The following document is the first draft of the Regional Hazard Mitigation Plan, dated February 1, 2005. There will be modifications to follow, as the development for this plan will continue through fall 2005.

Your input is important! You may provide comments or suggestions at any time by emailing jredick@hampton.gov. There will also be periodic public meetings throughout this process, and they will be advertised through City resources (i.e. website, eNews, Channel 47, etc.).

Next Public Meeting:

When: *Monday, February 28, 2005, 7-8pm*
Where: *Sandy Bottom Nature Park*
(1255 Big Bethel Rd. Hampton, VA 23666)

amec

PENINSULA MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

DISASTER MITIGATION ACT OF 2000

Submitted to:

Peninsula Hazard Mitigation Planning Committee
513 Oyster Point Road
Newport News, Virginia 23602

Submitted by:

AMEC Earth & Environmental Inc.
Newport News, Virginia

February 1, 2005

DRAFT

Letter (*date must be in day/month/year format*)

DRAFT

AMEC Earth & Environmental
Newport News, Virginia
Tel: ()
Fax: ()
www.amec.com

EXECUTIVE SUMMARY

DRAFT

TABLE OF CONTENTS

PAGE

1.0 INTRODUCTION 3
1.1 Scope 3
1.2 Plan Organization 4

2.0 COMMUNITY PROFILE 5
2.1 History of the Peninsula Region 6

3.0 THE PLANNING PROCESS 8

4.0 INTRODUCTION TO HAZARD IDENTIFICATION AND RISK ASSESSMENT 11
4.1 City of Hampton Risk Assessment ..... **Error! Bookmark not defined.**
4.1.1 Hazard Identification – City of Hampton ..... **Error! Bookmark not defined.**
4.1.2 Non-Critical Hazards – City of Hampton ..... **Error! Bookmark not defined.**
4.1.3 Critical Hazards – City of Hampton ..... **Error! Bookmark not defined.**
4.1.4 Vulnerability Assessment – City of Hampton ..... **Error! Bookmark not defined.**
4.1.5 Capability Assessment – City of Hampton ..... **Error! Bookmark not defined.**
4.2 City of Newport News Risk Assessment ..... **Error! Bookmark not defined.**
4.2.1 Hazard Identification – City of Newport News ..... **Error! Bookmark not defined.**
4.2.2 Non-Critical Hazards - City of Newport News ..... **Error! Bookmark not defined.**
4.2.3 Critical Hazards - City of Newport News ..... **Error! Bookmark not defined.**
4.2.4 Vulnerability Assessment – City of Newport News ..... **Error! Bookmark not defined.**
4.2.5 Capability Assessment – City of Newport News ..... **Error! Bookmark not defined.**
4.3 City of Williamsburg Risk Assessment ..... **Error! Bookmark not defined.**
4.3.1 Hazard Identification – City of Williamsburg ..... **Error! Bookmark not defined.**
4.3.2 Non-Critical Hazards - City of Williamsburg ..... **Error! Bookmark not defined.**
4.3.3 Critical Hazards - City of Williamsburg ..... **Error! Bookmark not defined.**
4.3.4 Vulnerability Assessment - City of Williamsburg ..... **Error! Bookmark not defined.**
4.3.5 Capability Assessment – City of Williamsburg ..... **Error! Bookmark not defined.**
4.4 James City County Risk Assessment ..... **Error! Bookmark not defined.**
4.4.1 Hazard Identification – James City County ..... **Error! Bookmark not defined.**
4.4.2 Non-Critical Hazards - James City County ..... **Error! Bookmark not defined.**
4.4.3 Critical Hazards – James City County 72
4.4.4 Vulnerability Assessment – James City County ..... **Error! Bookmark not defined.**
4.4.5 Capability Assessment – James City County ..... **Error! Bookmark not defined.**
4.5 York County Risk Assessment ..... **Error! Bookmark not defined.**
4.5.1 Hazard Identification – York County ..... **Error! Bookmark not defined.**
4.5.2 Non-Critical Hazards - York County ..... **Error! Bookmark not defined.**
4.5.3 Critical Hazards - York County ..... **Error! Bookmark not defined.**
4.5.4 Vulnerability Assessment – York County ..... **Error! Bookmark not defined.**
4.5.5 Capability Assessment – York County ..... **Error! Bookmark not defined.**

DRAFT

TABLE OF CONTENTS (cont)

PAGE

LIST OF TABLES

Table 1 This is a table. ..... **ERROR! BOOKMARK NOT DEFINED.**

LIST OF FIGURES

Figure 1 This is a figure. ..... **ERROR! BOOKMARK NOT DEFINED.**

LIST OF PHOTOS

Photo 1 This is a photo ..... **Error! Bookmark not defined.**

LIST OF APPENDICES

Appendix A

DRAFT

1.0 Introduction

The Disaster Mitigation Act of 2000 (DMA 2000), approved by Congress and signed into law (Public Law 106-390) in October 2000, is a key component of the Federal government's attempt to reduce the rising cost of disasters in the United States. The Act establishes the Pre-Disaster Hazard Mitigation Program (PDM) and new requirements for the post-disaster Hazard Mitigation Grant Program (HMGP). It emphasizes the importance of mitigation planning in communities.

In an effort to highlight the importance of planning in the mitigation process, the DMA 2000 law requires local governments to develop and submit natural hazard mitigation plans in order to qualify for PDM and HMGP grant funding. Specifically, the Act requires that the plan demonstrate "a jurisdiction's commitment to reduce risk from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards." The final plan must be adopted by the jurisdiction and then approved by the Federal Emergency Management Agency (FEMA).

In order to facilitate DMA 2000 compliance for its member jurisdictions, the Peninsula Hazard Mitigation Planning Committee (PHMPC) developed a Natural Hazard Mitigation Plan pursuant to the requirements of DMA 2000. Peninsula's hazard mitigation planning process also incorporated steps to meet the requirements of the Flood Mitigation Assistance (FMA) program, which will qualify its member jurisdictions for additional Federal flood mitigation assistance.

Hazard Mitigation, defined, is any sustained action taken to reduce or eliminate long-term risk to human life and property from hazards. Planning is the process of setting goals, developing strategies, and outlining tasks and schedules to accomplish these goals. In preparing this plan, PHMPC identified natural hazards that threaten its member jurisdictions, determined the likely impacts of those hazards, assessed the vulnerability of its communities to the studied hazards as well as their capability to address those hazards, set mitigation goals, and determine and prioritize appropriate strategies that will lessen the potential impacts of hazard events.

1.1 Scope

The Peninsula Natural Hazard Mitigation Plan is a multi-jurisdictional plan that identifies goals, information, and measures for hazard mitigation and risk reduction to make the area communities more disaster resistant and contribute to the area's long-term sustainability. The plan not only addresses current concerns, but has also been constructed so it can be used to help guide and coordinate mitigation activities and local policy decisions for future land use.

This Plan follows FEMA's DMA 2000 planning requirements and associated guidance for developing Local Hazard Mitigation Plans. This guidance sets forth a four-task mitigation planning process: 1) organize resources, 2) assess hazards and risks, 3) develop a mitigation plan, and 4) evaluate your work. The plan also utilizes the criteria set forth in FEMA's Crosswalk Reference Document for Review and Submission of Local Mitigation Plans.

DRAFT

1.2 Plan Organization

The Peninsula Natural Hazard Mitigation Plan is organized into six sections. The organization of the plan is as follows:

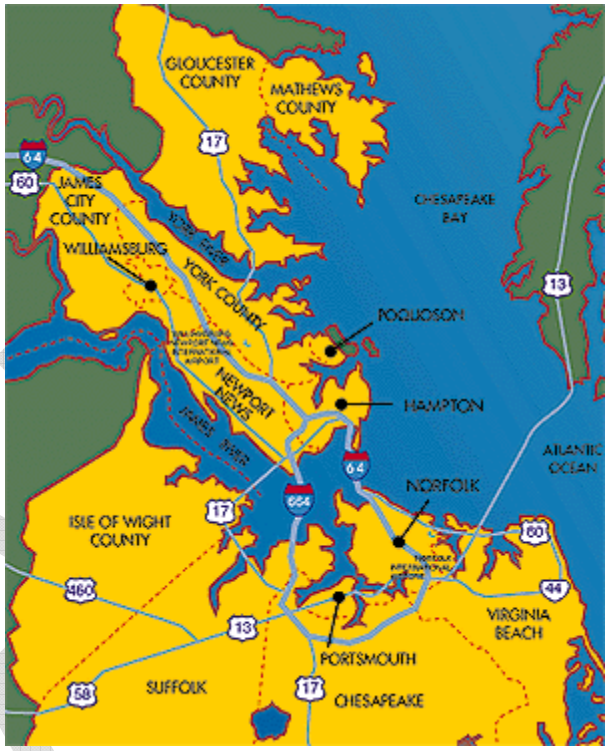
Section Number	Title
1.0	Introduction
2.0	Regional Profile
3.0	Planning Process
4.0	Hazard Identification and Risk Assessment (Including Local Capability Assessment) a) City of Hampton b) City of Newport News c) City of Williamsburg d) York County e) James City County
5.0	Mitigation Goals and Strategy a) City of Hampton b) City of Newport News c) City of Williamsburg d) York County e) James City County
6.0	Plan Implementation and Maintenance

DRAFT

2.0 Community Profile

Location and Geography

The Virginia Peninsula is a peninsula in southeast Virginia, bounded by the York River, James River, and Chesapeake Bay. It is generally accepted to encompass James City County, York County, and the independent cities of Williamsburg, Poquoson, Hampton, and Newport News.



This peninsula is rich in colonial American history. The first permanent English settlement in North America was established in 1607 at Jamestown. Virginia's first capital was in Williamsburg; much of the historic district of that city has been restored. Also, the decisive battle of the American Revolution, the Battle of Yorktown in 1781, took place on the Virginia Peninsula.

In 1862 during the American Civil War, the Union Army invaded the peninsula as part of the Peninsular Campaign to capture Richmond. The 1862 Battle of Yorktown took place along the York River.

The region has extensive natural areas, including 26 miles of Atlantic Ocean beaches, the Chesapeake Bay, picturesque rivers, state parks, wildlife refuges, and botanical gardens. There's also a wealth of history to explore. Colonial Williamsburg is a living museum of early American life. General Cornwallis surrendered to George Washington at Yorktown in 1781. Hampton Roads is the common name for the metropolitan area in southeastern Virginia. Hampton Roads has a population nearing 1.6 million and is the fourth largest metropolitan area in the southeastern United States, and the largest between Washington, D.C. and Atlanta. The land portion of Hampton Roads is divided into two regions, the Peninsula, on the north side, and South Hampton Roads, on the south side, where most of the area's population lives.

Hampton Roads is an important highway of commerce, especially for the cities of Norfolk, Portsmouth, and Newport News. At Portsmouth, a few miles up the Elizabeth River, Norfolk Naval Shipyard is located. Newport News Shipbuilding and Drydock Company (NNS) is located a short distance up the James River. There are also several smaller shipyards, numerous docks and terminals. Massive coal loading piers and facilities were established in the late 19th and early 20th century by the Chesapeake & Ohio (C&O), Norfolk & Western (N&W), and Virginian (VGN) Railways. The latter two were predecessors railroads of Norfolk Southern Corporation, a Fortune 500 company which has its' headquarters in Norfolk, and continues to export coal from a large facility at Lambert's Point on the Elizabeth River. CSX Transportation now serves the former C&O facility at Newport News.

Population

Bordered by the York and James rivers, Hampton Roads Harbor, and the Chesapeake Bay, the Virginia Peninsula is home to more than 450,000 people. Future population projections have estimated that by mid-century the area will have more than 600,000 residents.

The Peninsula region has been one of Virginia's fastest growing regions in recent years. Between the 1990 and 2000 Census, the region grew by 12.8 percent (see Table 2.1). Recent population projections completed by the Weldon Cooper Center for Public Service at the University of Virginia show that the region continues to grow at a rapid pace. Demographically, Peninsula is in many ways typical of metropolitan America. It contains within its boundaries an urban core, a ring of older, settled neighborhoods and newer suburban development. Its citizens' age, educational, occupational and socio-economic characteristics reflect the typical American demographic profile. The Peninsula region's dynamic growth over the past two decades is due, in part, to its strategic location with the transportation access to the eastern seaboard. The region, located in the heart of the east coast's urban corridor, is located between Richmond to the north and Norfolk to the south. The Peninsula area offers easy access to the global marketplace and has proven to be a profitable location for a wide range of national and international companies.

Table 2.1 – Regional Population Statistics

Jurisdiction	1990 Census	2000 Census	% Increase '90 – '00
City of Hampton	133,793	146,437	9.5%
City of Newport News	170,045	180,150	5.9%
City of Williamsburg	11,530	11,998	4.1%
James City County	34,859	48,102	38.0%
York County	42,422	56,297	32.7%
Peninsula Region Total	392,649	442,984	12.8%

2.1 History of the Peninsula Region

City of Hampton, Virginia

The City of Hampton, established in 1610, has its roots as America's first continuously occupied English-speaking settlement. Hampton has several significant historical structures. Completed in 1834, Fort Monroe is the largest stone fort in America, as well as the only one surrounded by a moat. The fort contains the Casemate Museum, which provides a history of the fort and features Jefferson Davis's prison cell, Robert E. Lee's living quarters, and a collection of old military uniforms and supplies. Fort Wool is located in the middle of the Hampton Roads harbor, and traces history from 1819 to 1945. Remains of stone Civil War fortifications provide quite a vantage point for the site of the epic battle of the ironclads Monitor and Virginia.

City of Newport News, Virginia

The City of Newport News is located in the southeastern portion of the Peninsula. It's bordered by the James River to the southwest, Hampton Roads to the southeast, the City of Hampton to the east, York County to the northeast, and James City County to the north. Established as a town in 1880, Newport News became a city in 1896. Where did Newport News get that name? While there are several explanations, the most widely accepted version is that back in 1610, returning from England, Captain Christopher Newport met the Jamestown Colonists on Mulberry Island (located offshore on the James River) as they were preparing to return to the Mother Country. The news of his arrival with three vessels, a plentiful supply of provisions and 150 men, gave heart to the dispirited colonists who agreed to return to Jamestown. In gratitude, they named the point of landing "Newport's News." Over the years, the "s" was dropped, thus the name Newport News.

Newport News played a major role in the Peninsula Campaign during the Civil War. Numerous earthen fortifications and attractions that relate to the Civil War can be experienced in Newport News. In addition, the famous "Battle of the Ironclads" took place off the shores of Newport News in 1862. Collis P. Huntington, a Northern railroad tycoon from Connecticut, brought two magnet industries to Newport News: the Chesapeake and Ohio Railroad and Newport News Shipbuilding. Newport News Shipbuilding and Dry Dock Company, established in 1886, built many of the U.S. super aircraft carriers including the Enterprise, Kennedy, Washington, Vinson, and Roosevelt.

Newport News was designated as a Port of Embarkation by the U.S. Army immediately after America's entry into World War I. The final major military base during WWI was Camp Eustis, which later came to be known as Fort Eustis. Named after the founder of Fort Monroe's Artillery School of Practice and War of 1812 veteran Brigadier General Abraham Eustis, the camp was created in 1918 to meet the need for an artillery firing range.

City of Williamsburg, Virginia

The City of Williamsburg is located in southeastern Virginia. The city is bordered by the unincorporated areas of James City County to the north, west, and south and the unincorporated areas of York County to the east. In 1699, the General Assembly of Virginia established the City of Williamsburg as the colony's capital. The new City, formerly known as Middle Plantation, was named in honor of King William III. In 1722, George I granted a royal charter incorporating the City of Williamsburg after the fashion of the English municipal borough.

During the 1700's, Williamsburg developed into a bustling capital city and played a singularly historic role in events leading to American Independence. Then in 1780, the capital of Virginia moved to Richmond, and Williamsburg area reverted to a quiet college town and rural county seat. In retrospect, Williamsburg's loss of capital city status was its salvation. Many eighteenth century buildings survived into the early twentieth century, when John D. Rockefeller Jr. supported a massive restoration effort.

The city government itself was overhauled in 1932 with adoption of the Council-Manager form of government. As a place of national significance, Williamsburg needs to preserve its historic center while encouraging new development of an appropriate scale and character. By the time Williamsburg reached its prime as the colonial capital of Virginia, it had achieved the formal organization originally intended. The City celebrated its 300th anniversary in 1999.

James City County, Virginia

James City County is famous around the world as the centerpiece of a unique historical area. It encompasses land important in the early history of our nation: Jamestown, Williamsburg, and Yorktown. It sponsored the first colonial government on the continent. The three jurisdictions – James City County, York County, and the City of Williamsburg – have an obligation to collaborate on policies, programs, infrastructure and land use to preserve this Historic Triangle.

James City County is a place of special significance, not only for its residents, but also for the citizens across the Commonwealth and the nation. Given the importance of our unique community identity, we have a responsibility to preserve and protect our assets for future generations. James City County will cooperate with private conservancies and landowners to protect these spaces. James City County will uphold its identity as an exceptional area to visit and a special place to live

York County, Virginia

The County of York, Virginia, is located on the Virginia Peninsula between the James and York Rivers. The 108-square-mile county is 27 miles long, 6 miles wide at its broadest point, and ranges in elevation from sea level to 124 feet above sea level. There are more than 200 miles of coastline along the York River and other creeks and estuaries.

The County lies 50 miles from Richmond and 25 miles from Norfolk, and borders the cities of Poquoson, Hampton, Newport News, Williamsburg and James City and Gloucester Counties.

During its 350-year history, the County of York has figured prominently in both the political and economic history of the Virginia Peninsula, the Commonwealth, and the Nation. The port of Yorktown, which remains the seat of government, was the site of the final battle of the American Revolution where on October 19, 1781; Lord Cornwallis surrendered his British Army to the combined American-French forces under Washington and Rochambeau. Yorktown also figured prominently in the Civil War, serving as a major port to supply both northern and southern towns, depending on who held Yorktown at the time.

After World War II, one of the nation's largest and most diversified military-industrial complexes emerged in the Norfolk-Virginia Beach-Newport News area, spawning numerous small precision machine, metal fabrication and technical research companies. The influence of the early waterman remains active; seafood processing, ship building, and ship repair prosper.

The County of York successfully blends contemporary living with the appreciation and preservation of a rich community heritage.

3.0 The Planning Process

The Peninsula Group retained AMEC Earth & Environmental (AMEC) to assist with the facilitation and development of the region's Multi-Hazard Mitigation Plan, which will be a document covering natural hazards. AMEC assisted the region with the following tasks/processes:

- Establishment of a planning organization for Peninsula;
- Meeting all of the DMA requirements as established by federal regulations, following FEMA's planning guidance;
- Facilitation of the planning process;
- Identification of the data requirements and conduct of the research and documentation necessary to augment that data;
- Development and facilitation of the public input process;
- Production of the draft and final plan documents;
- Submission for acceptance by the Virginia Department of Emergency Management (VDEM) and FEMA Region III.

AMEC assisted Peninsula with the establishment of the process for this planning effort utilizing the DMA 2000 planning requirements (Table 3.0), and FEMA's associated guidance. This guidance is structured around a broad, 4-phase approach. In addition, AMEC's planning process also incorporated another 10-step planning process that satisfies the planning requirements of several other federal programs, including the U.S. Army Corps of Engineers, Community Rating System (CRS) Planning, and FEMA's Flood Mitigation Assistance (FMA) program. The approach for each essentially followed the steps in Table 3.0 below.

Local Government / Community Participation

The DMA planning regulations and guidance stress that each local government seeking the required FEMA approval of their mitigation plan must:

- Participate in the process;
- Detail areas within the Planning Area where the risk differs from that facing the entire area;
- Identify specific projects eligible for funding; and
- Have the governing boards adopt the plan.

To help define the participation process in this plan, AMEC assisted the Peninsula staff with the composition of a Hazard Mitigation Planning Committee. Participation on the committee was defined as including the following:

- Attendance at the Hazard Mitigation Planning Committee meetings;
- Providing data that is requested by the Planning Committee;
- Reviewing and providing comments on draft plans;
- Advertising, coordinating, and participating in the Public Input; and
- Coordination of plan adoption by the individual communities.

Table 3.0: DMA 2000/CRS Planning Requirements

Disaster Mitigation Act Planning Regulations (44 *CFR* 201.6)	CRS / FMA Planning Steps
Planning Process	
201.6(c)(1)	1. Organize
201.6(b)(1)	2. Involve the public
201.6(b)(2) & (3)	3. Coordinate
Risk Assessment	
201.6(c)(2)(i)	4. Assess the hazard
201.6(c)(2)(ii) & (iii)	5. Assess the problem
Mitigation Strategy	
201.6(c)(3)(i)	6. Set goals
201.6(c)(3)(ii)	7. Review possible activities
201.6(c)(3)(iii)	8. Draft an action plan
Plan Maintenance	
201.6(c)(5)	9. Adopt the plan
201.6(c)(4)	10. Implement, evaluate, revise

DRAFT

Step 1: Get Organized – Building the Planning Team
The Hazard Mitigation Planning Committee (HMPC) was comprised of key Peninsula and local stakeholder representatives. The Deputy Coordinator of the Office of Emergency Management of the City of Newport News led the team. With the Committee's commitment to participate, AMEC's first step was to establish both a framework and organization for the development of this Plan. The Committee met seven times over an eight-month period. Typical attendees to each meeting included representatives from the police departments, fire departments, planning departments, public works, utilities, emergency management, and finance departments, as well as the Virginia Department of Emergency Management (VDEM). Other agency participants also attended the meetings, including representatives from the Virginia Department of Environmental Quality, the Virginia Department of Health, and the U.S. Navy. A list of Committee members is included in Appendix A. Attendance and agendas for each of the Committee meetings are on file at the Newport News Emergency Management office in the City of Newport News. The Committee will remain intact for the purpose of implementing and updating this plan.

Step 2: Plan for Public Involvement – Engaging the Public
An open public planning process was utilized that provided opportunities for the public and stakeholders to comment on the plan at all stages of its formation. At HMPC Meeting #1 in November 2004, the plan for public involvement was discussed and agreed upon. Committee meeting schedules, minutes, and plan updates were posted on each community's web pages at http://www.hampton.va.us/, http://www2.ci.newport-news.va.us/newport-news/index.htm,http://www.james-city.va.us/, http://www.yorkcounty.gov/, http://www.ci.williamsburg.va.us/. All articles, press releases and Internet postings are on file with the City of Newport News Project Manager's Office. A series of nine public meetings, one in each community in the region (to be determined), were held to take comments on the draft Risk Assessment. Two additional press releases were provided, as well. One coincided with the presentation to the public of the draft plan, and the last coincided with the announcement of the adoption of the Plan by all the communities within the Peninsula region.

Step 3: Coordinate with other Departments and Agencies
Early in the planning process, the Committee determined that the participation of other state and federal agencies would be beneficial in the data collection, mitigation and action strategy development, and plan approval process. Representatives from the following key agencies were invited to participate on the Committee:

- FEMA Region III (Mitigation Planning Division)
- Virginia Department of Emergency Management (Mitigation Planning Division)
- Virginia Department of Conservation and Recreation

In addition to the agencies listed above, the Committee used the resources of the agencies set forth below in the development of this Plan. Specifically, technical data, reports, and studies were obtained from these agencies either through web-based resources or directly from the agencies themselves:

- National Climatic Data Center (NCDC)
- Virginia Department of Emergency Management (VDEM)
- Virginia Department of Conservation and
- National Oceanic and Atmospheric Association (NOAA)
- Federal Emergency Management Agency (FEMA)
- National Weather Service (NWS)

Recreation (DCR)

- Colorado State University, Tropical Meteorology Project
- Virginia Department of Health (VDH)
- Virginia Soil and Water Conservation
- U.S. Geological Survey (USGS)
- Virginia Department of Forestry (VDOF)
- Department of Mines, Minerals, and Energy

Relationship to Other Community Planning Efforts and Hazard Mitigation Activities
Coordination with other community planning efforts is paramount to the success of a hazard mitigation plan. Hazard mitigation planning involves identifying existing community policies, tools, and actions that will reduce a community's risk and vulnerability to natural hazards. The Committee identified a variety of comprehensive planning mechanisms such as land use and master plans, emergency response and mitigation plans, and municipal ordinances and building codes that guide and control community development. Integrating existing planning efforts, mitigation policies, and action strategies into this Hazard Mitigation Plan establishes a credible and comprehensive plan that ties into and supports other community programs. This Plan, therefore, links the specific natural hazards that present a risk to the community with the existing mitigation elements found in community programs, other planning documents, and regulations. The development of this Plan utilized information included in the following community plans, studies, reports, and initiatives:

- Municipal Comprehensive Plans from Peninsula area localities
- Codified Ordinances from Peninsula area localities
- Virginia Uniform Statewide Building Code - 2000
- Flood Insurance Study and Flood Insurance Rate Maps for the Peninsula region
- 2003 Hurricane Isabel Damage Survey Reports (DSRs)
- Peninsula area Tax Assessor and Land Use data

4.0 Introduction to Hazard Identification and Risk Assessment

This document continues with a separate evaluation of the hazards that could potentially affect each community in the Peninsula area. The following sections contain an assessment of the risks posed by each hazard and an evaluation of the individual localities' capabilities to plan for, and mitigate against, the natural hazards each community faces. Each community's assessment follows the same form and format. The following is an explanation of the template and what each data set represents.

DRAFT

Identified Hazards

Non-Critical

Non-critical hazards are hazards that have occurred very infrequently or have not occurred at all in the historical data. They are not considered a widespread threat resulting in significant losses of property or life.

Critical

Critical hazards are those in which historical data exists to document impacts that have resulted in losses to the community and its citizens.

Community History of Recorded Natural Hazard Losses

This section presents the county/city specific hazard data, where the Hazard Identification and Vulnerability Assessment sections presented earlier in the plan described the hazards, and the impacts, that the entire Planning Area faces.

Other Hazards in the City/County

This section presents a listing of other pertinent hazard data that did not appear within the "History of Disaster Losses" table, such as total number of tornadoes, wildland/grassland fire reports, incidences of West Nile Virus, landslide risk, historical earthquakes, and high and low temperature extremes.

Assessment of the Risk

Vulnerability Assessment

Addresses the community's vulnerability to the hazards identified in terms of a metric, in this case, assets at risk by dollar value as established by local property assessments.

Critical Facility Identification

Critical facilities are those facilities that warrant special attention in preparing for a disaster and/or facilities that are of vital importance to maintaining citizen life, health, and safety during and/or directly after a disaster event.

Capability Assessment

The purpose of this section of the planning process is to determine what policies, programs, regulations, and other mechanisms each County/City, and the incorporated communities, already have in place that either contribute to, or hinder the ability to mitigate the effects of natural hazards.

The Hazard Identification section identifies those hazards that have, or could, adversely affect the jurisdictions. The Vulnerability Assessment then estimates the impacts that those hazards could have. This section quantifies what protective measures and practices exist and lessen those impacts --- leaving a net vulnerability upon which the plan's goals and objectives are based. Additionally, the analysis of the existing capabilities also allows the identification of those practices that may increase the impacts of hazards upon the communities.

The true value of a Mitigation Capability Assessment is in its analysis. For this plan, each community presents a good first effort, as exemplified by the inventory they have completed. This is an ongoing process that will continue with the implementation and maintenance of this plan. But this is not to say that an initial analysis has not been completed. It is such an analysis that has led to this plan's strongest regional recommendation: to have each county/city certified as "Storm Ready" by the National Weather Service within the next three years. On the following page is the "key" to the Capability Assessment Matrix utilized and presented by each county/city.

Development Trends in the Community

Clearly, mitigation is most effective in protecting development that doesn't yet exist. Knowing a community's development trends, when juxtaposed with the hazard analysis, is a valuable information tool that can provide direction, incentive and alternatives to placing new development at risk from natural hazards. This section describes the development trends within each community, where discernable.

Table 4.0: Capability Matrix (Example)

	Town of HAZARDVILLE
Comp Plan	Yes
Land Use Plan	Yes
Subdivision Ordinance	Yes
Zoning Ordinance	Yes
NFIP/FPM Ordinance	Yes
-Effective FIRM Date	22-July-77
-Substantial Damage Language?	Yes
- Certified Floodplain Manager?	No
- # of Floodprone Buildings?	0
- # of NFIP policies?	0
- Maintain Elevation Certificates?	No
- # of Repetitive Losses?	0
CRS Rating?	No
Stormwater Program?	Yes
Building Code Version Full-time Building Official?	USBC 2000 Edition (based on IBC)
- Conduct "As-built" Inspections?	Yes
BCEGS Rating	TBD
Local Emergency Operations Plan?	Yes
Hazard Mitigation Plan	
Warning Systems in Place?	Yes
- Storm Ready Certified?	No
- Weather Radio Reception?	Yes
- Outdoor Warning Sirens?	Yes
-Emergency Notification (R-911)?	Yes
-other? (e.g., cable over-ride)	Yes-Cable-Emergency Alert System
GIS system?	No
-Hazard Data?	N/A

DRAFT

Table 4.0: Capability Matrix (Example)

	Town of HAZARDVILLE
-Building footprints?	N/A
-Tied to Assessor data?	N/A
-Land Use designations?	N/A
Structural Protection Projects?	No
Property Owner Protection Projects	Buyouts
Critical Facilities Protected?	No
Natural Resource Inventory?	Yes
Cultural Resources Inventory?	Yes
Erosion Control Procedures?	Yes
Sediment Control Procedures?	Yes
Public Information Program/Outlet?	Yes
Environmental Education Program?	Yes

DRAFT

EXPLANATION OF CAPABILITY ASSESSMENT MATRIX
Does the Community have:

Comp Plan: A Comprehensive Long-Term Community Growth Plan?

Land Use Plan: A plan that designates type of Land Use desired/required; uses Zoning

Subdivision Ordinance: A regulation that dictates lot sizes, density, setbacks and construction type

Zoning Ordinance: An ordinance that dictates type of Use and Occupancy, Implements Land Use Plan

NFIP/FPM Ord: A Floodplain Management Ordinance: Directs development in identified Flood Hazard Areas. Required for Participation in NFIP and Availability of Flood Insurance

Sub. Damage: Does your FPM Ordinance contain language on Substantial Damage/Improvements?

Administrator: Do you have a Floodplain Management Administrator (someone with the responsibility of enforcing the ordinance and providing ancillary services (e.g., map reading, public education)

# of FP Bldgs: How many buildings are in the mapped Floodplain?

# of policies? How many buildings are insured against flood through the NFIP?

# of RL's: # of Repetitive Losses: (Paid more than $1,000, twice in the past 10 years)

CRS Rating: A Community Rating System rating from the NFIP, and if so, what is it?

BCEGS: A Building Code Effectiveness Grading System Rating

LEOP: A Local Emergency Operations Plan – a disaster RESPONSE plan

HM Plan: A Hazard Mitigation Plan

Warning: Any type of system, such as "Storm Ready" Certification from NWS, NOAA Weather Radio reception, outdoor sirens, Cable (TV) Override, or an Emergency Warning Notification System?

GIS: A Geographic Information System

Structural Protection Projects: (levees, drainage facilities, detention/retention basins)

Property Protection Projects: (buy-outs, elevation of structures, floodproofing, small "residential" levees or berms/floodwalls)

Critical Facility Protection: (for example, protection of power substations, sewage lift stations, water-supply sources, the EOC, police/fire stations or medical facilities that are at risk)

Natural And Cultural Inventory: Do you have an inventory of resources, maps, or special regulations within the community? (wetlands and historic structures/districts, etc.)

Erosion Or Sediment Control: Do you have any projects or regulations in place?

Public Information And/Or Environmental Education Program: Do you have an ongoing program even if its primary focus is not hazards? Examples would be "regular" flyers included in city utility billings, a website, or an environmental education program for kids in conjunction with Parks & Recreation?)

In the County Capability Assessment matrix, a "Yes" means the County provides the service, and an "TBD" means the item or activity is either in progress or to be determined. Blank boxes or N/A means the information was either unknown or unavailable.

4.1 Hazard Identification

The Hazard Mitigation Planning Committee (HMPC) for the Peninsula region conducted a Hazard Identification study to determine which hazards threaten the planning area's communities. The natural hazards identified and investigated in the Peninsula region included the following:

- Flooding
- Hurricanes/Tropical Storms
- Tornadoes
- Nor'easters
- Thunderstorms
- Winter Storms
- Extreme Heat
- Wildfire
- Drought
- Earthquakes
- Biological Hazards/Epidemics
- Landslides
- Expansive Soils

Historical data was collected for all hazard types. By examining the historical occurrence of each hazard, along with the impacts, the HMPC was able to identify the hazards that pose the most significant risks to the region. This identification will allow the HMPC to focus its hazard mitigation planning efforts on the hazards most likely to impact the region in the future. Prioritizing the potential natural hazards that threaten the Peninsula area required analysis of two factors: the probability that a certain type of natural hazard will affect the region and the potential extent and severity of the damage caused by that hazard. The probability of occurrence for each hazard was determined using existing technical analyses, such as the FEMA Flood Insurance Study. When data was not available, the probability was based on the history of events.

There have been 34 presidential disaster declarations in Virginia since 1969 (Table 4.1).

Table 4.1
Presidential Disaster Declarations in Virginia Since 1969

Month	Year	Description
Aug.	**1969**	Hurricane Camille (flooding); 27 jurisdictions declared
June	**1972**	Hurricane Agnes (flooding); 106 jurisdictions declared
Sept.	**1972**	Storm/Flood; Hampton, Newport News, & Virginia Beach declared
Oct.	**1972**	Flood; Western, Central, Southeastern Virginia; 31 jurisdictions declared
April	**1977**	Flash Flood; Southwestern Virginia; 16 jurisdictions declared
Nov.	**1977**	Flood; Southwestern Virginia; 8 jurisdictions declared
July	**1979**	Flood; Buchanan County declared
Sept.	**1979**	Flood; Patrick County declared
May	**1984**	Flood; Buchanan, Dickenson & Washington Counties declared
Nov.	**1985**	Flood; Western, Central Virginia; 52 jurisdictions declared
Oct.	**1989**	Flood; Buchanan County declared
April	**1992**	Flood; Western Virginia; 24 jurisdictions declared
March	**1993**	Snowstorm; 43 jurisdictions declared
Aug.	**1993**	Tornado; Petersburg declared
Feb.	**1994**	Ice Storm; Central, Western Virginia; 71 jurisdictions declared
March	**1994**	Ice Storm; Central, Western Virginia; 29 jurisdictions declared
June	**1995**	Flood; Central & Western Virginia; 24 jurisdictions declared

Jan.	**1996**	Blizzard; All counties and cities in state declared
Jan.	**1996**	Flood; 27 jurisdictions declared
Sept.	**1996**	Hurricane Fran (flooding); 88 jurisdictions declared
Aug.	**1998**	Hurricane Bonnie (flooding); 5 jurisdictions declared
Sept.	**1999**	Hurricane Dennis; Hampton declared
Sept.	**1999**	Hurricane Floyd (flooding); 48 jurisdictions declared
Feb.	**2000**	Winter Storms; 107 jurisdictions declared
July	**2001**	Flood; Southwestern Virginia; 10 jurisdictions declared
Sept.	**2001**	Pentagon Attack; 1 jurisdiction declared
March	**2002**	Flood; Southwestern Virginia; 10 jurisdictions declared
April/May	**2002**	Flood; Southwestern Virginia; 9 jurisdictions declared
Feb.	**2003**	Winter Storms/Flooding; 39 jurisdictions declared
Sept.	**2003**	Hurricane Isabel (winds, flooding); 100 jurisdictions declared
Nov.	**2003**	Flood; Southwestern Virginia; 6 jurisdictions declared
May	**2004**	Flood; Southwestern Virginia; 3 jurisdictions declared
Sept.	**2004**	Flood; Central Virginia; 12 jurisdictions declared
Oct.	**2004**	Flood; Southwestern Virginia; 10 jurisdictions declared

Data taken from VDEM website http://www.vdem.state.va.us/library/dishist.cfm

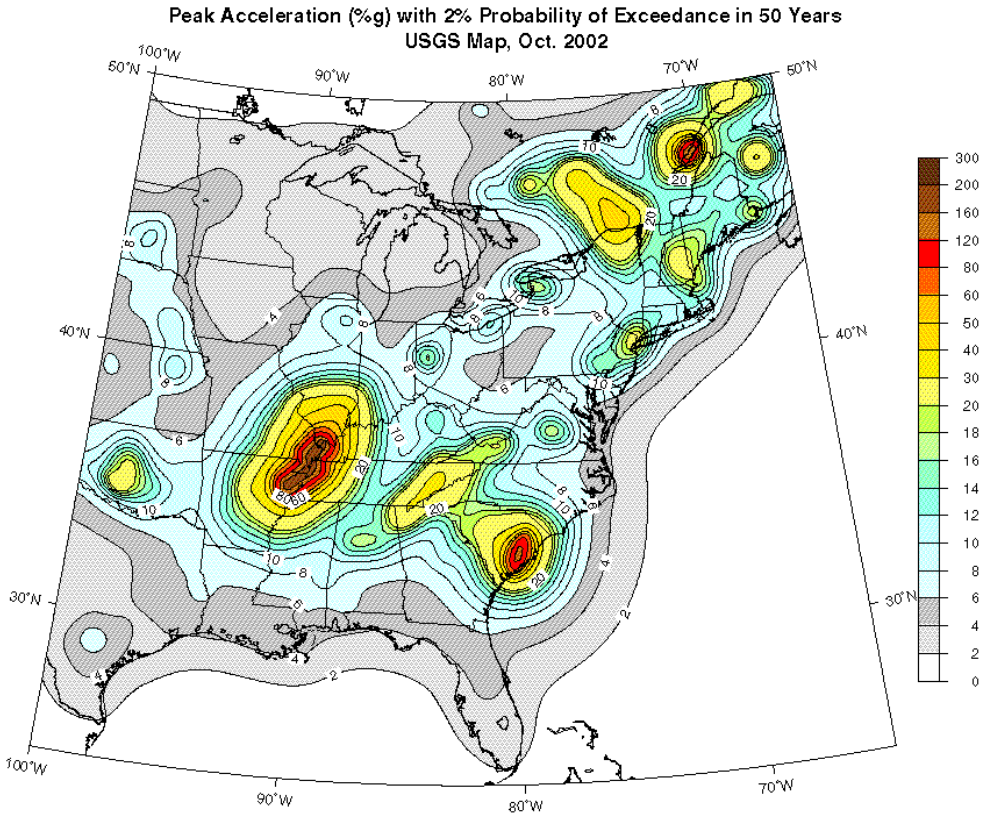
4.1.1 Earthquakes

The earth's outer surface is broken into pieces called tectonic plates, which move away from, towards or past each other. Because the continents are part of these plates, they also move. An earthquake occurs when the stresses caused by plate movements are released. The abrupt release of stored energy in the rocks beneath the earth's surface results in a sudden motion or trembling of the earth. The epicenter is the point on the Earth's surface directly above the source of the earthquake.

Smaller earthquakes occur much more frequently than large earthquakes. These smaller earthquakes generally cause little or no damage. However, very large earthquakes can cause tremendous damage and are often followed by a series of smaller aftershocks lasting for weeks after the event. This phenomenon, referred to as 'minor faulting,' occurs during an adjustment period that may last for several months.

Virginia and the eastern side of the North American continent are in the middle of a tectonic plate. The U.S. east of the Mississippi has fewer earthquakes than the western portion of the country. Quakes occurring in the west are typically stronger, but eastern earthquakes can cause more damage away from their origin, because in the east, the underlying bedrock is well connected (like a concrete slab). This geology allows eastern earthquakes to travel farther than in the west, where the underlying topography is so disconnected (like a brick patio) that the energy of a quake is dissipated closer to the epicenter.

According to the Virginia Department of Mines, Minerals and Energy, Virginia has a moderate earthquake risk (similar to most states on the eastern seaboard). This risk assessment is further supported by the United States Geologic Survey (USGS). The USGS rates areas of the United States for their susceptibility to earthquakes based on a two percent probability of a given peak force, being exceeded in a 50 year period. Based on this map, the Peninsula area lies in an area of moderate seismic risk, with a peak acceleration of 6-10%g (See Figure 4.1.1a).

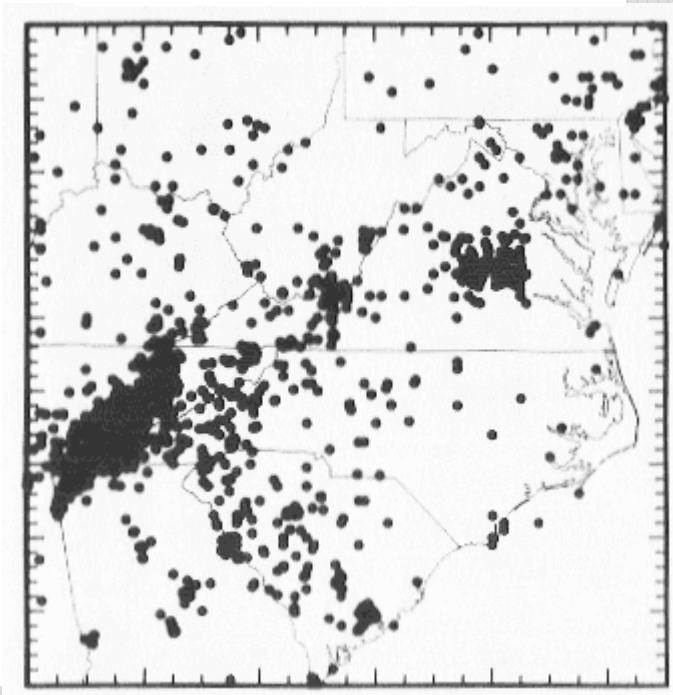


The first recorded earthquake in Virginia occurred in 1774. Since then, over 300 earthquakes have been recorded within or near the boundaries of the state. Fourteen of these events had a magnitude of 4.0 or higher on the Richter scale. The largest earthquake in Virginia was the 1897 Giles County quake. It was felt over 11 states (approximately 280,000 square miles) and had an estimated magnitude of 5.8, making it the third largest earthquake in the eastern United States. Figure 2.0 (from the Virginia Division of Mineral Resources, September, 2004) shows a map of 2,460 epicenter locations in the southeast United States.

DRAFT

Historical data is supportive of the moderate earthquake risk assessment for Virginia and the Peninsula area. Although there have been a large number of earthquakes in Virginia since 1774, most have been very small in magnitude and rarely caused damage. Virginia has experienced quakes of a larger magnitude in the past, and it is assumed that it will experience more at some point in the future. However, compared to the frequency of other hazards such as hurricanes and floods, the frequency with which larger, more damaging earthquakes occur in Virginia is considerably lower.

Figure 4.1.1b
Regional earthquakes (VDMR 1994)



DRAFT

Table 4.1.1
Summary of Significant Earthquakes within and Surrounding the Commonwealth of Virginia

STATE	DEPTH[1] (km)	DEATHS	DAMAGE[2] ($)	MAG	MMI	LOCATION	YEAR
PA	0	0	100000	0.00	7	Wilkes-Barre, Pennsylvania	1954
PA	0	0	0	3.90	6	Near York, Pennsylvania	1889
PA	0	0	0	0.00	6	Allentown, Pennsylvania	1908
PA	0	0	0	3.30	6	Southern Blair County, Pennsylvania	1938
PA	0	0	0	0.00	6	Sinking Spring, Pennsylvania	1954
PA	0	0	0	0.00	6	Wilkes-Barre, Pennsylvania	1954
PA	1	0	0	3.20	6	Cornwall, Pennsylvania	1964
PA	5	0	0	4.10	6	Lancaster County, Pennsylvania	1984
PA	5	0	0	4.60	5	Reading, Pennsylvania	1994
PA	0	0	0	0.00	5	Pennsylvania	1991
TN	0	0	0	5.00	7	Near Memphis, Tennessee	1865
TN	0	0	0	4.10	7	Near Knoxville, Tennessee	1913
TN	0	0	0	4.20	6	Knoxville, Tennessee	1844
TN	0	0	0	3.80	6	Memphis, Tennessee	1889
TN	5	0	0	4.50	6	Southern Appalachians, Tennessee	1928
TN	0	0	0	0.00	6	Near Dyersburg, Tennessee	1952
TN	0	0	0	3.90	6	Finley, Tennessee	1955
TN	5	0	0	4.10	6	Knoxville, Tennessee	1956
TN	8	0	0	3.60	6	Dyersburg, Tennessee	1962
TN	12	0	0	4.60	6	Eastern Tennessee	1973
TN	5	0	0	3.80	6	Northwest Tennessee	1980
TN	10	0	0	4.00	6	Western Tennessee	1981
TN	10	0	0	3.50	6	Eastern Tennessee	1984
TN	19	0	0	4.20	6	Near Greenback, Tennessee	1987
TN	0	0	0	4.50	5		1898
TN	0	0	0	4.50	5		1918
TN	20	0	0	4.30	5	Tiptonville, Tennessee	1996
TN	10	0	0	0.00	5	Tennessee	1990
TN	13	0	0	0.00	5	Tennessee	1990
NC	0	0	0	5.20	7	Near Waynesville, North Carolina	1916
NC	0	0	0	0.00	7	Southern Mitchell County area, North Carolina	1926
NC	0	0	0	5.00	6	Near Wilkesboro, North Carolina	1861
NC	5	0	0	4.00	6	Near Woodlawn, North Carolina	1957
NC	7	0	0	3.70	6	Buncombe County area, North Carolina	1957
NC	0	0	0	3.90	6	Northwest Jackson County, North Carolina	1957
NC	10	0	0	3.50	6	Hendersonville, North Carolina	1981

DRAFT

STATE	DEPTH[1] (km)	DEATHS	DAMAGE[2] ($)	MAG	MMI	LOCATION	YEAR
WV	3	0	0	4.53	6	Southern West Virginia	1969
MD	10	0	0	0.00	5	Chesapeake Bay region	1990
MD	0	0	0	0.00	5	Chespeake Bay Region	1990
VA	0	0	0	5.60	8	Giles County, Virginia	1897
VA	0	0	0	4.80	7	Central Virginia	1875
VA	0	0	0	4.50	6	Near Petersburg, Virginia	1774
VA	0	0	0	4.80	6	Near Wytheville, Virginia	1852
VA	0	0	0	4.30	6	Central Virginia	1852
VA	0	0	0	4.30	6	Southwest Virginia	1897
VA	0	0	0	4.40	6	Pulaski, Virginia	1898
VA	0	0	0	4.00	6	Near Arvonia, Virginia	1907
VA	0	0	0	4.60	6	Luray, Virginia	1918
VA	0	0	0	0.00	6	Near Front Royal, Virginia	1919
VA	0	0	0	3.70	6	Charlottesville, Virginia	1929
VA	1	0	0	3.90	6	Giles County, Virginia	1959
VA	1	0	0	3.20	6	Southwest Virginia	1975
VA	9	0	0	3.30	6	Southwest Virginia	1976
VA	0	0	0	4.60	5		1828
VA	0	0	0	4.50	5	Central Virginia	1833
VA	0	0	0	4.60	5		1853
VA	0	0	0	4.50	5		1898
VA	0	0	0	4.50	5		1899
VA	18	0	0	0.00	5	Virginia	1991

Source: USGS, National Atlas, 30 June 1999
[1] Depth of the focus
[2] Direct cost of the earthquake for the year of the earthquake

4.1.2 Biological Hazards/Epidemics

Biological hazards are naturally occurring substances such as bacteria, fungi, moulds and viruses. In many cases these hazards are not visible, yet they can cause serious health effects to humans, plants and animals. The West Nile Virus, Lyme disease, and bacterial epidemics have all been documented in the Peninsula region within the last ten years.

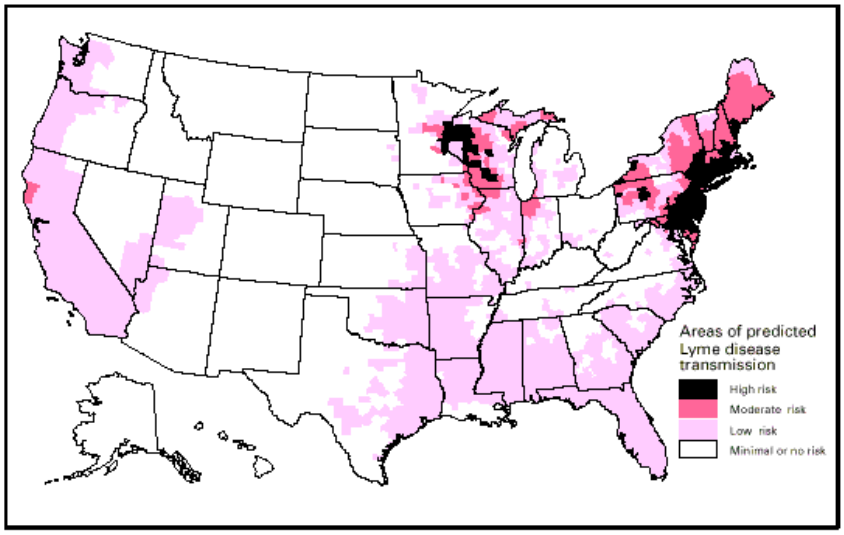
The West Nile Virus (WNV) is a disease that first found its way to the United States in 1999. Since then, almost 10,000 people have fallen ill across the country. WNV is transmitted to humans through mosquito bites and usually causes little reaction. However, a small percentage develop mild symptoms that include fever, headache, body aches, skin rash and swollen lymph glands. Less than 1% of infected people develop a more severe illness that can include meningitis (inflammation of one of the membranes covering the brain and spinal cord) or encephalitis. York County has taken a proactive stance against WNV by eliminating mosquito populations and breeding grounds. Some of the techniques used are low volume spraying, draining areas of standing water, and introducing mosquito-eating fish. York County also coordinates with the Virginia Department of Transportation (VDOT) to maintain easements and right-of-ways that contain standing water. According to the Virginia Department of Health, there were 101

positive WNV cases for animals (birds, horses, and mammals) in the Peninsula region from 2000 to 2003. There was one probable case of human WNV in Newport News City in 2003.

Lyme disease is a bacterial infection that can afflict humans and animals. It is most commonly transmitted to humans when they are bitten by deer ticks. If Lyme disease goes untreated, some patients may develop arthritis, including intermittent episodes of swelling and pain in the large joints; neurologic abnormalities, such as meningitis, facial palsy, motor and sensory nerve inflammation and encephalitis; and cardiac problems, such as an inlarged heart and inflammation of the heart tissue. The Peninsula region is an area of low risk for Lyme disease transmission, according to the Center for Disease Control (CDC 2004). In 2002, 259 cases of lyme disease were reported (out of 23,763 nationwide) in Virginia by the CDC.

Figure 4.1.2
National Lyme Disease Risk Map
Source: CDC 2004

National Lyme disease risk map with four categories of risk



Note: This map demonstrates an approximate distribution of predicted Lyme disease risk in the United States. The true relative risk in any given county compared with other counties might differ from that shown here and might change from year to year. Risk categories are defined in the accompanying text. Information on risk distribution within states and counties is best obtained from state and local public health authorities.

Bacteria and viruses can be a serious cause of water contamination and can have disastrous effects on the animals living within polluted waterways. In some instances, pollution from storm flooding and combined sewer overflow (CSO) can produce high levels of fecal coliform bacteria and viruses in rivers and drinking water. The Poquoson River, Chisman Creek, Patricks Creek, Lambs Creek, Roberts Creek, and Lyons Creek are all listed as bacteria impaired water body segments on the Virginia Department of Environmental Quality's (DEQ) 2003-2004 Total Maximum Daily Load (TMDL) schedule.

4.1.3 Thunderstorms

The State of Virginia averages 35 to 45 thunderstorm days per year. Thunderstorms can occur any day of the year and at any time of the day, but are most common in the late afternoon and evening during the summer months. Thunderstorms are generally beneficial. They provide needed rain for crops, plants,

and reservoirs. However, about five percent of thunderstorms become severe and can produce tornadoes, large hail, damaging downburst winds, and heavy rains causing flash floods. Thunderstorms can develop in less than 30 minutes, allowing little time for warning. All thunderstorms produce lightning, which can be deadly. The National Weather Service does not issue warnings for ordinary thunderstorms nor for lightning. The National Weather Service does highlight the potential for thunderstorms in the daily forecasts and statements.

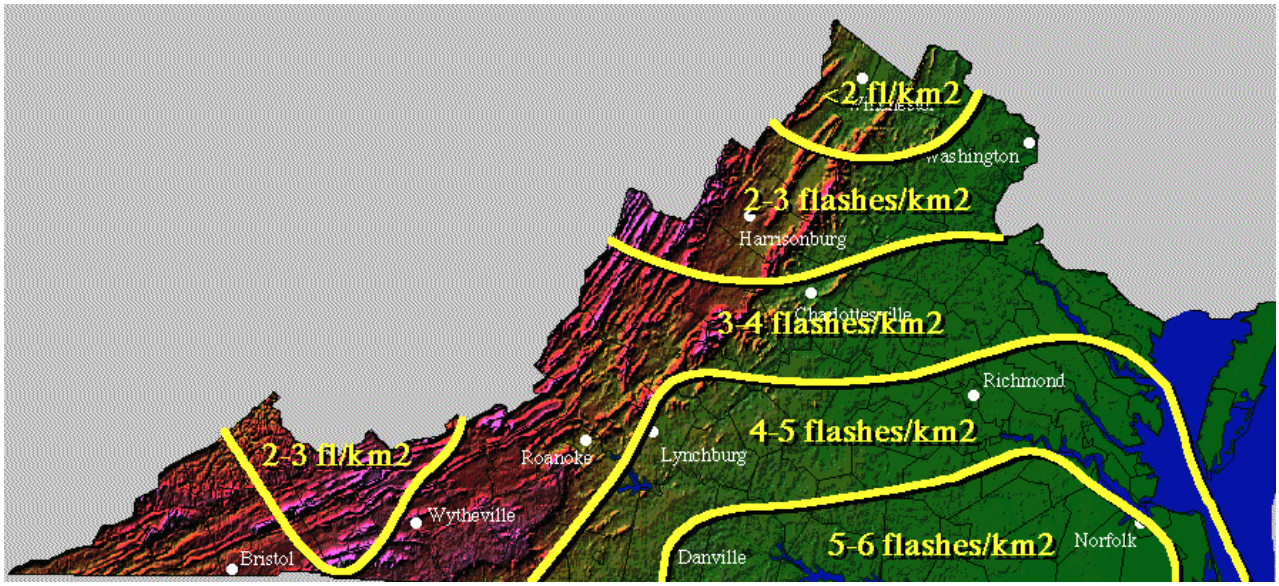


Figure 4.1.3a: Lightning Strike Density Map for Virginia (UVCD 1989)

Lightning can strike up to 10 to 15 miles from the rain portion of the storm. The lightning bolt originates from the upper part of the thunderstorm cloud known as the anvil. A thunderstorm can grow up to 8 miles into the atmosphere where the strong winds aloft spread the top of the thunderstorm cloud out into an anvil. The anvil can spread many miles from the rain portion of the storm but it is still a part of that storm. Lightning, from the anvil, may strike several miles in advance of the rain. Lightning bolts may also come from the side or back of the storm, striking after the rain and storm have seemed to have passed or hitting areas that were totally missed by the rain.

Lightning is a serious danger in the United States and Virginia. Between 1959 and 2000, lightning killed 58 people in Virginia and injured at least 238 (Watson 2004). In the Peninsula area, 10 cases of lightning strikes were reported between 1950 and 2004 (Table 4.1.3). The majority of the damage caused by lightning in the area was related to home strikes, and power line failures but one person was injured and one person was killed. A typical 100-million volt lightning flash can heat the air to more than 40,000 degrees in an instant. This amazing amount of power can damage homes, down trees and power lines, and take lives. The best defense against this natural hazard is to recognize the danger and take shelter when appropriate.

Table 4.1.3
Summary of Lightning Occurrences in Peninsula

Location	Date	Type	Death	Injury	Property Damage
Hampton	07/16/2003	Lightning	0	0	5K
Newport News	06/20/1996	Lightning	0	0	0
Denbigh	06/19/2000	Lightning	0	0	100K

Williamsburg	01/02/1996	Lightning	0	0	20K
Norfolk	09/04/1993	Lightning	0	1	500K
Williamsburg	07/17/1995	Lightning	0	0	25K
Grafton	07/15/2000	Lightning	0	1	20K
Williamsburg	04/01/1993	Lightning	0	0	50K
Centerville	08/24/2000	Lightning	0	0	100K
Jamestown	08/30/2003	Lightning	1	0	0

Source: NCDC 2004

4.1.4 Extreme Heat

Extreme heat hazards, often referred to as the silent killer, result from high daily temperatures combined with high relative humidity. High relative humidity retards evaporation, robbing the body of its ability to cool itself. On average, about 175 Americans succumb to the taxing demands of heat every year (NOAA 2004).

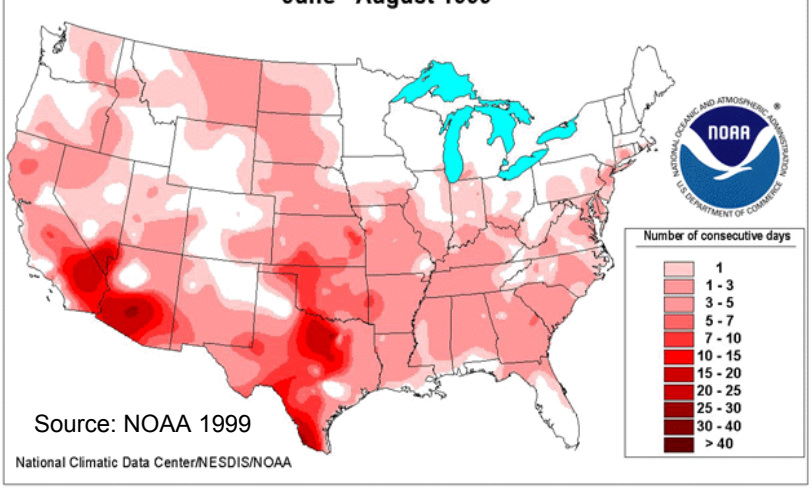
When heat gain exceeds the level the body can remove, body temperature begins to rise, and heat related illnesses and disorders may develop. The Heat Index (HI) is the temperature the body feels when heat and humidity are combined. The table below (Table4.1.4a) shows the HI that corresponds to the actual air temperature and relative humidity. (This chart is based upon shady, light wind conditions. Exposure to direct sunlight can increase the HI by up to 15°F.) (NOAA 2004).

Table 4.1.4a
Temperature (F) versus Relative Humidity (%)

°F	90%	80%	70%	60%	50%	40%
80	85	84	82	81	80	79
85	101	96	92	90	86	84
90	121	113	105	99	94	90
95		133	122	113	105	98
100			142	129	118	109
105				148	133	121
110						135

Source: NOAA 2004

Figure 4.1.4a
Greatest Number of Consecutive 100°F Days
June - August 1999



Source: NOAA 1999

During the summer (June-August) of 1999, the United States experienced an intensifying drought and heat wave. The east coast was the area hardest hit by the drought, with record and near-record short-term precipitation deficits occurring on a local and regional scale resulting in agricultural losses and drought emergencies being declared in several states (NOAA 1999). Figure 4.1.4a shows the number of consecutive days of 100° temperatures.

The threat of extreme heat to the Peninsula communities is episodic and, although it cannot be controlled, threats to population can be minimized by warnings

and public awareness of the potential dangers that extreme heat presents.

4.1.5 Flooding

Flooding is the most frequent and costly natural hazard in the United States. Nearly 90 percent of presidential disaster declarations result from natural events in which flooding was a major component. Excess water from snowmelt, rainfall, or storm surge accumulates and overflows onto adjacent floodplains—lowlands adjacent to rivers, lakes, and oceans that are subject to recurring floods. While many floodplain boundaries are mapped by FEMA's National Flood Insurance Program (NFIP), floods sometimes go beyond the mapped floodplains or change courses due to natural processes (e.g., accretion, erosion, sedimentation, etc.) or human development (e.g., filling in floodplain or floodway areas, increased imperviousness within the watershed from new development, or debris blockage including cars, trailers, and propane tanks). Since the floodplains in the United States are home to over nine million households, most property damage results from inundation by sediment and debris-filled water.

There are four basic types of floods that afflict Virginia; coastal flooding, urban flooding, flash flooding, and river flooding. Due to its geographic location within the coastal plain and its rapid population growth, the Peninsula area is susceptible to all four types of flooding. Coastal flooding (or tidal flooding) results from higher than average tides along coastal areas. This usually occurs during passing tropical storms (hurricanes) and northeasters. The high winds produced by these events can pile water on the shorelines. If this occurs at the time of the astronomical high tide, the flooding amplified and will cause flooding along low-lying area along shorelines. Urban flooding occurs in heavily paved areas where pavement does not allow water to be absorbed into the ground thereby increasing the speed and amount of water run-off. If areas are without proper drainage, or storm drains become clogged, then streets become streams and water will gather in low-lying areas. If it rains hard enough, underpasses can rapidly fill trapping motorists and streets can accumulate enough water to submerge cars or carry them wherever the water flows. Flash floods occur in a short period of time - a "flash". Rain falls at such a high rate that water does not have time to be absorbed into the ground. It flows downhill into ditches, lowlands and small streams. As the heavy rain continues, ditches overflow, drains backup, water ponds in lowlands and streams rise over their banks. Streams and creeks can become raging rivers in just hours. People are often caught off guard, especially motorists. Half of flash flood deaths in the United States are in automobiles. River floods occur when heavy rains fall over a large area. In many cases in Virginia, it begins as widespread flash flooding of small streams. About 60% of Virginia's river floods begin with flash flooding from tropical systems passing over or near the state. River flooding also occurs as a result of successive rainstorms. Rainfall from any one storm is not enough to cause a problem, but with each successive storm's passage over the basin, the river rises until eventually it overflows its banks. If it is late winter or spring, melting snow in the mountains can produce added runoff that can compound flood problems.

There have been numerous significant flash floods in the Peninsula area between 1996 and 2003, making this area very susceptible to future flooding events. The flash flooding and urban flooding is often brought on by powerful thunderstorms that can dump 1.0 to 4.0 inches of rain in a matter of a few hours. Small creeks and streams as well as over burdened drainage systems often can not cope with the quick influx of rain waters. Their banks can quickly overtop resulting in dozens of flooded roads as well as personal and private property damage.

Nor'easters, which are intense low-pressure systems that move slowly up the coast carrying large amounts of moisture and high winds, as well as hurricanes, have historically passed through the Peninsula area (Hurricane season lasts from June through November while Nor'easters occur from September through March). These systems can drop 1-6 inches of rain over the course of a few days. Combined with snowmelt in winter months as well as saturated soils from previous nor'easters can spell disaster for flood prone areas.

4.1.6 Dam Failure

For the purposes of this plan, dam failure is addressed as a natural hazard consequence of a flooding condition. Dam failure can occur if hydrostatic pressure behind the dam exceeds its design capacity or the crest of the dam is over topped and rushing flood water scour the base of the dam. The hazard classification associated with dam failure is outlined below. Dams that meet regulatory criteria in Virginia are regulated under the Virginia Dam Safety Act by the Soil and Water Conservation Board (VS&WCB). A dam may be exempt from the regulation if any of the following criteria apply:

- The dam is less than 6 feet in height;
- The dam has a capacity less than 50 acre-feet and is less than 25 feet in height;
- The dam has a capacity of less than 15 acre-feet and is more than 25 feet in height;
- The dam is used for primarily agricultural purposes and has a capacity less than 100 acre-feet (should use or ownership change, the dam may be subject to regulation);
- The dam is owned or licensed by the Federal Government; or
- The dam is operated for mining purposes under 45.1-222 or 45.1-225.1 of the *Code of Virginia*.

Dams are assigned a hazard classification based on the downstream loss anticipated in the event of dam failure. It should be noted that hazard potential is not related to the structural integrity of the dam. The hazard potential classification speaks to the level of risk to life and economic loss the dam imposes on downstream properties and facilities. The classification scheme used by the VS&WCB is listed blow.

- **Class I** - dams which upon failure would cause probable loss of life or excessive economic loss
- **Class II** - dams which upon failure could cause possible loss of life or appreciable economic loss
- **Class III** - dams which upon failure would not likely lead to loss of life or significant economic loss
- **Class IV** - dams which upon failure would not likely lead to loss of life or economic loss to others

The owner of each regulated Class I, II, or III dam are required to apply for an operational and maintenance certificate from the VS&WCB. One of the requirements for obtaining the operational and maintenance certificate is the development of an emergency action plan. These plans are filed with the local emergency management official and VDEM. Table 4.1.6a provides the number of each dam classification in each community within the Peninsula region. For further information regarding community-specific dams, please contact the office of the local emergency services coordinator.

Table 4.1.6a
Number of Dams in Peninsula by Community and Hazard Classification

Community	No. Class I Dams	No. Class II Dams	No. Class III Dams
City of Hampton			
James City County			
City of Newport News			
City of Williamsburg			
York County			

4.1.7 Drought

All areas of Virginia are susceptible to drought, which is defined by a combination of intensity and duration. In a one-year time frame, droughts are considered large when the 12-month rainfall averages about 60% of normal. On a multi-year time scale, 75% of normal rainfall indicates a serious problem. High summer temperatures can exacerbate the severity of a drought. Normal high summer temperatures in the central and northern Virginia areas can reach the 90 degree mark and higher. Most of the soil is relatively wet, and a great deal of the sun's energy goes toward evaporation of the ground moisture. However, when drought conditions eliminate soil moisture, the sun's energy goes toward heating the ground surface and temperatures reach into the low 100's – further drying the soil. This can have a

devastating effect on crops, stream levels and water reserves. A short-term precipitation deficit of six summer weeks can often ruin crops. Droughts lasting a year, which occur in the Mid-Atlantic when the region receives 60 percent of the typical 40 inches of rain, begin to draw down water wells and livestock ponds and decrease stream flows and water reserves.

There have been five major droughts in Virginia that have affected the communities in the Peninsula region since the early 1900's. The drought of 1930-32 was one of the most severe droughts recorded in the state. The droughts of 1938-42 and 1962-71 were less severe; however, the cumulative stream flow deficit for the 1962-71 drought was the lowest of the five droughts because of the extreme duration. The droughts of 1980-82 and 1998-99 were the least severe for the state; however, the drought of 1998-99 hit the communities of the Peninsula region particularly hard.

The drought of 1930-32 had a tremendous impact on Virginia. Numerous rivers completely dried up, crops were totally destroyed, drinking water was difficult to come by, forest fires burned approximately 300,000 acres of land (over 30 times the current annual average) and average summer temperatures were in the low 100's. After adjusting for inflation, the estimated losses for this drought were $1 billion. If the same drought were to occur in Virginia today, the devastation would be much greater due to an increased population and demand for water resources.

The drought of 1998-99 had a particularly hard impact on the communities of the Peninsula region. The region received some of the lowest rainfall totals in over 120 years. This led to decimated crops, depletion of water and feed reserves, as well as a number of brush fires. Many stream-gauging stations reported stream flow at or below 10% of the normal flow. During August of 1999 the NOAA ranked the Peninsula area in a moderate to severe drought, by use of the Palmer Drought Index (See Figure 4.1.7a).

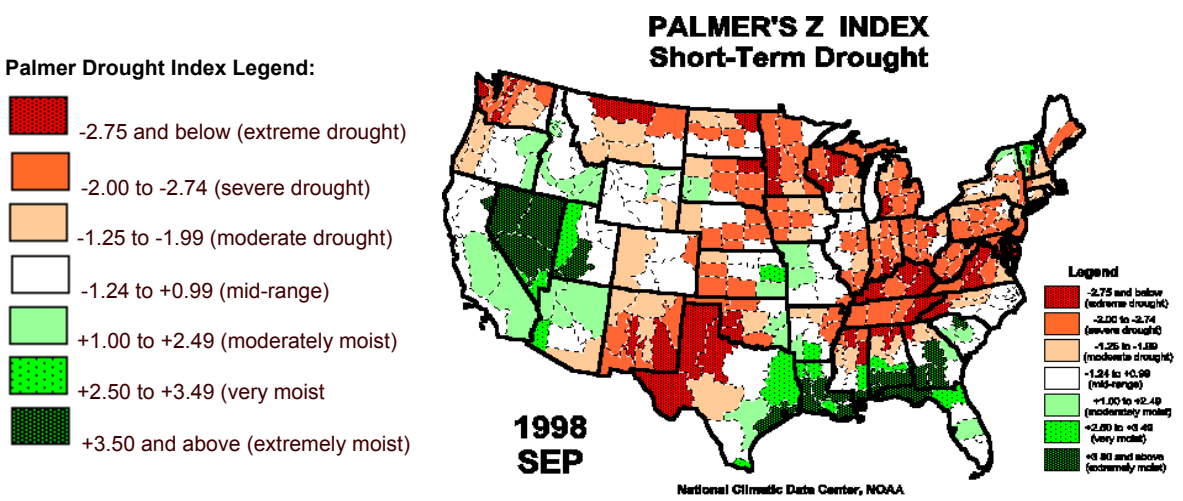


Figure 4.1.7a: Palmers Index Source: NOAA 1999

The Palmer Drought Index (PDI) has been used for U.S. drought monitoring for the last 30 years. It is based on a water budget model that incorporates the balance between water supply (i.e., precipitation), soil moisture, runoff, and water demand (computed from estimates for evaporation and transpiration).

On December 1, 1998 the Governor of Virginia declared a state of emergency and requested for federal aid. Losses in the region grew to nearly $190 million.

VDEM rates Virginia's drought risk as "Significant," with Virginia communities experiencing approximately 20 years of severe drought in the last century, which has caused millions of dollars of damage. Proper

mitigation planning can lessen a drought's impact and keep communities from being severely impacted by drought conditions.

4.1.8 Hurricanes

Hurricanes and tropical storms, as well as tropical depressions, are all tropical cyclones. According to the National Hurricane Center (NHC), once they have formed, tropical cyclones maintain themselves by extracting heat energy from the ocean at high temperatures and releasing heat at the low temperatures of the upper troposphere. Hurricanes and tropical storms bring heavy rainfalls, storm surge, and high winds, all of which can cause significant damage. These storms can last for several days, and therefore have the potential to cause sustained flooding, high wind, and erosion conditions. Of particular importance to communities susceptible to hurricane damage is the track of an approaching storm. Proximity and direction are important factors when determining impacts and subsequent damage from the storm.

Damage generated from high winds is a frequent occurrence within the Peninsula region. Hurricane season in the North Atlantic runs from June 1 until November 30, with the peak season between August 15 and October 15. The average hurricane duration is 12 to 18 hours. Wind speeds may be reduced by 50% within 12 hours of landfall. These storms are capable of producing a large amount of rain in a short period; as much as 6 to 12 inches of rain has occurred within a 12 to 16 hour period.

In 1971, wind engineer Herbert Saffir and hurricane expert Dr. Robert Simpson developed a scale to classify hurricanes. The Saffir-Simpson scale rates the intensity of hurricanes based on wind speed and barometric pressure measurements. The National Weather Service uses the scale to predict potential property damage and flooding levels from imminent storms. Although the scale assigns a wind speed and surge level to each category of storm, in recent years, there has been more and more recognition of the fact that wind speed, storm surge and inland rainfall are not necessarily of the same intensity for a given storm. Therefore, there is some interest in classifying hurricanes by separate scales according to each of these risks. However, the Saffir-Simpson Scale is still the most widely used classification tool for hurricanes. The scale is outlined in Table 4.1.8a.

Over time, researchers and meteorologists have further refined the analysis of the wind damage that hurricanes can produce by differentiating the concept of sustained winds from peak gusts. Sustained winds are measured over longer periods of time, typically a minute. A peak gust is the highest 2 to 5 second wind speed.

Table 4.1.8a
Saffir-Sampson Scale and Typical Damages

Category	Sustained Wind Speeds (Mph)	Tidal Surge (Ft)	Pressure (Mb)	Typical Damage
Tropical Depression	<39	--	--	
Tropical Storm	39-73	--	--	
Hurricane 1	74-95	4-5	> 980	*Minimal* – Damage is done primarily to shrubbery and trees, unanchored manufactured homes are damaged, some signs are damaged, no real damage is done to structures on permanent foundations.

Table 4.1.8a
Saffir-Sampson Scale and Typical Damages

Category	Sustained Wind Speeds (Mph)	Tidal Surge (Ft)	Pressure (Mb)	Typical Damage
Hurricane 2	96-110	6-8	965-980	*Moderate* – Some trees are toppled, some roof coverings are damaged, major damage is done to manufactured homes.
Hurricane 3	111-130	9-12	945-965	*Extensive Damage* – Large trees are toppled, some structural damage is done to roofs, manufactured homes are destroyed, and structural damage is done to small homes and utility buildings.
Hurricane 4	131-155	13-18	920-945	*Extreme Damage* – Extensive damage is done to roofs, windows, and doors, roof systems on small buildings completely fail, some curtain walls fail.
Hurricane 5	> 155	> 18	< 920	*Catastrophic Damage* – Roof damage is considerable and widespread, window and door damage is severe, there are extensive glass failures, some buildings fail completely.

Historically, hurricanes have come close enough to Virginia to produce hurricane force winds (>74 mph) about three times every twenty years, while tropical storms, nor'easters and thunderstorms occur much more frequently. Virginia has felt the effects of over 20 hurricanes this century. In particular, the Peninsula region's communities were damaged by Hurricane Floyd in September of 1999 and Hurricane Isabel in September of 2003. Hurricane Floyd moved through the area dropping 4-5 inches of rain within 24 hours and generated winds in excess of 40 mph. Trees and power lines were knocked down, roads flooded, over 5,500 homes were left without power, and one woman was killed when a tree fell on her car. Hurricane Isabel was much more destructive. Its impact on the Commonwealth of Virginia was staggering; resulting in $1.6 billion in damages with over 1,186 homes and 77 businesses completely destroyed, 9,110 homes and 333 businesses with major damage, and over 107,000 homes and 1,000 businesses with minor damage. Hundreds of power lines were blown down leaving almost 2 million electrical customers without power. Crop losses were calculated to be $59.3 million with another $57.6 million in damages to farming infrastructure.

VDEM rates Virginia's overall wind risk as "High," and the Peninsula communities are no exception. Historical occurrences of high winds generated by hurricanes, tropical storms, nor'easters and thunderstorms are a strong indication of future events. With proper planning, the impact and amount of damage caused by high winds can be lessened.

In evaluating the localized threat of hurricanes and tropical storms to the region, the planning team analyzed NOAA hurricane track data from 1851 to 2003 to identify storms that have posed a threat to the area (Table 4.1.8b). Based on this data, 22 storms, including hurricanes, tropical storms, tropical depressions, and extratropical storms tracked through the Peninsula region (Map B-2). Of the 22 storms, ten were tropical depressions and extratropical storms (winds <39 mph), eleven were tropical storms (winds of 39-73 mph), and one was a category 2 hurricane. A total of 114 tropical cyclones of varying magnitude have tracked over the Peninsula communities or within a 50-mile radius. In addition, the 2004 hurricane season was one of the most severe in recorded time. Five separate tropical cyclones (Charley, Frances, Ivan, Jeanne, and Gaston) of varying magnitude hit the eastern and Gulf coasts of the United States.

Table 4.1.8b
Historic Hurricanes that Tracked Across Peninsula Communities 1851 to 2003
Source: NOAA 2004

YEAR	NAME	PRESSURE (millibars)	WIND (mph)	CATEGORY
1859	NOTNAMED	0	60	TS
1872	NOTNAMED	0	45	TS
1874	NOTNAMED	0	60	TS
1877	NOTNAMED	0	60	E
1882	NOTNAMED	0	45	TS
1886	NOTNAMED	0	40	TS
1889	NOTNAMED	0	45	TS
1902	NOTNAMED	0	45	E
1904	NOTNAMED	0	65	TS
1924	NOTNAMED	0	40	E
1928	NOTNAMED	0	35	E
1933	NOTNAMED	971	70	TS
1933	NOTNAMED	0	60	TS
1944	NOTNAMED	998	40	E
1961	UNNAMED	0	40	TS
1969	CAMILLE	0	30	TD
1971	GINGER	0	35	TD
1971	GINGER	0	35	TD
1979	BOB	1011	25	TD
1985	DANNY	1012	30	E
1996	BERTHA	993	70	TS
2003	ISABEL	958	100	H2

E = Extratropical
TS = Tropical Storm
TD = Tropical Depression
H2 = Category 2

DRAFT

4.1.9 Nor'easters

Nor'easters are slow moving low pressure systems off of the coast that typically form either in the Gulf of Mexico or in the Atlantic Ocean off the east coast of the U.S. Although typically associated with winter storm events, nor'easters can occur anytime of the year. Low pressure systems develop off the East Coast that lead to storms that bring strong northeast winds, heavy rains/precipitation and storm surge to coastal areas. Although nor'easters' winds and storm surge generally are less intense than that of hurricanes, nor'easters can linger for several days over a given area. Storms with this longer duration allow larger accumulations of precipitation as well as more damage to structures as they are exposed to wind and flooding for longer periods of time. High pressure systems to the north can increase the impact of the storm.

The Dolan-Davis Scale (1993), Table 4.1.9a, was developed to identify and classify the damages that may occur during these storm events. This scale is a useful tool to estimate the damage potential of a nor'easter. This scale is especially useful to those communities in the Peninsula region that experience tidal flooding.

Table 4.1.9a
The Dolan-Davis Nor'easter Intensity Scale (Davis and Dolan, 1993)

Storm Class	Beach Erosion	Dune Erosion	Overwash	Property Damage
1 (Weak)	Minor changes	None	No	No
2 (Moderate)	Modest; mostly to lower beach	Minor	No	Modest
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 at regional-scale; millions of dollars

Historical Occurrences

At times, nor'easters have become so strong that they have been labeled the "White Hurricane". In order for these storms to form, several things need to occur. High pressure builds over New England. Arctic air flows south from the high center into Virginia. The colder and drier the air is, the denser and heavier it becomes. Winds around the storm's center can become intense, building waves that rack the coastline and sometimes pile water inland causing extensive coastal flooding and severe beach erosion. The strong wind from the northeast gives the storm its name, "nor'easter". Unlike hurricanes, which usually come and go within one tidal cycle, the nor'easter can linger through several tides, each one piling more water on shore and into the bays. Table 4.1.9b is a listing of historic nor'easters for Virginia.

Table 4.1.9b
Historic Virginia Nor'easters

Date	Description
April 6, 1889	Hampton Roads recorded a sustained wind of 75 mph from the north and Cape Henry 105 mph though it was estimated to have reached 120 mph. Tides at Norfolk reached 8.37 ft above Mean Low Water which is over 4 feet above flood. From *The Norfolk Landmark* on April 7, 1889 - "...the storm was equal of the famous one of August 18, 1879. Water Street from end to end was a river of raging water; both ends of Main Street were covered with water, West Main Street as high as Jackson. Jackson Street was flooded clear up to Main. The water was a foot at the station-house door, and all the low Washington, was far under water." And on April 9, 1889, *The Norfolk Landmark* reported that damage was heavier than the August 1879 hurricane even though the wind was not as strong in Norfolk, because it lasted for a much longer duration. It was estimated that the water was 18 inches higher than that of August 1879. This storm was said to have lasted two days and two nights. Rain, snow and sleet fell with the storm and totaled 3.2 inches liquid. Drummonds bridge was swept away (later replaced by the Ghent bridge). Trees were uprooted and roofs were torn off.
March 1-3, 1927	High winds around the nor'easter gusted to 62 mph at Cape Henry, Virginia and 52 mph at Norfolk. Heavy snow fell across North Carolina into Virginia and travel was delayed for 2 to 3 days. In Virginia Beach, high tide and heavy surf on March 2 inflicted considerable damage. The beaches in some places eroded 50 feet and denuded of the overlying sand so that the clay beneath was exposed. The large hotel in Virginia Beach and other buildings were severely damaged along with the boardwalk and other protective structures.
April 11, 1956	A severe nor'easter gave gale winds (40 mph +) and unusually high tides to the Tidewater Virginia area. At Norfolk, the strongest gust was 70 mph. The strong northeast winds blew for almost 30 hours and pushed up the tide which reached 4.6 feet above normal in Hampton Roads. Thousands of homes were flooded by the wind-driven high water and damages were large. Two ships were driven aground. Water front fires were fanned by the high winds and, the flooded streets made access for Fire Fighters very difficult and it added to the losses.
March 6,1962	The March 1962 (Ash Wednesday) Northeaster flood had a devastating effect on the city of Poquoson. This low pressure cell which moved from south to north past Hampton Roads and then reversed its course, moving again to the south, brought with it huge volumes of water and high waves which battered the mid-Atlantic coast for several days.
January 27, 1998	A slow moving Nor'easter combined with high tides resulted in an extended period of gale force onshore winds driving tides to 6.44 feet above Mean Low Lower Water (MLLW) at Sewells Point in Norfolk. Moderate coastal flooding was reported across the middle peninsula and northern neck areas. The damage was estimated at $1.5 million.

DRAFT

Table 4.1.9b
Historic Virginia Nor'easters

Date	Description
February 4,1998	A nor'easter battered eastern Virginia for 3 days. The slow movement of the storm resulted in an extended period of gale to storm force onshore winds driving tides to 7.0 feet above MLLW at Sewells Point in Norfolk. The tide levels resulted in severe coastal flooding throughout the Hampton Roads area and the Virginia Eastern Shore. Damage was estimated at $75 million for the Hampton Roads area.
January 24-25, 2000	The nor'easter spread heavy snow into Virginia during the night of the 24th and through the 25th. Storm warnings were posted for the late news on the 24th, but those who went to bed early without catching the news were startled to see the heavy white stuff falling in the morning. Several inches of snow was on the ground at daybreak, with winds gusting at 25 to 45 mph creating blizzard conditions in some areas. The region was at a stand still. Airports and transit systems were shut down. Schools were closed. Federal, state and county government offices were closed or quickly closed once the full impact of the storm was realized. Some federal employees in Northern Virginia who begin their commutes well before the government shutdown at 7 am were left battling the storm to attempt to return home. Drifts of four to five feet were common. Snow mixed with sleet and freezing rain in some of the eastern counties.

Source: VDEM 2004

4.1.10 Tornado

Tornadoes are one of nature's most violent storms. In an average year, about 1,000 tornadoes are reported across the United States, resulting in 80 deaths and over 1,500 injuries. A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of one mile wide and 50 miles long. A tornado's destructive power is measured using the Fujita Damage Scale (See Table 4.1.10a).

Table 4.1.10a
Fujita Damage scale

Scale	Wind Estimate (MPH)	Typical Damage
F0	< 73	Light Damage Some damage to chimneys; branches off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	Moderate Damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	Considerable Damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
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 away some distance; cars thrown and large missiles generated.

Source: Fujita 1971.

A tornado's intense power often destroys homes, downs power lines, and can cause significant tree damage. The NCDC has recorded 13 tornado events within the Peninsula communities since 1950, see Table 4.1.10b. The magnitudes of the events range from F0 to F3. The F3 tornado hit the City of Newport News on September 5, 1979 cutting a path 50 yards wide and 3 miles in length. It is estimated

that this tornado caused $2.5 million in property damage. Most of tornados have occurred from June through October; however, tornadoes can strike at any time during the year.

Table 4.1.10b
NCDC Tornado Data for Peninsula

Community	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
City of Hampton	9/5/1979	F2	0	9	$250K	0
City of Hampton	9/4/1996	F0	0	0	$1K	0
City of Hampton	9/4/1999	F2	0	6	$7.7M	0
James City County	8/6/1993	F1	0	10	$5.0M	0
City of Newport News	6/27/1951	F1	0	0	$3K	0
City of Newport News	4/6/1958	F1	0	0	$250K	0
City of Newport News	10/7/1965	F0	0	0	$3K	0
City of Newport News	9/5/1979	F3	0	2	$2.5M	0
City of Newport News	6/1/1982	F0	0	0	$0K	0
City of Newport News	8/11/2001	F0	0	0	$50K	0
City of Williamsburg	None Reported					
York County	11/1/1951	F1	0	0	$3K	0
York County	7/12/1996	F1	0	0	$15K	0
York County	8/7/2003	F1	0	0	$20K	0

NCDC dataset included data from January 1, 1950 to June 30, 2004

Hurricanes have historically spawned tornadoes throughout the Commonwealth and the Peninsula communities. Table 4.1.11c lists hurricanes that have spawned tornadoes.

Table 4.1.10c
Hurricane Spawning Tornadoes

Date	Hurricane	Tornadoes Generated
September 4, 1915	unnamed	1 small tornado
October 29, 1917	unnamed	2 small tornados
September 5, 1935	unnamed	5-7 tornadoes, 3 dead, 21 injured
August 31, 1952	Able	1 strong tornado
July 10, 1959	Cindy	3 small tornadoes
September 29, 1959	Gracie	3 strong tornadoes, 12 dead, 13 injured
September 10, 1960	Donna	1 strong tornado
September 5, 1979	David	8 tornadoes, 6 strong, 1 dead, and 19 injured
July 25, 195	Bob	2 small tornadoes and 1 strong
August 17, 1994	Beryl	1 strong tornado injuring 10 people
October 5, 1995	Opal	3 small tornadoes
July 12, 1996	Bertha	5 small tornadoes injuring 9 people
September 6, 1996	Fran	2 small tornadoes
July 24, 1997	Danny	3 small tornadoes
September 4, 1999	Dennis	1 strong tornado injuring 6 people

Source: Watson 2004b

The tidewater area is subject to tornadoes because waterspouts are common and once on shore are classified as tornados. In 2000 16 waterspouts were reported, three of these made landfall. Additionally, the interaction of cool coastal breezes and warm air masses over land create ideal tornadic conditions when thunderstorms move over this boundary (Watson 2004c). Figure 4.1.11a below shows the distribution of tornadoes in Virginia by County from 1950-2000.

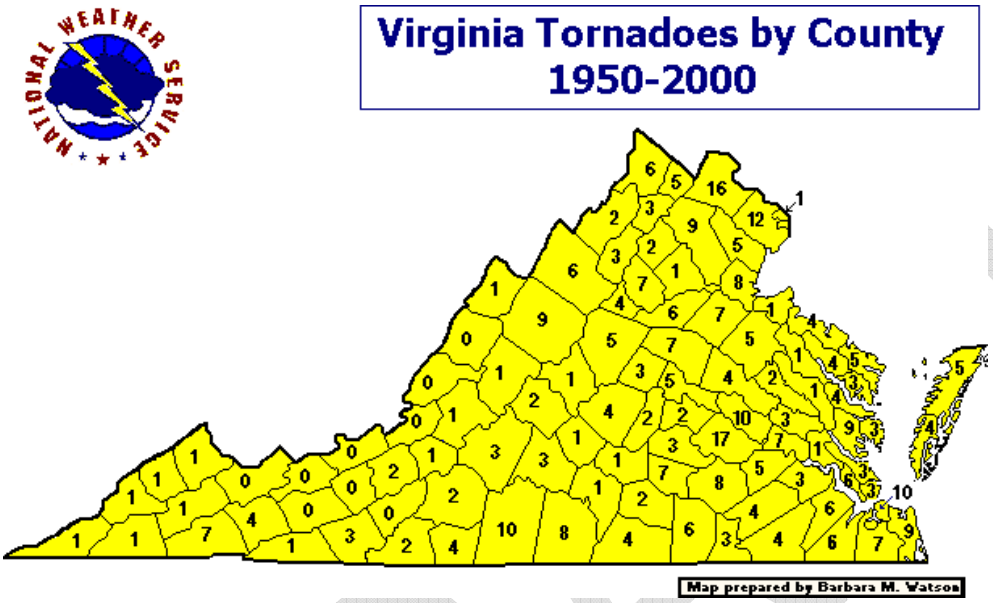


Figure 4.1.11a

More recently, hurricanes Frances and Charley of the 2004 hurricane season spawned numerous unconfirmed tornados. As detailed information relating to damage and wind speed intensity on the Fujita scale become available over time, the region's communities may wish to update this portion of the plan. As described in the section discussing lightning strikes, it is important to note that other tornados may have occurred in the region over time. Without a sighting or confirmation, however, inclusion in the body of tornado statistics is impossible.

4.1.12 Wildfire

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. They often start unnoticed and spread quickly, often causing dense smoke that fills the area for miles around. Naturally occurring and non-native species of grasses, brush, and trees fuel wildfires. (FEMA, How-to Guide, 2-29) Generally, there are three major factors to consider in assessing the threat of wildfires to a community: topography, vegetation, and weather.

The type of land cover in an area affects a number of factors including ease of ignition, the intensity with which a fire burns, and the facilitation of wildfire advancement. Topographic variations, such as steeper slopes, can lead to a greater chance of wildfire ignition. Generally speaking, steeper slopes are predisposed to convective pre-heating, which warms and dries the vegetative cover. Also, slopes that generally face south receive more direct sunlight than those facing north. Direct sunlight in turn dries vegetative fuels, thereby creating conditions that are more conductive to wildfire ignition. Population density has a causal relationship to wildfires because an overwhelming majority of the wildfires in Virginia are ignited intentionally or unintentionally by humans. Travel corridors increase the probability of human presence, which increases the potential for wildfire ignition. Hence, areas closer to roads have a higher ignition probability. The hurricanes of the past few years, especially hurricane Isabel, have brought down

hundreds of trees. This increase in potential fuel has initiated a public awareness campaign by the Virginia Department of Forestry (VDOF) to educate the public to this increased hazard.

The VDOF has determined that approximately 30% of the Peninsula area is in a High fire risk zone, 38% is in a Moderate fire risk zone and 32% is in a Low fire risk zone (See Map B-??). Table 4.1.12a summarizes the wildfire hazard for each Peninsula community. There were approximately 32 wildfires in the Peninsula area between 1995 and 2001, which resulted in approximately 70 acres burned (VDOF 2003).

It is apparent that wildfires are a danger within the Peninsula area. The area's specific vegetative cover, topography and urban characteristics (relatively high population and dense road networks in some areas) furnish an environment with a predominantly High fire risk. Historical evidence shows that many of these fires could have been prevented with proper mitigation – lessening the negative impact on the environment and the citizens of the Peninsula area.

Table 4.1.12a
Wildfire Hazard for Peninsula Communities

Community	High Fire Risk (%)	Medium Fire Risk (%)	Low Fire Risk (%)
City of Hampton	6.7	11.6	81.7
James City County	33.3	12.6	54.1
City of Newport News	9.1	20.8	70.1
City of Williamsburg	9.0	36.1	54.9
York County	50.0	39.9	10.1
Peninsula Planning District (total area)	30.4	37.8	31.7

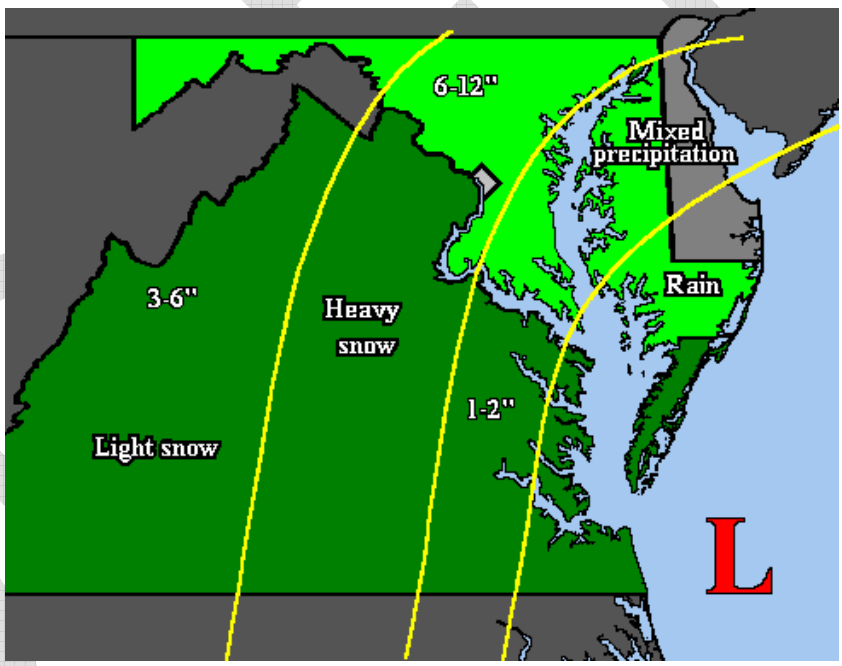
DRAFT

4.1.13 Winter Storms

Winter storms can refer to various types of precipitation including snow, freezing rain and ice. Sometimes winter storms are accompanied by strong winds creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chill. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days while utility companies work to repair the potentially extensive damage. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians. Heavy snow can immobilize a region and paralyze a community, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse buildings and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. The cost of snow removal, repairing damages, and loss of business can also have a significant economic impact on communities.

Although not all of Virginia's biggest winter storms are nor'easters, many of them are. At times, nor'easters have become so strong that they have been labeled the "White Hurricane." For a nor'easter to develop, the jet stream enters the West Coast of the U.S. and splits into the north branch crossing the northern Rockies and Canada and the south branch dipping to the Gulf Coast states. The south branch turns northeast across Virginia and rejoins the north branch off Newfoundland.

Figure 4.1.13a: Precipitation Map



Source: VDEM 2004

Wind blowing counter clockwise around the storm center carries warm, moist air from the Gulf Stream up and over the cold inland air. The warm air rises and cools and snow begins. Heavy snow often falls in a narrow 50 mile wide swath about 150 miles northwest of the low pressure center (see Diagram 1.0 - Low pressure center or storm center is represented by an "L"). The Peninsula area often finds itself within this 50-mile wide swath of dangerous winter weather.

It is also not uncommon for the Peninsula area to experience sleet, freezing rain, and ice storms. In fact, the Peninsula area has experienced over 19 major winter weather events from 1993 – 2003. One such event occurred in December, 1998. A major ice storm hit central and eastern Virginia, with ice accumulations of 0.5 – 1.0 inches that left dozens of power lines downed along with hundreds of tree limbs. Over 400,000 people in the area were left without power. The combination of automobile accidents, power line repair and clean-up cost the area over 20 million dollars (NCDC 2004).

The recurrence of severe winter weather in the Peninsula area is certain. These winter storms often leave tree limbs and power lines down resulting in dangerous conditions. Other impacts can include collapsed roofs from fallen trees and heavy ice and snow loads as well as icy roads and sidewalks. Winter weather can have devastating effects on a community and occurs fairly frequently.

Table 4.1.13a
Significant Winter Storm Events

Date	Description
January 18-19, 1857	More than a foot of snow fell with temperatures in the single digits and teens across the state. Strong winds caused structural damage on land and wrecked ships at sea. One account states that Norfolk was buried under 20 foot drifts of snow. Temperatures fell to between -10° to -17° in the city. According to eyewitness accounts, the cold was so extreme that all Virginia rivers were frozen over. The Chesapeake Bay was solid ice a mile and a half out from its coast. At Cape Henry, one could walk out 100 yards from the lighthouse on the frozen ocean.
March 1-2, 1872	Known as **"The Great Storm of 1872."** During the evening of March 1, winds increased from the northeast to gale force (over 40 mph) on the coast and snow began blowing and drifting. It was very cold and the snow accumulated several inches. The wind drove water up into the Tidewater area and up the rivers. Water rose rapidly flooding wharves and the lower part of Norfolk.
November 17, 1873	Severe storm and gale brought high tides to tidewater area flooding wharves and the lower portion of Norfolk.
December 26-28, 1892	Norfolk set three local records for snow (Official Weather Records began in 1871). The greatest single storm amount with 18.6 inches; the most in 24 hours with 17.7 inches; and the maximum depth of snow on the ground with 18.6 inches. Normal snowfall at Norfolk is only 7.8 inches per year.
The Winter of 1960-1961	The stormy pattern of the last couple winters continued with three more significant storms. The first one was December 10-12, 1960. Heavy snow and high winds hit from Virginia into New York. In Virginia, snow fall ranged from 4 to 13 inches in the north and west. There were seven fatalities in Virginia attributed to the storm. The next snowstorm struck on January 19-20 from North Carolina to New York. Virginia saw up to 12 inches. It caused a great traffic jam in northern and central Virginia and DC. Two deaths were blamed on the storm in Virginia, due to overexertion and accidents. The third storm struck February 3-5 and hit like a blizzard with severe cold and gale force winds. Eight inches fell in Washington, 2 to 13 inches across Virginia with as much as 36 inches in New York. There four fatalities in Virginia.
March 5-9, 1962	The "Ash Wednesday Storm." The storm hit Virginia during "Spring Tide" (sun and moon phase to produce a higher than normal tide). The storm moved north off the coast past Virginia Beach and then reversed its course moving again to the south and bringing with it higher tides and higher waves which battered the coast for several days. The storm's center was 500 miles off the Virginia Capes when water reached nine feet at Norfolk and 7 feet on the coast. Huge waves toppled houses into the ocean and broke through Virginia Beach's concrete boardwalk and sea wall. Houses on the Bay side also saw extensive tidal flooding and wave damage. A million dollars in damage was done to NASA's Wallops Island Launch facility and an estimated $4 million in wind and flood damages occurred to the City of Hampton. Winds up to 70 mph built 40-foot waves at sea.
Winter of 1980	On January 4 and 5, a heavy wet snow fell over eastern Virginia with as much as 18 inches reported at Williamsburg. A second storm hit on February 6 that dumped 6 inches in Williamsburg and as much as 20 inches at Virginia Beach. Over a foot of snow fell in Norfolk. Once again, arctic air had settled over Virginia and temperatures were in the teens. More than a foot (13.7 inches) of snow fell at Norfolk. The heavy snow combined with strong winds to create blizzard conditions. Norfolk's total for the season came to a record 41.9 inches making this the snowiest winter ever for eastern Virginia.
February 1989	This was a month of big swings in the weather for Southeast Virginia. Twice, Norfolk saw record high temperatures in the mid 70°s followed by a significant snowfall. The two

	storms that struck dumped a record 24.4 inches of snow at Norfolk. Over 14 inches occurred during one 24 hour period. It was the most snow to occur in one month in southeast Virginia in the last 100 years.
March 13-14, 1993	The "Superstorm of March '93" was also known as "The Storm of the Century" for the eastern United States, due to its large area of impact, all the way from Florida and Alabama through New England. The storm was blamed for some 200 deaths and cost a couple billion dollars to repair damages and remove snow. In Florida, it produced a storm surge of 9 to 12 feet that killed 11 people (more deaths than storm surges Hurricanes Hugo and Andrew combined) and it spawned 11 tornadoes. In a large swath from Alabama to New England, it dropped over a foot of snow. As the storm's center crossed Virginia, weather stations recorded their lowest pressure ever. This storm was not the storm of the century for Virginia. Virginia had seen greater snowfall and more damage by past storms such as the "Ash Wednesday" storm in March, 1962. It was the biggest storm in a decade and it packed quite a wallop to the western portions of the Commonwealth. Unlike most big winter storms that move up the coast, this storm took a more inland track across Richmond and the Chesapeake Bay. It brought rain and some high winds to Southeast Virginia and heavy snow and blizzard conditions over portions of the north and west. A foot to a foot and a half of snow fell along the foothills to the Blue Ridge with two feet to the west. Extreme Southwest Virginia saw 30 to 42 inches of snow from the storm (the most snow in over 25 years). Some roofs collapsed under the weight of the snow. Winds produced blizzard conditions over portions of the west with snow drifts up to 12 feet! Interstates were shut down. Shelters were opened for nearly 4000 stranded travelers and those that left without heat and electricity. Virginia called out its National Guard to help with emergency transports and critical snow removal. Eleven people died in Virginia during and immediately following the storm from over-exertion and heart attacks shoveling snow or from exposure and hypothermia. Snow removal and clean-up costs were estimated at 16 million dollars.
January 6-8, 1996	Much of the eastern seaboard received 1 to 3 feet of snow during the “Blizzard of ’96.” Wind gusts of over 50 mph were common and resulted in blizzard conditions for much of the east coast, including Virginia. Many areas of Virginia received over 20 inches of snow. Numerous accidents and flood related damages were reported in the area, along with 13 deaths in Virginia. Virginia, along with Ohio, Pennsylvania, Maryland, West Virginia and New York were declared Presidential Disaster Areas. All totaled the blizzard and resulting flooding killed and estimated 187 people and caused approximately $3 Billion in damages along the eastern seaboard.
December 23, 1998	A prolonged period of freezing rain and some sleet resulted in ice accumulations of 0.5-1.0 inches. The heavy ice accumulations on trees and power lines caused widespread power outages. Many accidents occurred due to slippery road conditions, especially bridges and overpasses – Many secondary roads were impassable due to fallen trees and tree limbs. Approximately 400,000 people were left without power in central and eastern Virginia and damages totaled more than $20 million.
February, 2004	On February 15 and 16, a winter storm hit the Tidewater area of Virginia dumping wind driven rain, freezing rain, and snow on a significant portion of Hampton Roads. Snow accumulation totals in some areas reached three to six inches and winds were reported at up to 30 mph. Sleet also fell across much of the region causing roads to become icy and treacherous.

*Data from the NOAA National Climactic Data Center

DRAFT

4.1.14 Landslide

Landslides constitute a major geologic hazard because they are widespread, occurring in all 50 states, and cause $2 billion in damages annually and more than 25 fatalities on average each year (USGS 2003). Landslides can and do occur in conjunction with other natural hazards, such as heavy rain events and earthquakes or human activities like excavations. Landslides can be broken down into falls, flows, or slides based on the type of earth movement (USGS 2003).

Most of the Peninsula area is classified as low landslide risk on the Landslide Incidence and Susceptibility Map (USGS 2001). There are however small areas that are listed as Moderate. These areas occur in Hampton, James City County, Newport News, and York County (see landslide hazards map, Map B-??). The data used to generate these maps (USGS 2001) was highly generalized; therefore further investigation at the local level is required.

4.1.15 Expansive Soils

Soils with a high enough content of certain types of clay experience a change in volume from dry to wet conditions. These types of soils are called expansive soils or "shrink-swell" soils. Hazards associated expansive soils arise from the change in volume experienced. This physical factor can result in slope instability and cause damage to building foundations. Each community within the Peninsula region addresses the issue of expansive clay in their respective comprehensive plans, and each addresses soil conservation based on state standards set forth in the Virginia Erosion and Sediment Control Law and Regulations.

4.1.16 Multi-Hazard Correlation

While this plan investigates individual hazard history and occurrence, it should be noted that hazards typically occur together or result in other hazards later in time. For example, hurricanes are defined by sustained wind speed but not all hurricane damage is from wind. Heavy rains associated with these storms and storm surge generated by waters piled up on shore result in devastating flooding. The effects of natural hazards can last years after the initial devastating events. High wind events blow down trees, which can increase the wildfire hazard for years to come due to an increase in downed dead or dying woody debris. In addition, uprooted trees in low-lying or typically damp areas can cause other problems. For example, the root bulb from the fallen tree can excavate large holes in the landscape, which when filled the rainwater can provide breeding grounds for mosquitoes.

4.1.17 Critical vs. Non-critical Hazards

Based on readily available data, local knowledge, and observations, the HMPC performed a two-stage evaluation of above-mentioned hazards utilizing the Natural Hazard Ranking Sheet (Appendix B). First, they grouped the hazards into two categories; critical and non-critical hazards (Table 4.1.17a).

> **Non-critical hazards:** those hazards that have occurred very infrequently or have not occurred at all in the historical data. They are not considered a widespread threat resulting in significant losses of property or life. Non-critical hazards also include hazards that occur frequently (on average every year) and those that the jurisdiction is equipped to mitigate. For example big snow storms can slow continuity of daily operation even though the community has procedures in place to mitigate these hazards because they occur frequently.
>
> **Critical hazards:** those hazards in which historical data exists to document impacts that have resulted in significant losses to the region and its citizens. Critical hazards are those natural hazards that occur with little or no warning and have the possibility to create such wide spread destruction that resources from outside the jurisdiction would be required to respond or recover.

Secondly, the HMPC, in conjunction with the consulting team, ranked each critical hazard based on the threat posed to its citizens (Table 4.1.17a). Hazards that ranked critical with a medium to high hazard level were then investigated further and a vulnerability analysis was performed.

Table 4.1.17a
Hazard Identification Results

Hazard type	Non-Critical/Critical	Hazard Level
Flooding	Critical	High
Hurricanes	Critical	Medium
Tornadoes	Critical	Medium
Wildfire	Critical	Medium
Nor'easters	Critical	Low
Winter storms	Critical	Low
Earthquakes	Non-Critical	Low
Biological Hazards/Epidemics	Non-Critical	Low
Thunderstorms	Non-Critical	Low
Dam Failure	Non-Critical	Low
Extreme Heat	Non-Critical	Low
Expansive Soils	Non-Critical	Low
Landslides	Non-Critical	Low

5.0 Community Specific Profiles

The previous section addressed general hazard information that affects the entire Peninsula region. The following sub-sections address those hazards that have a significant recurrence interval that is measurable and a known hazard history. These sections describe the history of occurrence, vulnerability assessment for a particular hazard, and the section ends with a community capability analysis for addressing these natural hazards.

A vulnerability assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from hazard events. The assessment provides the foundation for the rest of the mitigation planning process by defining and quantifying various problems. The assessment process focuses attention on vulnerable areas with the greatest needs by evaluating populations and facilities that are most vulnerable to community specific hazards and to what extent injuries and damages may occur (FEMA, 2001). The risk assessment process allows a community to better understand its potential risk and associated vulnerability to hazards.

The planning team developed the natural hazard risk assessment for each member jurisdiction in three main steps: 1) a hazard analysis, 2) vulnerability assessment, and 3) capability assessment. This information provides the framework for the HMPC and the consulting team to develop and prioritize mitigation strategies and plans to reduce the risks and vulnerabilities that the region's communities may encounter from future hazard events.

This Multi-Hazard Identification and Risk Assessment (MHIRA) evaluates the location, extent, magnitude, probabilities, and likelihood of the occurrence of hazards. While there are many hazards that could potentially affect the region, certain hazards are more likely to cause significant damage than others. This analysis attempts to measure these potential impacts and identify the hazards that create the greatest possible risks.

The second phase in this process is the vulnerability assessment, which estimates the extent of injury and damages that may result from a hazard that occurs within the member jurisdiction. The vulnerability assessment also examines the region's existing and future land uses, development trends, and demographics within the identified hazard areas, so that the impacts of future disasters can be lessened.

The third phase of this process includes the capability assessment. The capability assessment will provide the member jurisdiction with a better understanding of its own preparedness levels and its capability to mitigate against natural hazards.

The planning process has identified the natural hazards posing a threat to the Peninsula Region and described, in general, the vulnerability of the counties and cities to these risks. The next step, prior to forming goals and objectives for improving each jurisdiction's ability to reduce the impacts of these risks, is to assess what loss prevention mechanisms are already in place. This will provide the counties and cities net vulnerability to natural disasters and more accurately focuses the goals, objectives and proposed actions of this plan. This part of the planning process is referred to as 'The Mitigation Capability Assessment'.

The PHMPC took two approaches in conducting this assessment for the Counties and Cities. First, an inventory of common mitigation activities was made through the use of a matrix. The purpose for this effort was to identify activities and actions that were either in place, needed improvement, or could be undertaken, if deemed appropriate. Second, the PHMPC conducted an inventory of existing policies, regulations, and plans. These documents were collected and reviewed to determine if they contributed to reducing hazard related losses, or if they inadvertently contributed to increasing such losses.

The mitigation capabilities of each community are individually identified and included as part of each community profile. The section below presents State, Regional, and Federal mitigation capabilities that are common to all communities within the Peninsula planning area.

State Capabilities

Virginia Department of Emergency Management (VDEM)

VDEM's Strategic Plan 2004-2013

This plan recognizes and prepares for Virginia's changing demographics and increasing threats over the next ten-year period. Goals, strategies and resources are built around the mission statement, which is "to protect the lives and property of Virginia's citizens from emergencies and disasters by coordinating the state's emergency preparedness, mitigation, response, and recovery efforts."

Commonwealth of Virginia Emergency Operations Plan (State EOP), April 2004

This plan consists of a Disaster Recovery Plan, a Hazard Mitigation Plan, and five hazard-specific volumes.

Virginia Emergency Alert Systems (EAS) Stations

Specific AM/FM radio stations provide updated disaster and directional information to listeners in the Commonwealth. Thirty-seven radio stations cover fourteen regions in Virginia, including: Eastern Virginia (2 FM stations), Southside (1 AM station, 1 FM station), and the Richmond extended area (2 AM stations, 2 FM stations), which provide coverage for the Peninsula planning area.

Virginia Department of Conservation and Recreation (VDCR)

Chesapeake Bay Regulations

As part of Virginia's commitment to help preserve and restore the resources of the Chesapeake Bay, the Virginia General Assembly adopted the Chesapeake Bay Preservation Act in 1988. The Chesapeake Bay Preservation Area Designation and Management Regulations were adopted in 1990 and amended in

December 2001. The revised regulations took effect in March 2002 and localities had until December 31, 2003 to revise their local ordinances to become consistent with the new language.

The regulations require that communities east of Interstate 95, the "Tidewater" area of Virginia, regulate and enforce the use of Resource Protection Areas (RPAs) and Resource Management Areas (RMAs). The RPA is relevant to floodplain management because new development within the designated area must maintain a 100-foot buffer from the waterline of any perennial stream, as defined by the regulations. This includes all tidal water bodies in coastal areas. Both the Hampton Roads Planning District Commission and the VDCR provide technical assistance and guidance to communities in enforcing the regulations.

Virginia Flood Damage Reduction Act
Virginia's General Assembly enacted the Virginia Flood Damage Reduction Act of 1989. The legislation was the result of several disastrous floods and coastal storms that impacted the state between 1969 and 1985. To improve Virginia's flood protection programs and place related programs in one agency, responsibility for coordination of all state floodplain programs was transferred in 1987 from the Water Control Board to VDCR. The agency was named manager of the state's floodplain program and designated coordinating agency of the NFIP under the act.

Virginia Dam Safety Act
The Virginia Soil and Water Conservation Board established the state's dam safety regulations as a result of the Virginia Dam Safety Act of the Code of Virginia. The Dam Safety Program's purpose is to provide for safe design, construction, operation and maintenance of dams to protect public safety. The program enforces permit requirements related to the construction and alteration of impounding structures. All dams in Virginia are subject to the Dam Safety Act unless specifically excluded.

Shoreline Erosion Advisory Service (SEAS)
DCR's Shoreline Erosion Advisory Service promotes environmentally acceptable shoreline and riverbank erosion control measures to protect private property and reduce sediment and nutrient loads to the Chesapeake Bay and other waters of the Commonwealth. In addition, the program promotes research for improved shoreline management techniques to protect and enhance Virginia's shoreline resources.

Since SEAS was created in 1980, DCR has provided technical advice about tidal shoreline erosion problems to more than 7,000 clients. They include landowners, local governments and environmental agencies. SEAS program activities also help local governments deal with sediment and nutrient loads from shoreline erosion and, of course, address the Commonwealth's obligation to reduce sediment and nutrient loads in the Chesapeake Bay and its tributaries.

Virginia Marine Resources Commission (VMRC)
The Virginia Marine Resources Commission was established in 1875 as the Virginia Fish Commission. The Virginia Wetlands Act was passed in 1972 and placed under the management of VMRC, as was the 1980 Coastal Primary Sand Dune Protection Act. In 1982, the General Assembly broadened the 1972 Wetlands Act to include non-vegetated wetlands. Environmental permits issued by the Habitat Management Division are of three types: subaqueous or bottomlands, tidal wetlands, and coastal primary sand dunes. The division's authority specifically regulates physical encroachment into these valuable resource areas.

The permit process relies on a single Virginia joint local/state/Federal permit application. The review process takes into account various local, state and Federal statues governing the disturbance or alteration of environmental resources. The Marine Resources Commission plays a central role as an information clearinghouse for all three levels of review. Applications receive independent yet concurrent review by the community's Wetlands Board, the VMRC, the Virginia Department of Environmental Quality, and the U.S. Army Corps of Engineers.

Regional Capabilities

Hampton Roads Planning District Commission (HRPDC) – HR STORM and HR CLEAN
Regional governments are developing and implementing stormwater management programs that include construction of best management practices (BMPs), system maintenance, water quality testing, enforcement of program standards and public education. Significant results and cost cuts are achieved through regional cooperation. These regional efforts are coordinated through HR STORM, a coalition of local government staff members who share ideas and pool resources for targeted educational program efforts about stormwater management. In addition, the HRPDC facilitates monthly meetings of the Regional Stormwater Management Committee where program staff members from 14 localities in Hampton Roads coordinate efforts in water quality data gathering and pollutant loading studies. These data enable localities to better target future program dollars to improve management of stormwater quantity and quality. HR CLEAN is the recycling and litter prevention education program of the HRPDC.

Hampton Roads Emergency Management Committee (HREMC) - The objective of the HREMC is to promote the inter-jurisdictional and inter-agency coordination of emergency management issues and foster emergency preparedness in the Hampton Roads area. The purpose is to provide a working group for the exchange of information, experience and technology among Hampton Roads Emergency Management officials and individuals with responsibilities in emergency management. Participants include community officials, American Red Cross, military liaisons, State and Federal agency representatives, Verizon, Virginia Natural Gas and Dominion Power. Public information materials include *Is Your Family Prepared for Hurricanes,* a detailed family preparedness booklet focusing on Hampton Roads' procedures for evacuation and readiness.

Hampton Roads Planning District Commission (HRPDC) - Regional Emergency Management Technical Advisory Committee (REMTAC). This organizational, policy-making group is composed of HRPDC staff, Emergency Management staff in local communities and VDEM staff. REMTAC works to enhance emergency management plans on a regional level. The HRPDC provides support to REMTAC and local jurisdictions on a variety of emergency management issues, including: hurricane evacuation planning; emergency shelter planning; debris management resource planning; disaster planning for populations with special needs and public education awareness and hurricane preparedness programs. REMTAC members have access to a secure online forum among registered participants, in addition to monthly meetings.

Surry Power Station Emergency Public Information – Although Surry Power Station, located on the James River about 7 miles south of Williamsburg, would not normally be included in natural hazard mitigation planning, the facility represents a noteworthy manmade hazard and area emergency management plans pay considerable attention to the siren warning system HREMC participating communities exclude all other hazard siren systems to avoid confusion over multiple siren tones and signals in the region.

Federal Capabilities

The National Flood Insurance Program (NFIP)
Established in 1968, the NFIP provides flood insurance in communities that agree to regulate new development in identified Special Flood Hazard Areas through the adoption and enforcement of a minimum Flood Damage Prevention Ordinance. The program also requires, as a condition of every Federally-backed mortgage within an identified Special Flood Hazard Area, the purchase and maintenance of a flood insurance policy for the life of the loan.

The Coastal Barrier Resources Act (CoBRA)
Established in 1972, the CoBRA is environmental legislation administered by the U.S. Fish and Wildlife Service. The legislation provides for the identification and protection of Coastal Barrier Resources. The

act further prohibits the availability of Federally-backed assistance within identified areas, including grants, loans, mortgages and Federal flood insurance.

Coastal Zone Management Act (CZMA)
Established in 1972, and amended by the Coastal Zone Protection Act of 1996, the CZMA defines a national interest in the effective management, beneficial use, protection and development of the coastal zone and identifies the urgent need to protect the natural system from these competing interests. The act encourages states to exercise their full authority over the lands and waters of the coastal zone. Annual cost-share grants to states create an incentive to establish land use and environmental protection standards that have served to reduce damage from coastal storms, as well as achieve other multi-objective goals. In Virginia, the Department of Environmental Quality (DEQ) oversees the Virginia Coastal Resources Management Program.

Military Installations
Several military installations within the planning area of this document are not addressed herein: Langley Air Force Base, Fort Eustis, Fort Story, Fort Lee, Fort Monroe, Naval Weapons Station Yorktown, and the Coast Guard Training Center Yorktown. Liaisons from each of these facilities participate in the HREMC, but funding for this document and the actions recommended herein are limited to the participating jurisdictions and the non-Federal lands over which they maintain land use authority.

5.1 City of Hampton Profile

Like many communities in the United States, the City of Hampton is subject to a number of natural hazards. Some of these hazards have a measurably higher chance of occurring in any given year (recurrence interval) than do others based on historical records of occurrence. Since the advent of federal, modern-era disaster assistance programming in 1969, the Commonwealth of Virginia has had 30 Presidential Disaster Declarations (including the declaration for the impacts of Hurricane Isabel in September 2003). Of these 30 declarations, 22 have been flood events (with several floods spawned by hurricanes); six were winter weather events (snow/ice/extreme cold), one for tornadoes and another for the terrorist attacks at the Pentagon in Arlington on September 11, 2001.

The following sections present a detailed assessment of critical hazards that affect the City. Understanding these hazards will assist the Peninsula region in its process of identifying specific risks and developing a mitigation strategy to address those risks.

5.1.1 Flooding – City of Hampton

Its geographic location makes the City of Hampton most susceptible to coastal flooding. Storms associated with coastal flooding include tropical cyclones and nor'easters. These types of events typically drop large amounts of rain and generate high winds that result in storm surge. Storm surge is essentially the water that is pushed toward the shore by the persistent force of the winds of an approaching storm. It should be noted that astronomical tides occur independent of climactic conditions. Depending on the tide level at the time of landfall, the storm surge may be elevated due to high tides or spring high tides. Flash flooding and urban flooding are also a concern within the City limits.

As part of the National Flood Insurance Program (NFIP), FEMA has created a Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) for the City of Hampton, dated July 16, 1987. The National Climatic Data Center (NCDC) tracks the occurrence of flooding events for communities across the nation. The City of Hampton has developed surge elevations for its parcel data set. All of these data sources were considered in developing the hazard ID and vulnerability assessment.

FEMA Flood Insurance Study (FIS)
The Flood Insurance Rate Maps (FIRMs), which accompany this FIS, delineate the 100- and 500-year flood hazard boundaries for flooding sources identified in areas of growing development or areas

predicted to have future development, at the time of the report. A detailed wave height analysis was developed to in order to delineate the 100- and 500 year flood hazard boundaries for the City. This analysis resulted in a 100-year Stillwater elevation of 8.5 feet for the City and a maximum 100-year wave crest of 11-13 feet. Refer to this report for a detailed description of methods and assumptions. The significant flood events outlined in the FIS are given below in Table 5.1.1a.

Table 5.1.1a
Significant Flood Events from City of Hampton FIS

Date	Storm	Tide Elevations
August 1933	Hurricane	Max tide heights averaged 8 feet
March 1962	Nor'easter	Max tide heights averaged 6.8 feet
April 1956	Nor'easter	Not given
October 1957	Hurricane	Not given
September 1960	Hurricane	Not given

Source: FEMA 1987

Table 5.1.1b
National Flood Insurance Policy Data

Community City of Hampton	Policies in Force	Insurance in Force	Written Premium in Force	Total Losses	Total Payments
1978-Sept 03	9,547	$1,292,954,700	$396,465	1,750	$4,733,900
1978-Dec 03	9,664	$1,324,989,300	$4,090,417	3,153	$28,519,595
1978-Jun 04	9,792	$1,384,777,600	$4,386,398	3,193	$36,984,731

National Climactic Data Center Data (NCDC)

The NCDC, operated by National Oceanic and Atmospheric Administration (NOAA), keeps a record of significant weather related events and damage estimates for the entire country. Listed below are some of the more significant events that have affected the City of Hampton (Table 5.1.1b).

Table 5.1.1c
NCDC Listed Significant Flood Events –City of Hampton

Date	Event	Rain Fall (in.)	Comments
September 15 to 17, 1999	Hurricane Floyd	12.0-18.0	▪ Numerous roads washed out due to flooding ▪ Flooding considered 500-year flood ▪ Enormous crop damage
October 17 to 18, 1999	Hurricane Irene	4.0-7.0	▪ Numerous flooded roads and road closures
July 24, 2000	Flash Flood	Torrential Rain	▪ Up to 35 residences had to be evacuated due to high water
June 14, 2002	Flash Flood	Not Given	▪ Numerous reports of street flooding ▪ Water shooting out of manholes

Table 5.1.1c
NCDC Listed Significant Flood Events –City of Hampton

Date	Event	Rain Fall (in.)	Comments
August 28, 2002	Flash Flood	2.0-3.0 in 3 hours	▪ Caused road closures
September 3, 2003	Flash Flood	Not Given	▪ Many roads flooded

5.1.2 Hurricanes – City of Hampton

Virginia has felt the effects of over 20 major hurricanes this century. In particular, the communities within the Peninsula area were damaged by Hurricane Floyd in September of 1999 and Hurricane Isabel in September of 2003. Hurricane Floyd moved through the area dropping 4-5 inches of rain within 24 hours and generated winds in excess of 40 mph. Trees and power lines were knocked down, roads flooded, over 5,500 homes were left without power, and one woman was killed when a tree fell on her car.

Historical Occurrences – City of Hampton
The FIS of the City identified three historic hurricanes that affected the City (see Table 5.1.1a above); however, specific damage estimates were not given. The NCDC dataset did not list any hurricanes for the City of Hampton but numerous hurricanes were listed under other Peninsula jurisdictions (see following community specific sections).

Hurricane Isabel made landfall on September 18, 2003 as a Category 2 hurricane near Drum Inlet, North Carolina. Hurricane Isabel is considered to be one of the most significant tropical cyclones to hit this area since hurricane Hazel (1954) and the Chesapeake-Potomac hurricane of 1933. Isabel produced storm surges 6-8 feet above normal high tide levels and is directly responsible for 10 deaths in Virginia and indirectly responsible for 22 deaths. Isabel caused wide spread wind and storm surge damage in eastern North Carolina and southeastern Virginia, currently estimated at $925 million in Virginia. All of the above data was taken from the NOAA Tropical Cyclone Report for Hurricane Isabel (Beven and Cobb, 2004).

The 2004 hurricane season was one of the most severe in recorded time. Five separate tropical cyclones (Charley, Frances, Ivan, Jeanne, and Gaston) of varying magnitude hit the eastern and Gulf coasts of the United States. Although the damage from these storms to the peninsula region was minor, the occurrence of significance multiple events over a few weeks speak to the random nature of these storms.

Post Hurricane Isabel Insurance Losses

Community City of Hampton	Policies in Force	Insurance in Force	Written Premium in Force	Total Losses	Total Payments
1978-Sept 03	9,547	$1,292,954,700	$396,465	1,750	$4,733,900
1978 - Jun 04	9,792	$1,384,777,600	$4,386,398	3,193	$36,984,731
Hurricane Isabel Change	245	$91,822,900	$3,989,933	1,443	$32,250,831
% Change	2.57%	7.10%	1006.38%	82.46%	681.27%

5.1.3 Tornados – City of Hampton

The City of Hampton has experienced 3 tornadoes over the period of 1979 to 1999 (Table 5.1.3a), which have caused a variety of damages. The three tornadoes identified on the NCDC dataset consisted on one F0 and two F2. The most significant tornado occurred in September of 1999 ahead of an approaching hurricane (Dennis). This tornado caused extensive structural damage to a three block area. As a result, 6 people were injured and three apartment complexes and an assisted living facility were condemned.

Table 5.1.3a
Historic Tornadoes – City of Hampton

Date	Magnitude	Deaths	Injuries	Property Damage ($)	Crop Damage ($)	Descriptions
9/5/1979	F2	0	9	250k	0	▪ Unroofed a home and damaged 27 others (Watson 2004c) ▪ Spawned by Hurricane Davis (Watson 2004c)
9/4/1996	F0	0	1	1k	0	▪ Minor damage
9/4/1999	F2	0	6	7.7M	0	▪ Extensive structural damage to 3 block area ▪ 3 apartment complexes and 1 assisted living complex condemned ▪ 2 additional apartment complexes partially condemned ▪ 460 persons forced to evacuate ▪ 800 vehicle damaged ▪ Occurred ahead of hurricane Dennis

5.1.4 Wildfire – City of Hampton

Wildfires are caused through human acts, be they intentional (i.e. arson) or accidental, or through natural occurrences, such as lightning strikes. Wildfire danger can vary greatly season to season and is often exacerbated by dry weather conditions. The high productivity and the tendency for the previous year's growth to remain interspersed among the current year's growth make it a wildfire danger. Because of wild fire risk, the Virginia Department of Forestry (VDOF) has provided new information on identifying high-risk fire areas. Their Fire Risk Assessment Map was designed to help communities determine areas with the greatest vulnerability to wildfire.

The Wildfire Risk Assessment Map, Map B-5, delineates the aerial extent of wildfire vulnerability within the City of Hampton, based on VDOF fire risk assessment data. Parameters used to establish these risk boundaries are based on land use, population density, slope, land cover and proximity to roads. Land use, land cover and proximity to county roads are the main influences on the fire risk. The map shows that approximately 7% of the City is located in the High wildfire risk zone, which attributed to <vegetative cover ?? look at map>. No Fire incidences were reported with the City limits by the VDOF for the time period of 1995-2001.

The proximity of the tree lines or brush to the highway or roadway is also included in the wildfire risk analysis to capture the human/wildfire casual relationship. Travel corridors increase the probability of human presence across a landscape, thereby increasing the probability of wildfire ignition. As such, areas closer to roads are much more likely to attain a higher ignition probability. As stated previously in this report, the Peninsula region is currently experiencing an accelerated development rate. Land that once was rural and inaccessible is under development. Although the clearing of land for development

removes potential fuel sources for wildfire, the wildfire hazard is not necessarily diminished because human access to the area is significantly increased. This development trend increases the wildland/urban interface, which places structures in close proximity to large amounts of vegetation, which in turn increases the risk of wildfire (NWUIFPP undated).

5.1.5 Vulnerability Assessment – City of Hampton

The HMPC conducted a vulnerability analysis for each natural hazard that was identified as critical with medium to high hazard potential. These hazards include: flooding, hurricanes, tornadoes, and wildfire. This section describes the method used to perform the vulnerability analysis for each hazard and then lists the results of this analysis. The vulnerability assessment investigated the following:

- Number and value of at risk structures
- Number of at risk critical facilities
- Extent of at risk critical infrastructure

Flooding Method – City of Hampton
The City GIS Department provided a digital parcel polygon layer containing attribute fields that included a FEMA flood hazard designation and improvement values. This database was queried to determine which parcels were within 100-yr flood hazard boundaries. The improvement values of these parcels were then totaled.

Flood Results – City of Hampton
From the vulnerability analysis it was determined that 11,094 parcels are designated as Zone AE, 348 parcels were designated as Zone VE, and 23 were designated as Zone A. All of these zones represent the 1% annual chance (100-year) flood hazard as defined by FEMA. There were a total of 50,194 parcels in the database with a flood zone determination. The Analysis found that approximately 23% of these parcels are designated with 100-year flood hazard. The database provided by the City also included the types of dwelling on each parcel. Table 5.1.5a summarizes this analysis.

Table 5.1.5a
Summary of Flood Analysis – City of Hampton

Structure Type	Total No.	% of total	No. designated as 100-year	Improvement value ($)
Dwelling	42,056	84	10,815	$1,124,810,600
Commercial	1,977	4	391	$2,067,112,700
Other	538	1	285	$20,001,300
No value	5,681	11	N/A	N/A
Total	**50,252**	**100**	**11,491**	**3,211,924,600**

Repetitive Loss Areas – City of Hampton
In recent years, FEMA has developed a concept to highlight the impact that repetitively flooded structures have had on the NFIP. The term “repetitive loss,” as applied to the NFIP, refers to any property for which two or more flood insurance claims in excess of $1,000 each in a 10-year period of time have been paid. In 1998, FEMA reported that the NFIP's 75,000 repetitive loss properties have already cost $2.8 billion in flood insurance payments and numerous other flood prone properties continue to remain at high risk in the Nation's floodplains. While these properties make up only 1-2 percent of the flood insurance policies currently in force, they account for 40 percent of the country's flood insurance claim payments. A report on repetitive loss structures completed by the National Wildlife Federation found that 20 percent of these structures are listed as being outside of the 100-year floodplain (Conrad et al. 1998).

Including flood insurance claims paid as a result of flood damage caused by Hurricane Isabel in 2003, FEMA has identified 60 structures as repetitive loss structures in the City of Hampton (Table 5.1.5b). The

properties listed below do not reflect the total number of houses that have flooded in the City, rather the total number of repetitive losses.

Table 5.1.5b
City of Hampton Repetitive Losses

Community with Repetitive Loss Properties	Total
City of Newport News	60

Wildfire Method-City of Hampton
The Wildfire Risk Assessment data, provided by the VDOF, was utilized to estimate the wildfire risk for the City of Hampton. The Wildfire Risk Map (Appendix B-??) shows that approximately 7% of the City is in a High risk area. This data layer was overlaid with the City parcel mapping in order to estimate the value of at risk structures. The VDOF also provided the number of wildfire incidence reported from 1995-2001.

Wildfire Results-City of Hampton
According to the VDOF, zero incidence of wildfire was reported for the City of Hampton from 1995-2001.

Table 5.1.5c
Wildfire Risk – City of Hampton

Total No. Buildings	No. Buildings in High Wildfire Zone	Est. at Risk Value

<insert data when available>

Hurricane Vulnerability Methods – City of Hampton
Hazards U.S. – Multi Hazard (HAZUS®*MH*) was utilized to perform a wind hazard analysis for the entire Peninsula region. HAZUS®*MH* software is a multi-hazard loss estimation program that was developed under a cooperative agreement between the National Institute of Building Sciences and FEMA. The current version of HAZUS®*MH* has the ability to calculate earthquake, wind, and flood hazards as well as potential economic losses associated with these hazards. The software is designed with the flexibility to perform loss estimations at three different levels. Level 1 utilizes all default parameters built into the software. Levels 2 and 3 require user defined scenarios and building inventory data. For the purpose of this Plan, a Level 1 wind analysis was performed to calculate the wind hazard for each Peninsula community. The software package also has the ability to analyze historic storm data or a probabilistic scenario. For this analysis, the 1933 historic hurricane was analyzed because the conditions of this storm were close to Hurricane Isabel (this storm is not included in the current version of HAZUS-MH). The probabilistic scenario activates a database of many thousands of storm tracks and intensities. This scenario generates hurricane hazards based on set return periods. These return periods define the statistical probability that a storm of a given size and intensity could occur within any year.

Hurricane Vulnerability Analysis – City of Hampton
Table 5.1.8b lists the total dollar value ($1,000) of exposed structures for the City of Hampton. The default data set provided with the HAZUS®*MH* software is based on the 2002 census data. It is recognized by the authors of this plan that the current development trends in the Peninsula region may render the 2002 census data that HAZUS®*MH* is programmed with somewhat obsolete. However, this analysis depicts the probability of occurrence and can generally be used estimate potential damages due to high winds.

Table 5.1.5d
Total dollar value of Exposed Structures from HAZUS®*MH* – City of Hampton

Occupancy Type	Total $ Value Exposed Structures ($1,000)
Residential	7,243,284
Non-Residential	1,100,057
Total	**8,343,341**

<insert values fron Ed Copeland HAZUS analysis>

Hurricane Vulnerability Analysis – 1933 Hurricane
The 1933 hurricane historic storm track passed approximately 90 miles east of the Peninsula region and had a maximum wind gust of 54 miles per hour. HAZUS-MH estimated that most of the damage from this storm if it occurred today would be associated with residential structures 57 total) experiencing minor damage. This analysis found that approximately 66,700 tons of debris, mostly from downed trees, would be generated across the Peninsula Region.

Hurricane Vulnerability Probabilistic Analysis – City of Hampton
The probabilistic analysis generated with the HAZUS®*MH* software utilized the same building stock information listed above for the 1933 historic hurricane. The probabilistic scenario generates hurricane hazards based on set return periods. These return periods define the statistical probability that a storm of a given size and intensity could occur within any year. The probabilistic method was used to generate loss estimations of storms with specific recurrence intervals; 10-, 20-, 50-, 100-, 200-, 500-, and 1000-year. Since residential structures comprised a significantly large percentage of the occupancy classification these data are presented in Table 5.1.5c below.

Table 5.1.5e
Summary of Probabilistic Analysis – Residential Structures – City of Hampton

Return Period	Residential Building Damage – No. of Buildings			
	Minor	Moderate	Severe	Destruction
10-year	42	4	0	0
20-year	449	48	9	0
50-year	6,069	1,034	148	35
100-year	12,906	4,896	1,057	739
200-year	15,238	7,334	1,816	1,273
500-year	14,693	11,004	4,457	3,632
1000-year	10,263	12,075	8,424	8,798

<insert 100-peak wind gust map from HAZUS analysis>

Tornado Vulnerability Analysis – City of Hampton
Three tornado events were reported for the City of Hampton (see discussion in Hazard Identification Section). The random nature of these events renders them difficult predict and therefore difficult to

conduct a vulnerability analysis. The entire City has equal statistical probability of experiencing a tornado. Historic occurrences of tornadoes in the region show the severity of tornadoes ranges from F0 to F3 or the Fujita Scale, but the likelihood of a bigger torndadic event cannot be discounted.

The facilities and building stock that were identified as exposed under the hurricane hazards above are also exposed to tornado hazards. Tornados are random natural events that strike with little warning but are associated with thunderstorms and hurricanes.

5.1.6 Capability Assessment – City of Hampton

As an additional tool to assist with the examination of the hazards identified and to evaluate the community's ability to plan, develop, and implement hazard mitigation activities, the planning team developed a local capability assessment for the City of Hampton. This assessment is designed to highlight both the codified, regulatory tools available to the community to assist with natural hazard mitigation as well as other community assets that may help facilitate the planning and implementation of natural hazard mitigation over time.

Capability Assessment – City of Hampton
The purpose of this section of the planning process is to determine what policies, programs, regulations, and other mechanisms each jurisdiction, and the incorporated communities, already have in place that either contribute to, or hinder the ability to mitigate the effects of natural hazards.

In addition to the community's local capabilities as outlined in each section below, state, regional and Federal policy, regulations, and resources are available to the community to assist in directing natural hazard mitigation efforts.

The true value of a Mitigation Capability Assessment is in its analysis. For this plan, each community presents a good first effort, as exemplified by the inventory they have completed. This is an ongoing process that will continue with the implementation and maintenance of this plan. But this is not to say that that an initial analysis has not been completed. It is such an analysis that has led to this plan's strongest regional recommendation: to have each county certified as "Storm Ready" by the National Weather Service within the next three years. On the following page is the "key" to the Capability Assessment Matrix utilized and presented by each City/County.

Capability Assessment – City of Hampton

The following Capability Assessment Matrix has been used as a basis for the City of Hampton's mitigation plan.

Capability Matrix – City of Hampton

	City of Hampton
Comprehensive Plan	Yes
Land Use Plan	Yes
Subdivision Ordinance	Yes
Zoning Ordinance	Yes
Floodplain Management Ordinance	Yes
-Effective Flood Insurance Rate Map Date	7-3-95
-Substantial Damage Language?	Yes
-Certified Floodplain Manager?	No
-Number of Floodprone Buildings?	_____

Capability Matrix – City of Hampton

	City of Hampton
-Number of NFIP policies?	9,792
-Maintain Elevation Certificates?	Yes
-Number of Repetitive Losses?	60
CRS Rating?	none
Stormwater Program?	Yes
Building Code Version Full-time Building Official?	Yes, VUSBC
- Conduct "As-built" Inspections?	Yes
- BCEGS Rating	2
Local Emergency Operations Plan?	Yes
Hazard Mitigation Plan	No
Warning Systems in Place?	Yes
-Storm Ready Certified?	Yes
-Weather Radio Reception?	Yes
-Outdoor Warning Sirens?	No
-Emergency Notification (R-911)?	Yes
-other? (e.g., cable override)	Yes – cable override, CERT
GIS system?	Yes
-Hazard Data?	Yes
-Building footprints?	Yes
-Tied to Assessor data?	Yes
-Land Use designations?	Yes
Structural Protection Projects?	Yes
Property Owner Protection Projects	Yes
Critical Facilities Protected?	Not fully
Natural Resources Inventory?	No
Cultural Resources Inventory?	Yes, partial inventories
Erosion Control Procedures?	Yes
Sediment Control Procedures?	Yes
Public Information Program/Outlet?	Yes
Environmental Education Program?	Yes

Form of Governance
The Hampton City Council is composed of seven elected members, including an elected Mayor. Council selects the Vice Mayor after each election. Elections are held on the first Tuesday in May. Council members are elected to four-year terms in staggered elections in even years. Council appoints a City Manager who administers day-to-day City services and directs City agencies.

Guiding Community Documents
The City of Hampton has a range of guidance documents and plans for each of their departments. These include a comprehensive plan, 15 neighborhood/small area plans, capital improvement plans, and emergency management plans. The City uses building codes, zoning ordinances, subdivision

DRAFT

ordinances, and various planning strategies to address how and where development occurs. One essential way the municipality guides its' future is through policies laid out in the Comprehensive Plan.

Comprehensive Plan 2010 and Comprehensive Plan 2020

The Code of Virginia requires all cities and counties in the state to have a comprehensive plan and to review it every five years to determine if it needs to be revised. The City of Hampton's *Comprehensive Plan 2010* features the following:

- The plan presents long-range intentions regarding the direction and nature of future development, assesses current conditions and incorporates citizen desires into long-range public policy.
- Comprised of six elements that focus on aspects of future development: Land Use, Transportation, Community Facilities, Environment, Housing, and Urban Design.
- Environmental element focuses on Chesapeake Bay water quality, balancing environmental restraints and development needs, stormwater management, protecting and enhancing water access, and the need for inventories of significant natural resources.
- Plans for continued growth and development and urban design in designated growth/redevelopment areas, including:
    - Coliseum Central
    - Downtown Hampton
    - Buckroe Beach
    - King Street Corridor
- Plans for necessary transportation enhancements and improvements to service projected growth
- Plans for operation and expansion of public facilities to accommodate expected growth in the City, including bikeways, playgrounds, and pools.
- *Comprehensive Plan 2020* will be based on 10 neighborhood districts, rather than 7 original districts as in *Comprehensive Plan 2010*. The 2020 Plan had not yet been adopted in January 2005.

Zoning & Development Standards

- Identifies existing federal and state regulations for wetland, floodplain, and RPA/RMA protection.
- The document outlines required standards for new development and redevelopment based on use and zoning designation.

The City of Hampton has adopted the minimum requirements of the NFIP by designating the Flood Zone District as a Special Public Interest District in Zoning Ordinance §17.3-31. The community has 60 repetitive losses through the NFIP, 15 of which were constructed after the community's flood hazard areas were mapped (post-FIRM). Structures in A Zones must be constructed at or above the Base Flood Elevation, and structures in V-Zones must have their lowest horizontal structural member elevated to or above the base flood elevation. The Department of Codes Compliance enforced requirements for "substantially damaged" homes after Hurricane Isabel, but the process was exceedingly difficult and some difficult decisions were often left to the homeowners. The City's Building Permit application includes a notation regarding the map panel and zone designation, and a space for the Finished Floor Elevation.

A Site Plan Review Committee for new development is made up of representatives from Public Works, Division of Fire and Rescue, Police Division, Planning Department, Codes and Compliance, and any other department that the Director of Public Works deems necessary to review proposed plans. During the review of new site plans, recommendations concerning the plan may be made and any such suggestions shall be reported to the City Manager when the plan is submitted for his review. The committee is tasked with the responsibility of reviewing the plan to ensure its compliance with the City's building, structure, and safety codes. The Police Division is tasked with ensuring that Crime Prevention through Environmental Design (CPTED) is achieved. This is accomplished by ensuring appropriate lighting and landscaping design, while minimizing design barriers that may result in unsafe or unlawful activities. Emergency Management is not involved in the Site Plan Review Committee.

Building Codes
The Commonwealth of Virginia is responsible for enacting the Virginia Uniform Statewide Building Code (VUSBC), and the City of Hampton is responsible for enforcing the code locally. In January of 2005, the VUSBC is based on the 2000 International Building Code, International Plumbing Code, International Mechanical Code, and International Fire Protection Code, and the 1999 National Electrical Code. The 2003 version of the IBC has been incorporated into the VUSBC, and will go into effect in April 2005. The code contains the building regulations that must be complied with when constructing a new building or structure or an addition to an existing building, maintaining or repairing an existing building, or renovating or changing the use of a building or structure.

Enforcement of the VUSBC is the responsibility of the local government's building inspections department. Hampton charges fees to defray the costs of enforcement and appeals arising from the application of the code. The VUSBC contains enforcement procedures that must be used by the enforcing agency.

As provided in the Uniform Statewide Building Code Law, Chapter 6 (36-97 et seq.) of Title 36 of the Code of Virginia, the USBC supersedes the building codes and regulations of the counties, municipalities and other political subdivisions and state agencies, related to any construction, reconstruction, alterations, conversion, repair or use of buildings and installation of equipment therein. The USBC does not supersede zoning ordinances or other land use controls that do not affect the manner of construction or materials to be used in the construction, alteration, or repair.

Stormwater Program and Fees
The City's stormwater fee is a result of the Federal Clean Water Act of 1987, which mandated that cities of 100,000 or more persons reduce pollution before it reaches the Chesapeake Bay. Hampton established the stormwater fee because no Federal or state dollars were provided to implement water quality measures in accordance with the Federal mandate.

Monies from the stormwater fee are used to fund many programs related to water quality including environmental education, street sweeping, capital improvements to the system, drainage maintenance, administration, review of permits, inspection, and monitoring activities.

Public Education
Among the readily available public outreach mechanisms for the City of Hampton, the City's website (http://www.hampton.va.us/) provides residents with pertinent information, provides an on-line complaint form, property information tool, and answers numerous Frequently Asked Questions (FAQs). The City also posts most of its guiding documents, including the Comprehensive Plan on this site.

The City of Hampton is the first locality in Virginia to establish a centralized 3-1-1 customer call center that offers citizens round-the-clock access to City services and information. Residents dial 3-1-1 and reach the voice of call center staff. Customer Advocates (call-takers) help with everything from reporting a missed trash collection or pothole, to answering questions about the City budget or inquiries about a community center's hours.

The City's Department of Public Works has many different types of materials available for Hampton residents, businesses, teachers, youth, and adult groups. Materials may include coloring books, posters, promotional magnets, environmental tip sheets, and guides to all environmental services in Hampton. The Hampton Watershed Restoration Project offers annual waterway clean-ups, Chesapeake Bay friendly seminars, Adopt-a Stream cleanups, storm drain marking, environmental ambassador efforts and public education activities.

Emergency Preparedness
Emergency Alert System (EAS) is a national civil emergency alert system that uses message relays between member radio and television stations to inform the public about immediate threats to national security, life, and property. EAS is now routinely used for severe weather warnings and can also be

employed to disseminate Amber Alerts for missing children. The enhancement is an initiative of Governor Warner's Secure Virginia Panel designed to improve statewide preparedness, response, and recovery capabilities for emergencies and disasters. Governor Mark R. Warner announced June 5, 2004, that Virginia will enhance its public warning capabilities with a new satellite-based system that can rapidly transmit Emergency Alert System (EAS) messages throughout the Commonwealth.

Storm Ready – The National Weather Service has certified only 5 Virginia communities as "Storm Ready", including Hampton, Newport News, Danville, Fairfax County and Loudon County. StormReady is a nationwide community preparedness program that uses a grassroots approach to help communities develop plans to handle severe weather. The program encourages communities to take a new, proactive approach to improving local hazardous weather operations by providing emergency managers with clear-cut guidelines on how to improve their hazardous weather operations. To be officially StormReady, a community must:

- Establish a 24-hour warning point and emergency operations center;
- Have more than one way to receive severe weather warnings and forecasts and to alert the public;
- Create a system that monitors weather conditions locally;
- Promote the importance of public readiness through community seminars; and,
- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises.

Evacuation Plan – The City of Hampton's evacuation planning is prepared by the Virginia Department of Transportation. Phase 1 and Phase 2 evacuation routes are shown and discussed online at http://www.virginiadot.org/comtravel/hurricane-evac-hro.asp. The City's emergency management officials are re-examining the 28 existing evacuation routes in conjunction with new storm surge mapping (produced by VDEM, FEMA and the USACE), existing topography, floodplains, new mapping, new traffic patterns and new development.

Hampton Citizen Corps and CERT Program – The Hampton Citizen Corps is part of the USA Freedom Corps that creates opportunities for individuals to volunteer to help communities prepare for and respond to emergencies by bringing together local leaders, citizen volunteers and organizations. Hampton's umbrella program includes Neighborhood Watch, Volunteers in Police Service, Neighborhood Groups, and Community Emergency Response Training (CERT).

CERT helps communities respond to disasters during the first 72 hours following an event when flooded roads, disrupted communications, and emergency demand outweigh local emergency services. The purpose of CERT training is to provide private citizens with basic skills to handle virtually all of their own needs and then to respond to their community's needs in the aftermath of a disaster.

Other Mitigation Activities

Prior to Hurricane Isabel, placement of the geotube and beach nourishment at the north end of Buckroe Beach was the largest flood mitigation project financed by the City. Since 2001, the City has purchased 8 inland structures in Buckroe with plans to install a dry stormwater pond in the area. All substations in the City are out of the floodplain; however, one fire station remains in the floodplain (Buckroe Fire Station).

Since Hurricane Isabel (September 2003), approximately 12 scattered residential structures have been elevated to at least the Base Flood Elevation with homeowner financing. The City's Codes Compliance Department issued over 50 letters to homeowners providing eligibility for the NFIP's Increased Cost of Compliance program for insured structures. Two post-Hurricane Isabel FEMA HMGP project requests have been submitted to elevate a total of 27 homes in Buckroe, Grandview, Chesapeake Avenue and the Coliseum Central areas. The homes have not been elevated and the grants have not been approved or denied at the time this plan was prepared. Several other HMGP projects have been proposed and

rejected regarding relocating school facilities at Windmill Point, beachfront restoration at Buckroe Beach, seawall reconstruction at Chesapeake Avenue, and generator-wiring of critical facilities.

The City of Hampton plans to expand and improve Newmarket Creek Park. Newmarket Creek watershed has a significant history of flooding. The improved park will include additional designated open space in the floodplain, and additional canoe launches and docking areas in an effort to improve recreational access to local waterways.

The City's Household Chemical Collection Program is a drop-off program sponsored by the City of Hampton and the Virginia Peninsulas Public Service Authority (VPPSA) to serve residents in the City of Hampton for the disposal of household chemicals. This program helps remove aging hazardous chemicals from residences throughout Hampton, including areas that could be affected by flooding.

INFORMATION NOT PERTAINING TO THE CITY OF HAMPTON HAS BEEN REMOVED FROM THIS DOCUMENT. TO REVIEW INFORMATION PERTAINING TO ONE OF THE OTHER PARTICIPATING JURISDICTIONS, PLEASE VISIT THEIR WEBSITE.

DRAFT

References

Conrad, D., McNitt, B., and Stout, M., 1998. Higher Ground; A Report on Voluntary Property Buyouts in the Nation's Floodplains, A Common Ground Solution Serving People at Risk, Taxpayers and the Environment. National Wildlife Federation, Washington, D.C., July 1998.

Fujita 1971. Fujita Damage Scale. (Online). Available at http://www.ncdc.noaa.gov/oa/satellite/satelliteseye/educational/fujita.html

NOAA 1999. National Oceanic and Atmospheric Administration, National Weather Service. Climate of 1999 – June – August; Drought in the U.S., 15 September 1999. (Online). Available at http://www.ncdc.noaa.gov/oa/climate/research/1999/sum/us_drought.html#heat. 8 December 2004

NOAA 2004. National Oceanic and Atmospheric Administration, National Weather Service. (Online). Available at http://www.crh.noaa.gov/pub/heat.htm. 8 December 2004.

NWUIFPP undated. Wildland/Urban Interface Fire Hazard Methodology. National Wildland Urban Interface Fire Protection Program, undated. (Online) Available at http://www.fema.gov/pdf/reg-viii/wham.pdf

Reinhart, B. 2004. Personal Correspondence 7 December 2004. Mr. Brian Rheinhart, Project Manager, United States Army Corp of Engineers, Norfolk District, brian.k.rheinhart@usace.army.mil

VDEM 2004. Virginia Winters; Snow, Wind, Ice, and Cold. Virginia Department of Emergency Management. (Online) Available at http://www.vdem.state.va.us/library/vawinter/va-win.htm

VS&WCB. Virginia Soil and Water Conversation Board. (Online) Available at http://www.dcr.virginia.gov/sw/damsafty.htm

DRAFT

Appendix A

Peninsula Natural Hazard Mapping

Historic Virginia Earthquakes	A-1
Historic Hurricane Tracks	A-2
Peninsula Wildfire Risk Boundaries	A-3
Wildfire Risk Zones	A-4
Landslide Hazards	A-5
Peninsula Hazard Mitigation Planning Committee	A-6

DRAFT

Appendix B

Natural Hazard Ranking Sheets

To follow in Future version

DRAFT