August, 2004

x Paul C. Brown
Notary Public

My Commission Expires:
July 11, 2007

PAUL C. BROWN NOTARY PUBLIC ONSLOW COUNTY, NC

Town of Surf City
Regular Council Meeting Minutes
August 3, 2004

Mayor Guy called the regular monthly meeting of the Surf City Town Council to order at 7:00 p.m. Councilman Medlin gave the invocation and Councilman Curley led the Pledge of Allegiance. Also present for the meeting were Mayor Pro Tem Albury, Councilmen Helms and Fowler, Attorney Charles Lanier, Town Manager J. Michael Moore, Finance Clerk Jane Kirk and Town Clerk Patricia Arnold.

Beautification and Appearance Recognitions
Mayor Guy announced the recipients of the Beautification and Appearance Committee's Award for July 2004.

- Home of the Month for July 2004 was James and Jane English located at 773 Driftwood Drive.
- Business of the Month for July 2004 was Sand Dollar Village owned by Joy Rhodes located at 214 A&B N. Topsail Drive.

Approval of Minutes
Minutes of the June 29, 2004 Special Meeting and July 6, 2004 Regular Meeting were recommended for approval by Town Attorney Charles Lanier. Motion was made by Mayor Pro Tem Albury and seconded by Councilman Helms to approve as presented. Motion carried unanimously.

Public Hearing
Mayor Guy recessed the regular council meeting at 7:06 P.M. to open the public hearing for comment on satellite annexation of property located at 1990 US Hwy 210E.

Manager Moore requested that Council consider:

- Water and sewer is not available on Hwy 210 at this time and with this request for volunteer annexation the Town does not have to provide water and sewer but it could be done at requester's cost. The nearby property that was annexed earlier is working on running water and sewer at his cost and maybe this property owner could talk to him regarding water and sewer.
- If Council annexes this property that the property be sent to the Planning Board as soon as possible for zoning at the Planning Board's September meeting. The property owner can request for rezoning when they would like to.

This property is currently zoned R-20 for Pender County however the Town does not have a R-20 zone, so virtually the property would be unzoned.

Calvin Coston, 2010 Hwy 210 E, asked what negative or positive impact would annexing this property have on him as an adjourning property owner.

Planner Rademacher stated that for the applicant if water and sewer was offered, it would be easier for the already annexed property to tap on and there are different types of zoning. For adjoining property owners, if the annexed property joined the town's water and sewer it would

be easier for the adjoining property owners to tap on if they would like to. Regarding zoning it would determine on what the applicant wanted and what the adjacent property owner wanted.

Mayor Guy stated that if the property is annexed the property will then go before the Planning Board for their zoning recommendation and the Board will assist Mr. Coston with any questions he may have.

Frank Camp-Campins, 101 S. Oak Drive, stated that the Planning Board meetings are open to the public and that Mr. Coston is more than welcome to attend and receive information.

Barbara Morrow, 1217 S. Topsail Drive, stated that she didn't understand how the town was looking at annexing more property when there is a concern about water supply to existing citizens of Surf City.

Manager Moore stated that when an annexation is involuntary the Town must provide water within two years but the Town does not have to supply services when it's a voluntary request. He asked the Council to note to make sure the owner is aware that water and sewer will not be available to this tract of land at this time.

Barbara Morrow stated that in her opinion the Town should refrain from expanding obligations until the Council has the matter at hand for their current commitments.

Wallie Paramore, Empie Sidbury Road, Hampstead, stated that he had a concern of Hwy 210's long-range tremendous growth in the next ten years. He stated that we need to hold on for the shock of people that are going to be coming here up from Wilmington into Pender County. He asked if all the adjacent property owners would be notified of the planning meeting when the zoning issue will be brought up?

Manager Moore stated that yes, all the adjacent property owners would be notified.

Wallie Paramore stated that it was his concern that a Pender County residential property will be brought into Surf City and the zoning status changed to commercial. He feels this is a misuse and abuse of Council powers. He stated that Hwy 210 is a very busy road and there is great concern of commercial businesses in a residential area. He asked that the Council think very seriously before they rezone property like that and that the Council knows more about the motive of the applicant when the request for voluntarily annexation is made. He urged the Council to keep looking at the growth for the future.

Mayor Guy stated that the Planning Board is doing an outstanding job and encouraged everyone to attend the Planning Board meetings to voice their concerns as the Council is asked to bring new areas into the Town.

Councilman Medlin stated the Planning Board is looking at the overall surrounding area. When they were looking at a rezoning request that they recommended not to zone the property to commercial as requested but as residential.

Public Hearing was closed at 7:18 P.M.

Councilman Curley made a motion to approve the satellite annexation for 1990 US Hwy 210 East and Councilman Helms seconded motion. Councilman Medlin made a motion for an amendment to Councilman Curley's motion to place the properties zoning on the Planning Board's September meeting to set the zoning. Mayor Pro Tem Albury seconded motion. Original Motion carried unanimously and Amendment motion carried unanimously. Copy of Ordinance is attached to these minutes.

Public Hearing
Mayor Guy recessed the regular council meeting at 7:21 P.M. to open public hearing for comment of zoning of newly annexed property at Hwy 210 East.

Planner Rademacher stated that the applicant, D.C. Lanier, has recently annexed approximately 168 acres of land into the Town. Mr. Lanier has submitted a request to zone his newly annexed property into four separate zoning classifications. The request is to zone 7.398 acres located along the Highway 210 road frontage to C-3 commercial, 72.67 acres to R-5M for the construction of a camping facility and par 3 golf course, 26. 545 acres from Highway 210 into the property for commercial and multi-family development and 61.804 acres to R-10 for the development of a single-family home neighborhood.

The Planning Board recommends that the portion of the 72.67 acres lot requested be zoned to R-5M be approved and the remainder of the lot be zoned R-10 residential. The Planning Board feels that the broad rezoning to R-10 for the majority of this lot is appropriate at this time and encourages the applicant to bring forth a rezoning application when more firm development plans have been designed.

Mayor Pro Tem Albury asked if this included campsites.

Councilman Medlin stated yes.

With no public comment the Public Hearing was closed at 7:25 P.M.

Mayor Pro Tem Albury made the motion to approve the Planning Board's recommendation of zoning 72.67 acres to R-5M Residential Manufacture Homes District zoning classification and 95.747 acres into R-10 Residential zoning classification. Councilman Fowler seconded motion and motion was carried unanimously. Copy of Ordinance is attached to these minutes.

Public Hearing
Mayor Guy recessed the regular council meeting at 7:27 P.M. to open the public hearing for comment on zoning map amendment request from Jay Mouser for property located at 9002 9th Street.

Planner Rademacher stated that the applicant, Jay Mouser is requesting that the property located at 9002 9th street be rezoned from C-1 commercial to MU mixed-use. The property is currently used as Sunshine Grill Restaurant, office space, as well as for a couple of residential units all

within the same structure. A rezoning to mixed use would allow for multi-family structures to be constructed on the site as well as for increased setbacks for any commercial uses. Surrounding uses are a motel, duplexes, multi-family, single-family and public beach located on the oceanfront.

Mayor Pro Tem Albury asked if the new owners were going to tear down the current motel and restaurant structure.

Planner Rademacher stated that yes he believed that the structure would be take down this fall.

Jay Mouser, applicant, stated that they plan to take the structure down this fall; weather permitting.

Public Hearing was closed at 7:29 P.M.

Councilman Helms made the motion to approve to rezone the property located at 9002 9th Street form C-1 Commercial to MU Mixed Use. Mayor Pro Tem Albury seconded motion and motion was carried unanimously. Copy of Ordinance is attached to these minutes.

Public Hearing
Mayor Guy recessed the regular council meeting at 7:30 P.M. to open the public hearing for comment on Community Based Hazard Mitigation Plan.

Manager Moore presented the Council with the Resolution to adopt the Community-Based Hazard Mitigation Plan. Manager Moore stated that with the Hazard Mitigation Plan if Hurricane Alex had produced any damage that the Town would not have had FEMA assistance. The State has critiqued the plan and recommends it for adoption.

With no public comment the Public Hearing was closed at 7:32 P.M.

Councilman Fowler made the motion to approve the adoption of the Community-Based Hazard Mitigation Plan. Mayor Pro Tem Albury seconded motion and motion was carried unanimously. Copy of Ordinance is attached to these minutes.

Mandolay Bay Site Plan
Planner Rademacher stated that the applicant, Jimmy Pierce is requesting approval of a site plan for the construction of a multi-family development. The submitted site plan proposes the construction of 19 residential units on a single lot. The site is 1.49 acres and is zoned MU mixed-use which allows for multi-family development. This site is located adjacent to Waters Bay and across the street from Surf Condos on New River Drive. The developer has shown the trees to be maintained outside the buildable area as well as the federal and state wetland delineations. The developer and the town have been working together on a sewer line extension to this site. The engineering and other paperwork are being submitted to the state for approval. This site will also require a major CAMA permit, which has been submitted for by the applicant. Also, NCDOT approval will be required for the access into the development. The developer on

the site-plan has showed storm water, landscaping, sidewalks, parking and all other applicable codes.

The Planning Board recommends approval of this site plan provided the developer shows connections between the units either by common entry, marriage walls or some other type of connection.

Mayor Pro Tem Albury asked if Mandolay Bay had met the recommendations of the Planning Board.

Planner Rademacher stated that they would be required to meet recommendations before they are issued a Certificate of Occupancy.

Councilman Curley asked why the Planning Board recommended that the developer have connections between the units?

Planner Rademacher stated that the Town does not allow 19 separate single-family homes on a single lot. The Town ordinance requires that if you are doing a multi family development that at least two of the units must be connected. The Town's density would require a 5000 square foot lot per single-family unit. The only way they could have 19 units was if they were multi family duplexes.

Councilman Curley asked what the advantages of connecting them would be?

Planner Rademacher stated it would have to be to legally be duplexes.

Mayor Pro Tem Albury asked the Planner if he meant that the applicant could get 19 residential units on 1.49 acres?

Planner Rademacher stated that with the ordinance there could be more. They are only required 8,500 square feet for the first two units of land and additional 2,500 square feet for each additional unit after that.

John Pierce, Jacksonville, stated that he prepares the plans for Jimmy Pierce and feels that having separate units look better. He stated that with a 4-6 feet area separating the units makes it nicer looking and helps on sound levels. He stated that they could have put 24 to25 units on that lot with the amount of density.

Public Hearing was closed at 7:37 p.m.

Councilman Curley asked if the Council could do what the applicant asked to make the detached units?

Planner Rademacher stated that not as the ordinance is written, that they would need a variance.

Councilman Helms made the motion to approve the Mandolay Bay site plan with Planning Board recommendations. Councilman Fowler seconded motion and motion was carried unanimously.

Fire District Boundary Discussion
Manager Moore stated that a request has been received from Jason Dorazio of Maebilt Construction, LLC for the Council to consider an amendment to the fire boundary. Maebilt Construction has been contracted to build an addition to an existing building located at 116 N. Topsail Drive. The addition will be constructed on both lot 11, and lot 10, block 22. Lot 10 is currently located within the fire district. The request is to remove the property located at lot 10 and lot 23 block 22 from the fire district.

Manager Moore stated that he was concern that if the Council changes the Fire Boundary that other businesses would be asking for a boundary change. North Carolina State states that every municipality must have an established Fire Boundary but they don't state how big or small it must be.

Building Inspector Steve Padgett stated that the Town currently has approximately a block and a half inside the fire boundary that was created in 1993 by the Council.

Councilman Medlin committed that the Council in 1993 was told that this area was the fire boundary and the Town had to have a fire boundary.

Inspector Padgett stated that the State's criteria talks about more than 50% of the area covered with motels, restaurants, and garages. Other towns don't have commercial properties but have to have a fire boundary.

Councilman Medlin asked what was the different in buildings inside the fire boundary.

Inspector Padgett stated that no combustible materials could be used in building. Only materials like concrete or steel could be used. He stated that he has been here seven years and the only building that had gone into that boundary is the bank and it is a masonry and steel building.

Mayor Pro Tem Albury stated that she wanted to know the Attorney's recommendation.

Attorney Charles Lanier stated that no one knows why a town needs a boundary but that the State requires them to have one. He stated that the Town would have to look at each case one step at a time.

Inspector Padgett stated that the area must be a reasonable area. He stated that he recommends that the Council change this one but that each case would have to be looked at one at a time.

Attorney Lanier stated that the owner probably wasn't aware of the boundary when they purchased the property.

Inspector Padgett stated that he made the owner aware of the boundary when they submitted the plans for the first building.

Manager Moore recommended that the Council review and approve Resolution to set public hearing regarding fire district for September 7, 2004.

Councilman Medlin made the motion to approve the Resolution and to set the public hearing on September 7, 2004. Motion was second by Council Fowler and unanimously carried.

Public Forum
No Public Comment.

Council Forum
Councilman Curley thanked everyone for coming and stated that he appreciated everyone's input. He advised the citizens that on the beach renourishment link on the Town's website that there is an option to assist you in submitting a letter to Senator Dole and Senator Edwards to support the Town's beach renourishment program. A Senate bill is going before the Senate that will complicate the beach renourishment program. It will slow projects down and make them more costly.

Councilman Medlin thanked each and everyone for attending tonight and was sure everyone was thankful that the recent storm went away. The Planning Board would like for everyone to attend their meetings and they have been working diligently on how to rezone the area that is on Hwy 210 to stay the same family type atmosphere.

Mayor Pro Tem Albury stated that she was glad to see Mrs. Inez present and it was good to see everyone and thanked them for their input.

Councilman Fowler encouraged everyone to go to the website and send a letter to get involved in beach renourishment. All correspondence matters and would help. He encouraged everyone to get involved in zoning issues. Usually the Planning Board has already looked at an issue before the Council has and they have been working very hard. We have a very active community and is thankful and appreciates everyone for coming out and giving their comments. He stated that he looks forward to continuing to have their comments and support on issues.

Councilman Helms thanked everyone for coming and he was glad the Hurricane missed us. He reminded everyone that school would be starting soon in Pender County and for everyone to please watch out for the kids and take their time around school buses. He encouraged everyone to attend the Planning Board meetings and see how much work they do.

Mayor Guy thanked everyone for coming and for the input they made. He stated that the Council has lobbied for a long time and finally the highway is being widened from Surf City to Hwy 17, Hwy 210 will be widened in the next 18 months 2 feet on each side and Little Kinston Road will be resurfaced. We are working on your behalf. A lot of coastal communities that have more resources then we do provide lifeguard services. We have looked at it on many, many occasional and it's quite expensive and we just can't warrant the initial expense right now. The Fire Department through the leadership of our manager is looking at other avenues of water safety. When we have a tropical storm off the coast and it turns our currents to the point where

they are dangerous for our visitors and children to go into the water, we need some type of warning. He requested that the Council give staff permission to identify crossovers with proper flags on the condition of the water. Motion was made by Mayor Pro Tem Albury to approve the staff setting up flags at the crossovers to identify water conditions. The motion was second by Councilman Medlin and unanimously carried.

One thing we try to do here is that everyone has an ample opportunity to voice his or her opinion. This is your board and we want to hear from you and we hope you leave here with the feeling in your mind that you had an opportunity to voice your opinion. Mayor Guy thanked everyone for being here.

Cavanaugh and Associates Update
Gus Simmons updated Council on ongoing projects.

- Wastewater project – presented the Council with the Town of Surf City 201 Facilities Report for the town to move forward. Twenty-five copies will be made; twenty two will be distributed to agencies in the State of North Carolina to review. Three copies will be sent here to the Town of Surf City and made available for the public to review. The next step in the process in the adoption of the 201 Plan is to conduct a public meeting. It will answer any questions or comments from the citizens of the Town of Surf City regarding information that is contained in the 201 Plan. A 201 Facilities Plan is a planned document that evaluates the economic and environmental aspects of expanding an infrastructure project such as a wastewater treatment plant here for the Town of Surf City.

  Mr. Simmons stated that he would be going to Raleigh for a submission meeting with Construction Grants and Loans to review and get recommendations for final submission that is due in mid September. The town has been placed on the priority-funding list.

- Bike Paths Phase II – Plans have been approved by DOT and he will advertise for construction of the project when the coordinator provides the required information for the advertisement, hopefully by the end of the week.

- Main Pump Station is nearing completion. It is fully functioning and only two remaining components are to be installed in the control panel. After paint and touch up, they expect the project to be done by the end of the month.

Manager Reports

- Request permission for the Town to use the EMS building for community meeting for people that are using the Fire Department meeting room.

  Motion was made by Councilman Medlin and seconded by Councilman Helms. Motion carried unanimously.

  Mayor Pro Tem Albury asked who would be responsible for unlocking and locking of the building.

Manager Moore stated that the Town Clerk will continue the responsibility for scheduling the community center.

- Community Center boundary survey is being done and he has asked that the survey identify the existing landfill area, pond area, and existing well. He has contracted with environmental company to do an environmental assessment.
- When Alltel was doing their repair construction on the water tank they found a 2000-gallon underground tank under the water tank. If a tank is found it must be reported to the State and closed according to state procedures. All of this is in the process of being completed at this time.
- With Tropical Storm Alex we were in constant contact with Pender County Emergency Management and with the nature of the storm. We didn't want to alarm everyone because we were being told it would only skirt the area. Projections called for 1" of rain and this morning the rain gauge read exactly 1".
- Test well – property owners are getting notified for us to get permission to do test sites on their property.
- Restrooms at the park are completed and sewer just needs to be tapped on.
- People are taking advantage of the pier and park.

Mayor Guy stated that Janet Thomas', the former Town Clerk, mother past away and the Town sent flowers and received a thank you card from Mrs. Thomas.

Town Attorney Report
No report at this time.

Closed Session – Personnel Issue
In compliance with G.S. 143-318.11(a)(6), and upon the motion of Councilman Medlin, second of Councilman Fowler and unanimously carried, Council went into closed session at 8:07 p.m. to discuss a personnel issue.

Regular Session was reopened at 8:30 p.m.

Personnel Issue
Councilman Medlin made a motion to increase Manager Michael Moore salary 7% effective July 1, 2004. Motion was second by Mayor Pro Tem Albury and carried unanimously.

Adjournment
There being no further business the meeting was adjourned at 8:40 p.m. upon the motion by Mayor Pro Tem Albury and seconded by Councilman Curley. The Council unanimously approved motion.

Patricia E. Arnold
Patricia E. Arnold, Town Clerk

A. D. (Zander) Guy, Jr., Mayor

Appendix D:

- **State of North Carolina Letter of Compliance July 20, 2004**
- **Town of Surf City Community-Based Hazard Mitigation Plan Adoption Resolution August 3, 2004**

North Carolina Department of Crime Control and Public Safety
Division of Emergency Management

Michael F. Easley, Governor | Bryan E. Beatty, Secretary

Tuesday July 20, 2004

Gina White
Gina White Consulting
Town of Surf City
1406 Governor's Court
Raleigh, NC 27604

Re: Town of Surf City Hazard Mitigation Plan

Dear Ms. White:

Please be advised the North Carolina Division of Emergency Management (NCDEM) will soon officially recommend the Town of Surf City, NC *Multi-Hazard Mitigation Plan* to FEMA for approval. Your plan has been reviewed by NCDEM and deemed to be compliant pursuant to Section 322 of the Disaster Mitigation Act 2000 (DMA2K).

Prior to submitting a Hazard Mitigation Plan to FEMA for approval, DMA2K requires that local governments officially adopt their mitigation plan. Please proceed with adoption of the plan following your locally established procedures. Upon adoption of your plan please resubmit the Plan (2 hard copies and 1 electronic copy) and the Adoption Resolution back to us at your earliest convenience. An electronic copy is necessary in order to allow NCDEM to place the plan on FEMA's electronic database. Once NCDEM receives FEMA's official approval to the Plan, we will forward FEMA's approval letter to you for your records.

If you have any questions regarding this matter please contact me at 919-715-8000, ext. 275.

Sincerely,

Randy Mundt, AICP
State Hazard Mitigation Officer

RESOLUTION OF THE TOWN OF SURF CITY TO ADOPT THE COMMUNITY-BASED HAZARD MITIGATION PLAN

WHEREAS, it is the intent of the Town Council to fulfill its obligation under federal and state statute and become eligible to receive federal and state assistance in the event of a declared disaster affecting the Town.

WHEREAS, the North Carolina Division of Emergency Management has stated that it is required for each municipality adopting a Community-Based Hazard Mitigation Plan to develop a thorough Hazard Identification and Analysis, Area Vulnerability Assessment, Community Capabilities Assessment and Hazard Mitigation Strategies that are appropriate for that specific municipality.

NOW THEREFORE, BE IT RESOLVED that the Town of Surf City does hereby adopt the Town of Surf City Community-Based Hazard Mitigation Plan.

BE IT FURTHER RESOLVED that the Town of Surf City shall update and revise the Town of Surf City Community-Based Hazard Mitigation Plan as stated in the Monitoring and Evaluation section of the Community-Based Hazard Mitigation Plan for Surf City.

ADOPTED the 3rd day of August 2004.

A.D. (Zander) Guy, Jr., Mayor

attest: Patricia E. Arnold
Patricia E. Arnold, Town Clerk

Appendix E:

- **Basemap of Surf City, NC**
- **Zoning Map of Surf City, NC**
- **Wind Zone Map of Surf City, NC**
- **Flood Zone Map of Surf City, NC**
- **Storm Surge Inundation Areas of a Fast Moving Hurricane in Surf City, NC**
- **Storm Surge Inundation Areas of a Slow Moving Hurricane in Surf City, NC**
- **10 – Year Flood History Map of Surf City, NC**
- **Repetitive Loss Areas Due to Water Events of Surf City, NC**
- **5 – Year Lightning Strike Map of Surf City**
- **Potential Areas of wildfire Surf City, NC**
- **5 – Year Wildfire History of Surf City, NC**
- **Potential Technological Hazards Map of Surf City, NC**
- **5 – Year HAZMAT Event History Map of Surf City, NC**

Potential Technological Hazards Map of Surf City, NC

Legend

- Fuel Distribution Site
- Bridge
- Town Hall
- Police Department
- Fire Department
- Water Wells
- Public Works Deptartment
- Post Office
- Lift Station
- Water Tank
- Lagoon
- Spray Field
- Surf City ETJ
- Roads
- Municipal Limits

This map is to be used for general informational purposes only. Geographic Spatial Data used to produce this map was obtained from disparate sources and may not reflect 100% accurate characteristics.

Prepared by:
Scott Logel
Cape Fear Council of Governments
1480 Harbour Drive
Wilmington, NC 28401
9/4/03

0 0.25 0.5 1 1.5 2 Miles

Surf City
North Carolina

Potential Technological Hazards Map of Surf City, NC

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- Fuel Distribution Site
- Bridge
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0 0.25 0.5 1 1.5 2 Miles

Surf City
North Carolina

Appendix F:

Potential Funding Sources for Mitigation Activities

POTENTIAL FUNDING SOURCES FOR MITIGATION ACTIVITIES

LOCAL RESOURCES

- **Capital Improvements Projects**
- **Community Empowerment Groups**
- **Donations**
- **Economic Development Funds**
- **Formation of separate benefit assessment districts**
- **Insurance**
- **Private Not-for-Profit**
- **Public/Private Partnerships**
- **School Bonds**
- **Volunteer Organizations**

STATE AND FEDERAL RESOURCES

When local resources are inadequate, the town can seek additional assistance from the state and federal governments. Many of these programs are categorized as either pre-disaster, post-disaster, and disaster-applicable. Pre-disaster programs exist without a disaster declaration and support pre-disaster mitigation activity. Post-disaster programs generally require a Presidential disaster declaration to become applicable. Disaster applicable programs are available for non-emergency purposes but may be redirected after a disaster declaration.

Adopt-a-Trail Program

Through the North Carolina Department of Environment and Natural Resources, this program provides grant funding for trail planning, construction, maintenance and administration.
Contact: NCDENR, 919-846-9991, http://www.enr.state.nc.us/

Assistance to Firefighters Grant Program

Through the Federal Emergency Management Agency, this program provides four grant categories to assist state, local, and tribal Fire Departments with funding necessary for training, equipment purchase, vehicle acquisition, public awareness, code enforcement, arson prevention, and the like.
Contact: FEMA, 866-274-0960, 301-447-1608, or http://www.usfa.fema.gov/grants

Clean Water Management Trust Fund

An agency of the North Carolina Department of Environment and Natural Resources (NCDENR), the Clean Water Management Trust Fund (CWMTF) provides grants for enhancement and restoration of degraded waters. In addition, funding is provided for development of buffers and greenways near rivers for environmental, educational and recreational needs.
Contact: 252-830-3222, http://www.cwmtf.net/

Community Facilities Loans
The U.S. Department of Agriculture (USDA), Rural Housing Service (RHS) provides funding for construction of community facilities for public use.
Contact: USDA, RHS Williamston Area Office, 252-792-7603, http://www.rurdev.usda.gov/rhs/index.html

Disaster Preparedness Improvement Grant
Funding for the Disaster Preparedness Improvement Grant (DPIG) is provided by FEMA and the North Carolina Division of Emergency Management (NCDEM). Grants fund community mitigation plan preparation and updates and preparation of plans required to receive Hazard Mitigation Grant Program funding.
Contact: NCDEM, 919-715-8000, http://www.dem.dcc.state.nc.us/

Flood Insurance
The Federal Emergency Management Agency, Federal Insurance Administration provides the opportunity to purchase flood insurance under the Emergency Program of the National Flood Insurance Program (NFIP).
Contact: NFIP, 1-888-CALL-FLOOD ext. 445, http://www.fema.gov/nfip

Flood Mitigation Assistance Program (FMA)
With the goal of reducing repetitive losses to the National Flood Insurance Program, this program provides funding for cost-effective actions to reduce or eliminate flood damages.
Contact: NCDEM. 919-715-8000, http://www.dem.dcc.state.nc.us/

Hazard Mitigation Grant Program
Funding from this FEMA program is available to areas affected by a presidentially-declared disaster. The program (75% federal, 25% state) funds mitigation measures through the post-disaster planning process.
Contact: NCDEM. 919-715-8000, http://www.dem.dcc.state.nc.us

North Carolina Wetlands Restoration Program
This program, through the North Carolina Department of Environment and Natural Resources (NCDENR), Division of Water Quality, provides in-kind services for the restoration of wetlands and for increased effectiveness of wetland mitigation efforts.
Contact: NCDENR, Div. of Water Quality, 919-733-5083, http://h2o.ehnr.state.nc.us/wrp

Parks and Recreation Trust Fund (PARTF)
Through the North Carolina Department of Environment and Natural Resources, this program provides matching funds for local parks and recreation public facility development.
Contact: NCDENR, 919-715-2662, http://www.enr.state.nc.us/

Physical Disaster Loans
The Small Business Administration (SBA) offers loans to victims of declared physical disasters for uninsured losses. The loan limit on these funds may be increased by twenty percent to provide for mitigation measures.
Contact: SBA, 1-800-827-5722, http://www.sba.gov/

Property Improvement Loan Insurance
The U.S. Department of Housing and Urban Development (HUD) insures lenders against loss on loans for alterations, repairs and improvements to existing structures and new construction of nonresidential structures.
Contact: HUD, (202) 708-1112, http://www.hud.gov/

Public Assistance Program
This FEMA program provides federal funding to communities in the immediate aftermath of a disaster. Grants focus on recovery, repair, and restoration of state and local facilities and non-profit organizations.
Contact: FEMA, http://www.fema.gov/r-n-r/pa/index.htm

Resource Conservation and Development
The U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) provides technical and limited financial assistance to communities for resource conservation projects including land conservation, water management and environmental enhancement.
Contact: NRCS, http://www.nrcs.usda.gov

River Basin Surveys and Investigations
The U.S. Department of Agriculture, Natural Resources Conservation Service provides technical assistance to local agencies for planning activities to solve problems related to the river basin, including wetland preservation.
Contact: NRCS, http://www.nrcs.usda.gov

Soil and Water Conservation
The U.S. Department of Agriculture, Natural Resources Conservation Service provides this in-kind service in order to provide for the conservation, development and productive use of the nation's soil, water and related resources.
Contact: USDA, NRCS, http://www.nrcs.usda.gov

Snagging and Clearing for Flood Control
The Office of the Chief of Engineers, Department of the Army, Department of Defense provides this service in order to reduce flood control.
Contact: http://www.usace.army.mil

Urban Park and Recreation Recovery Program
This program of the Department of the Interior, National Park Service (NPS) provides grants for local governments for improvements in park system management and recreational opportunities.
Contact: NPS, (202) 565-1200, http://www.cr.nps.gov/index.htm

Watershed Protection and Flood Prevention Loans
This U.S. Department of Agriculture, Rural Utilities Services (RUS) program provides loans to local organizations for the local share of costs for watershed improvement. Funding includes support for drainage, flood prevention and sedimentation control
Contact: RUS, http://www.rurdev.usda.gov/rus/index.html

Watershed Surveys and Planning

The U.S. Department of Agriculture, Natural Resources Conservation Service provides technical and financial assistance for sharing costs of watershed protection measures, including flood prevention, sedimentation control and recreation.

Contact: NRCS, http://www.nrcs.usda.gov

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