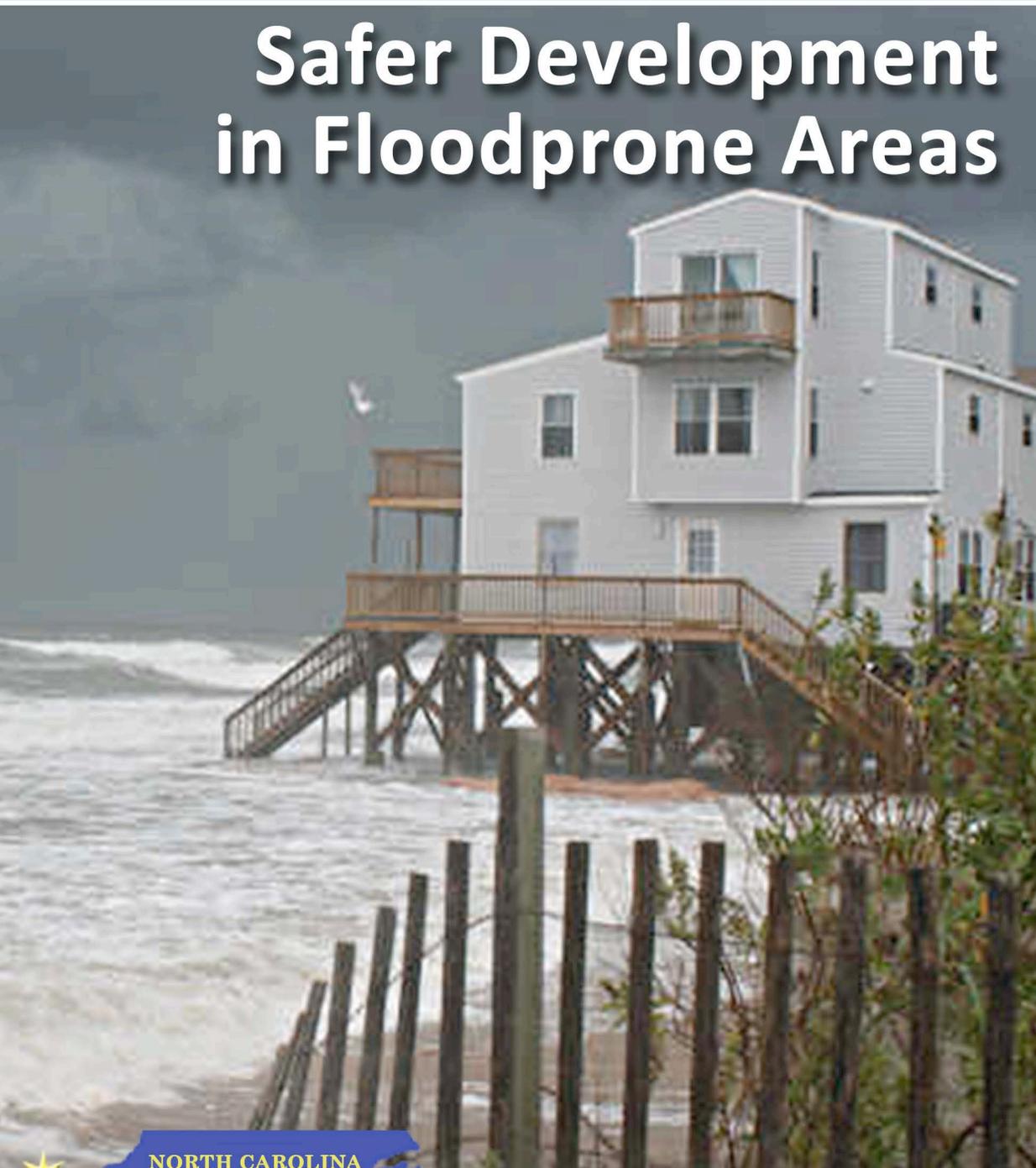




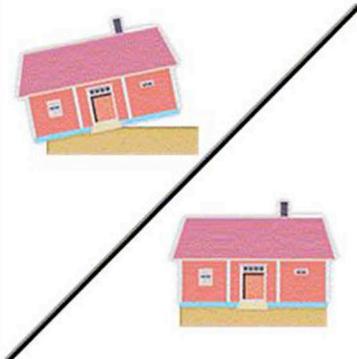
Safer Development in Floodprone Areas



Build it up



Build it out



Build it safer



FEMA'S COOPERATING TECHNICAL PARTNER

Second Edition
November 2011

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SAFER DEVELOPMENT IN FLOODPRONE AREAS

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PREFACE

The State of North Carolina faces extreme hazard and consequence from hurricanes and flooding. Between 1993 and 2010, there were 18 Federally declared disasters in North Carolina. Damages from Hurricane Floyd alone reached \$3.5 billion. Flood losses in North Carolina continue to escalate in spite of nearly 60 years of Federal flood control and 30 years of the National Flood Insurance Program. As of July 2010, all 100 counties and 438 municipalities in North Carolina participate in the National Flood Insurance Program. Community officials in these counties and communities recognize the importance of protecting their citizens from the devastation a flood can bring. Today, many communities also recognize that meeting the minimum requirements for participation in the National Flood Insurance Program does not provide the level of protection their citizens need and deserve. As such, communities are encouraged to adopt more stringent floodplain management standards than those required to participate in the NFIP or mandated by State statute in order to decrease their vulnerability to floods.

As seen by the impact of flooding disasters, in many areas these minimum standards do not provide sufficient protection from local hazards nor do they account for the effects of urbanization. North Carolina shares a responsibility with local officials to protect the lives and property of our citizens from the effects of natural disasters. During a flood, the State provides resources such as food, shelter, logistical support, and financial aid to flood victims and to local agencies to help get businesses and residents back on their feet after the floodwaters recede. Long before a flood occurs, however, there are opportunities for communities to keep businesses and residences out of harm's way. This means guiding new and improved development away from floodprone areas, and ensuring that new homes and businesses in these areas are built to standards that minimize or eliminate the risk of loss. In short, this means managing floodplain development.

Ultimately, the responsibility for managing floodplain development is held at the local level. As such, the State has and will continue to provide resources from which local officials can draw to assist them in these efforts. Planners, inspectors, floodplain administrators, and local professionals all need accurate, reliable flood maps that show what areas in their communities are the most floodprone. The State, in partnership with the Federal Emergency Management Agency, is meeting that need with new Flood Insurance Rate Maps. Properly used, the new maps are powerful tools that support all of the requirements for compliance with current National Flood Insurance Program regulations. In addition, the State is encouraging and supporting the efforts of local officials to increase the level of flood protection in their communities above minimum standards. These recommended safer standards are explained in detail in this guidebook. The standards encourage prudent land use management and development, while promoting responsibility, fairness, community involvement, and planning.

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ACRONYMS

ASFPM	Association of State Floodplain Managers
BFE	Base Flood Elevation
CAMA	Coastal Area Management Act
CFR	Code of Federal Regulations
CRS	Community Rating System
CTS	Cooperating Technical State
CTP	Cooperating Technical Partners
DEM	Division of Emergency Management
DENR	Department of Environment and Natural Resources
DFIRM	Digital Flood Insurance Rate Map
DWQ	Division of Water Quality
FBFM	Flood Boundary and Floodway Map
FEMA	Federal Emergency Management Agency
FHBM	Flood Hazard Boundary Map
FIA	Flood Insurance Administration
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
GIS	Geographic Information System
HAG	Highest Adjacent Grade
ICC	Increased Cost of Compliance
NAI	No Adverse Impact
NCCS	National Cooperative Soil Survey
NCFMP	North Carolina Floodplain Mapping Program
NFIP	National Flood Insurance Program
RV	Recreational Vehicle
SFHA	Special Flood Hazard Area
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey

DEFINITIONS

Attenuation — When a flood wave passes along a stream, storage in the channel and floodplain reduces the peak flow.

Base Flood — A flood that has a 1% chance of being equaled or exceeded in any given year.

Base (1% annual chance) Flood Elevation (BFE) — The elevation shown in the Flood Insurance Study Report and on the Flood Insurance Rate Map for Zones AE, AH, A1-A30, AR, AO, V1-V30, and VE that indicates the water-surface elevation resulting from a flood that has a 1% chance of being equaled or exceeded in any given year.

CAMA — North Carolina's Coastal Area Management Act. This act, along with the Dredge and Fill Law and the Federal Coastal Zone Management Act, is managed through North Carolina Department of Environment and Natural Resources' (NCDENR's) Division of Coastal Management (DCM).

Community Rating System (CRS) — A program developed by the Federal Emergency Management Agency to provide incentives for those communities in the Regular Program of the National Flood Insurance Program that have gone beyond the minimum floodplain management requirements to develop extra measures to provide protection from flooding.

FEMA Flood Maps (includes Flood Hazard Boundary Maps, Flood Boundary and Floodway Maps, and/or Flood Insurance Rate Maps/DFIRMs) — The official maps of a community on which the Federal Emergency Management Agency has delineated both the areas of special flood hazard, risk premium zones, and regulatory floodway boundaries applicable to the community.

Flood Insurance Study (FIS) — The engineering study performed by the Federal Emergency Management Agency to identify flood hazard areas, flood insurance risk zones, and other flood data in a community. The study includes a Flood Insurance Study Report, Flood Boundary and Floodway Map, and/or Flood Insurance Rate Map.

Floodplain — Any land area susceptible to being inundated by waters from any source. For floodplain management purposes, these areas are designated on an official Federal Emergency Management Agency flood map or other map adopted by a local community.

Floodplain Management — The operation of an overall program of corrective and preventive measures for reducing flood damage and losses, including but not limited to, emergency preparedness plans, flood control works, and floodplain management regulations.

Floodproofing — Any combination of structural and non-structural additions, changes, or adjustments to structures, which reduce or eliminate risk of flood damage to real estate or improved real property, water and sanitation facilities, or other structures and their contents.

Floodway — See Regulatory Floodway.

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Freeboard — An additional amount of height above the Base (1% annual chance) Flood Elevation used as a margin of safety (e.g., 2 feet above the Base Flood Elevation) in determining the level at which a structure's lowest floor must be elevated or floodproofed to be in accordance with State or community floodplain management regulations.

Freeboard Contour Area— The boundary of the additional area outside of the 1% annual chance floodplain that would be inundated if flood water rises to the freeboard height.

Increased Cost of Compliance (ICC) — A benefit integrated into an owner's flood insurance coverage that will pay up to \$30,000 (as of May 2004) for expenses a property owner must incur, above and beyond the cost to repair the physical damage the structure actually sustained from a flooding event, to comply with mitigation requirements of Federal, State, or local floodplain management ordinances or laws. Acceptable mitigation measures are elevation, floodproofing, relocation, demolition, or any combination thereof.

Interior Drainage — Surface water runoff through natural channels or pipes in a given tract of land located in the inside of a reference feature; for example, within the area protected from flooding behind a levee.

Map Revision — A reprinted National Flood Insurance Program map incorporating changes to floodplains, floodways, and/or flood elevations.

Reference Floor — Refers to the top of the lowest finished floor for a new or substantially improved structure within Special Flood Hazard Areas designated as Zone A1-A30, AE, A, A99 or AO.

Regulatory Floodway — The channel of a river or other watercourse and the adjacent land areas (shown on a Flood Insurance Rate Map or Flood Boundary and Floodway Map) that must be reserved in order to discharge the base flood without cumulatively increasing the water-surface elevation more than a designated height.

Regulatory Flood Protection Elevation — means the "Base Flood Elevation" plus the "Freeboard". In "Special Flood Hazard Areas" where Base Flood Elevations (BFEs) have been determined, this elevation shall be the BFE *plus the community adopted freeboard*. In "Special Flood Hazard Areas" where no BFE has been established, this elevation refers to height above the highest adjacent grade.

Special Flood Hazard Area (SFHA) — The land in the floodplain within a community subject to a 1% or greater chance of flooding in any given year. SFHAs are shown on a Flood Hazard Boundary Map or a Flood Insurance Rate Map as Zone A, AO, A1-A30, AE, A99, AH, AR, AO, V1-V30, VE, or V.

Watershed — The region draining into a river, river system, or body of water.

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I. INTRODUCTION

Safer development in floodprone areas of North Carolina is a goal shared by public officials at all levels of local, State, and Federal government. Planning and managing development are local responsibilities; therefore, this guidebook suggests ways for local officials to enhance the level of flood protection in their communities through higher floodplain management standards. Flood damage affects everyone in the nation, regardless of whether the impacts are experienced first-hand. Society has the choice to either spend tax dollars on prevention, or pay higher costs following a flood — financially, economically, socially, and environmentally. Chapter I discusses the reasons for adopting enhanced flood protection standards and the steps that the State and the Federal Emergency Management Agency (FEMA) are taking to support this effort, for example, by improving the quality of local flood maps. Chapter II offers advice on determining what standards are most appropriate for your community, and Chapter III recommends strategies for adoption and implementation of the standard in an efficient and effective manner.

What is Floodplain Management?

Floodplain management is a decision-making process that aims to achieve the wise use of floodplains. Wise-use means both reduced flood losses and protection of the natural resources and function of floodplains.

A. Making Safer Floodplain Development a Statewide Priority

In 1999, North Carolina experienced a flood of catastrophic proportions that devastated many of the counties in the eastern half of the State. Hurricane Floyd and its aftermath took the lives of over 50 State residents and caused approximately \$3.5 billion in property damages. Most of the counties and municipalities in the hard hit areas were participants in the National Flood Insurance Program (NFIP) and continue to participate. The participating communities are required to adopt minimum standards for floodplain management as a condition of participation in the NFIP; however, this level of protection may not meet the needs of North Carolina's citizens in the future; the need for safe development around floodprone areas is a statewide priority.

Unfortunately, limited funding for map revisions and accelerated growth in the years leading up to Hurricane Floyd resulted in flood maps that were inaccurate and out-of-date by more than 15 years in many communities. Limited Federal

North Carolina Major Flood Disaster Declarations of the 1990's and 2000's

Sept. 10, 1993	Hurricane Emily
Oct. 23, 1995	Storms/Flooding
Feb. 23, 1996	Storms/Flooding
July 18, 1996	Hurricane Bertha
Sept. 6, 1996	Hurricane Fran
Jan. 16, 1998	Storms/Flooding
Aug. 27, 1998	Hurricane Bonnie
Sept. 9, 1999	Hurricane Dennis
Sept. 16, 1999	Hurricanes Floyd and Irene
Jan. 31, 2000	Winter Storm
Dec. 12, 2002	Severe Ice Storm
March 27, 2003	Ice Storm
Sept. 18, 2003	Hurricane Isabel
Sept. 10, 2004	Tropical Storm Frances
Sept. 18, 2004	Hurricane Ivan
Oct. 7, 2005	Hurricane Ophelia
Oct. 8, 2008	Tropical Storm Hanna
Feb. 2, 2010	Severe Winter Storms

funding for map revisions restricted FEMA to providing updates to those communities with the most urgent mapping needs. Where flood hazard areas were indicated on the maps, even strict enforcement of the minimum NFIP floodplain management regulations by local officials was not adequate to protect their citizens' lives and property from floodwaters that inundated whole communities. Hurricane Floyd and the legacy of previous inland and coastal flooding disasters were a clear signal to Federal and State officials of the need for better tools to mitigate the risks of future development. Less than a year after Hurricane Floyd, North Carolina, with support from FEMA, began to develop those tools, including a new set of up-to-date flood maps and the initial version of this guidebook on adoption and implementation of local ordinances that exceed the NFIP minimum standards for floodplain management.

1. Becoming a Cooperating Technical State

Recognizing its own limitations in keeping the entire nation's inventory of Flood Insurance Rate Maps (FIRMs) up-to-date, FEMA created the Cooperating Technical Community program in 1997 as part of its Map Modernization initiative. This program is now known as the Cooperating Technical Partners (CTP) initiative. The program allows partners to contribute their own technical resources to the mapping process. Communities with sufficient resources are encouraged to take ownership of their flood maps and responsibility for future updates. With local resources in North Carolina strained by the demands of replacing infrastructure and finding replacement housing for displaced residents, the Governor and Legislative Assembly authorized funding for North Carolina to become a Cooperating Technical State (CTS), with a mandate to revise all of the State's FIRMs within five years. The CTS agreement was signed with FEMA on September 15, 2000 and, since then, the State has remapped all 17 of its river basins.



2. Partnering with Communities to Encourage Safer Floodplain Development

The State of North Carolina shares a responsibility with local officials to protect the lives and property of its citizens from the effects of natural disasters, including flooding. During a flood, the State provides resources such as food, shelter, logistical support, and financial aid to help local emergency responders rescue flood victims and to help local agencies get victims back on their feet after the floodwaters recede. Long before a flood occurs, there are opportunities for the State to partner with communities to keep residences and businesses out of harm's way. This means guiding new and improved development away from floodprone areas, or ensuring that new homes, businesses, and infrastructure (including roads, bridges, water, and sewer lines, etc.) in these areas are built to standards that minimize or eliminate the risk of loss. In short, this means managing floodplain development.

3. Providing Guidance on Safer Floodplain Development

Ultimately, the responsibility for managing floodplain development is held at the local level. It is accomplished by various methods, including a rigorous planning process, adoption of building codes and zoning/subdivision regulations, and enactment and enforcement of local flood damage prevention ordinances. Also, the State of North Carolina has and will continue to provide resources from which local officials can draw to assist them in these efforts. Planners, inspectors, floodplain administrators, and local professionals all need accurate, reliable maps

that show what areas in their communities are the most floodprone. The State, in partnership with FEMA, is meeting that need with new Digital FIRMs. Properly used, the new maps are powerful tools that support all of the requirements for compliance with current NFIP regulations. However, the State is encouraging and supporting the efforts of local officials to increase the level of flood protection in their communities above the minimum standards established by FEMA. Safer standards are explained in detail in Chapter II, Part B, of this guidebook.

4. Current Minimum State and Federal Standards Defined

The National Flood Insurance Act of 1968 was enacted with the Housing and Urban Development Act of 1968 (Pub. Law 90-448) to provide previously unavailable flood insurance protection to floodprone residents and property owners in communities that participate in the NFIP. Mudslide and flood-related erosion protection were added in 1969 and 1973, respectively. The Flood Disaster Protection Act of 1973 requires the purchase of flood insurance on and after March 2, 1974, as a condition of receiving any form of Federal or federally related financial assistance for acquisition or construction purposes with respect to insurable buildings and mobile homes within a FEMA identified special flood, mudslide, or flood-related erosion hazard area that is located within any community. The regulations related to the NFIP and floodplain management are published in Title 44 of the Code of Federal Regulations (44 CFR), Subchapter B, Insurance and Hazard Mitigation, Parts 50-77. **Appendix E** of this guidebook contains 44 CFR Section 60.3 which contains floodplain management criteria for floodprone areas.

In North Carolina, the responsibility to adopt regulations designed to promote the public health, safety, and general welfare of its citizens was delegated to local governmental units at the municipal level by the General Assembly in Part 6, Article 21 of Chapter 143; Parts 3, 5, and 8, Article 19 of Chapter 160A; and Article 8 of Chapter 60A of the North Carolina General Statutes. Similar responsibility is delegated to county authorities in Part 6, Article 21 of Chapter 143; Parts 3 and 4, Article 18 of Chapter 153A; and Article 6 of Chapter 153A of the North Carolina General Statutes.

B. Basic Principles of Floodplain Management

Floodplain management is complex and evolving, balancing the natural and environmental value of floodprone areas, the benefits of development, and unacceptable and increasing flood losses. Much has been written on floodplain management and recommended references have been prepared by the Association of State Floodplain Managers (ASFPM) and FEMA. The text of the FEMA home study course "Managing Floodplain Development through the National Flood Insurance Program" (FEMA IS-9) is available from both ASFPM and FEMA.



Floodplain management depends on good floodplain mapping and related flood hazard data. A floodplain map's accuracy depends on the data behind it and the resources put into it. Local communities, states and the private sector need accurate detailed maps to guide development, prepare plans for community economic growth and infrastructure, utilize the natural and beneficial function of floodplains, and protect private and public investments.

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The purpose of flood maps is to show which property in a community is subject to flooding, the expected flood levels and the different risks within the flooded area. This information is essential for a community to be able to reduce the risk to new and rebuilt structures, and to protect itself from damage to its infrastructure and from community liability. The maps show the area that will be flooded during a flood which has a 1% chance of occurring or being exceeded in any given year. Flood hazard areas are divided into zones, each of which carries a different risk and consideration for wise use. The entire 1% flood hazard area is the high-risk floodplain. Within riverine floodplains there is a **floodway** (not only is it high risk, but also structures and obstructions here increase flood levels on other property), the **flood fringe** (subject to slower moving water, but where structures and infrastructure will be damaged and loss of flood storage will increase flood levels). Coastal areas have **V zones** (where storm waves and surges generate high velocities in coastal areas). Moderate or unknown flood risk areas are called **B, C, D or X zones**.

All communities in the State of North Carolina have a Flood Insurance Rate Map (FIRM). FIRMs are prepared for the purpose of insurance rating, land use regulations, and for lenders in determining where the flood insurance must be purchased. Using the FIRM as the basis for a community's floodplain management program is a minimum requirement of NFIP. FIRMs serve several very important purposes. First, they provide "due public notice" where regulations will be enforced. This is a very important legal principle. In order for local government to adopt and enforce land-use regulations the people whose property will be regulated must be provided with "due public notice." FIRMs meet that legal test.

The other purpose served by the FIRM is to identify for lenders where flood insurance must be purchased. Federally regulated lenders must require that flood insurance be purchased to at least the limits of the loan for all insurable property within the Special Flood Hazard Areas.

Most participating communities have received FIRMs that are based on detailed hydrologic and hydraulic analyses of their rivers, lakes or ocean coasts. Detailed studies calculate the 1% chance (100 years) flood level [the Base Flood Elevation (BFE)], which is used to establish and/or revise the SFHA delineation.

Rivers and streams are mapped differently than coastal areas. For rivers the floodplain is comprised of the floodway and the flood fringe. The floodway is that portion of the floodplain where the depths are the greatest and the velocities are the highest. Buildings or fill material placed in the floodway will obstruct floodwaters and cause an increase in the BFE. The flood fringe is that portion of the floodplain outside of the floodway. It represents lands that will be inundated by a flood event. Buildings or fill placed in the flood fringe result in the loss of flood storage taken up by the building, its fill, roads, etc., which can result in increased flood levels elsewhere.

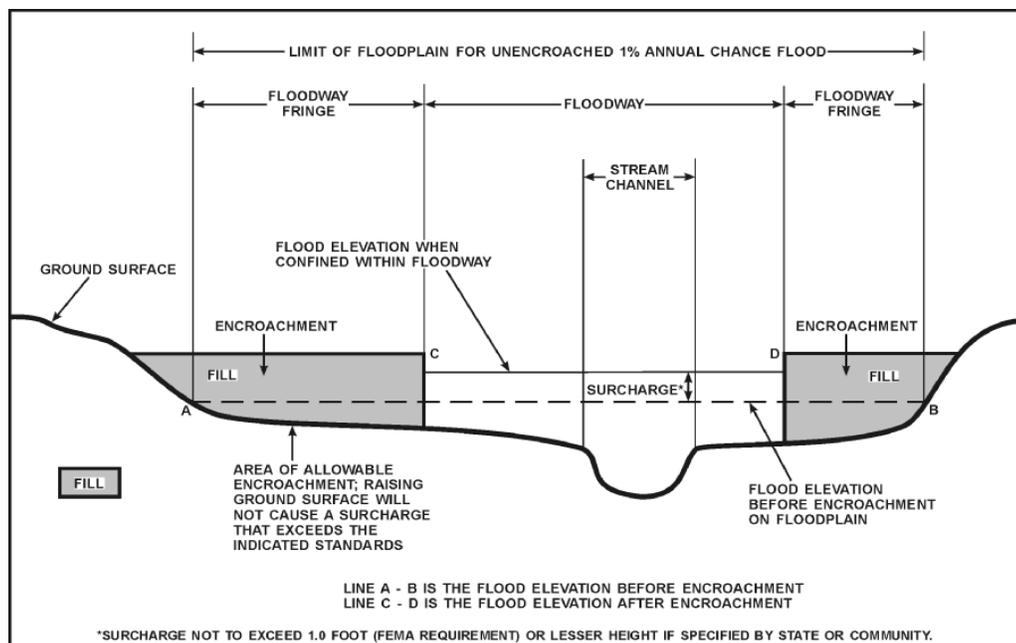
Coastal areas may include V zones. V zones, or "velocity zones," are areas subject to storm surge or wave action. V zones are particularly hazardous. Buildings constructed in the V zones may not cause an increase in the BFE, but will likely be demolished or damaged by the surge or wave action unless constructed to withstand the forces.

Key floodplain management concepts on floodways and future development are explained below.

1. What is the Difference between a Floodplain and a Floodway?

A floodplain is any land area susceptible to being inundated by water from any source. A floodway, for purposes of the guidebook and the NFIP, is an area within the floodplain that includes the channel or other watercourse and the portion of the adjacent lands that must be reserved in order to discharge the base flood without cumulatively increasing water-surface elevation more than a designated height. This height is referred to as surcharge. **Figure 1** below shows the difference between the floodplain and the floodway. NFIP minimum requirements limit encroachment in the floodway to prevent obstructions that will increase flood levels. They do not, however, prohibit development in the floodplain outside of the floodway boundaries, which can increase peak flows and increase flood levels due to the loss of storage in the floodplain outside of the floodway.

Figure 1: Floodplain and Floodway Delineation



2. How Does Development Cause Flood Levels to Increase?

Development in a watershed or its floodplains can cause increases in flood levels (surcharging) in two ways: hydraulic surcharge and hydrologic surcharge. Hydraulic surcharge is the rise associated with the physical constriction of the flow. As fill is placed in the floodplain, there is less cross-sectional area. This causes the flow velocity and the flood levels to increase. Hydrologic surcharge is the increase in flood elevations due to increased flows resulting from development in the watershed. Flow increases with development due to the following hydrologic factors:

- As development occurs, more land is made impervious and less open area is available to absorb rainfall. The volume of runoff from a site increases.
- Water runs across paved surfaces, curbs, and storm drains much faster than across vegetated or natural terrain surfaces. The water gets to the creek faster, and the peak of runoff increases.
- When a flood wave passes downstream through a channel, storage in the floodplains along a stream reduces the peak flow. This process is known as attenuation. Loss of floodplain storage reduces attenuation and increases peak flows.

C. Going Beyond the Minimum: Enhanced Flood Protection

Over 23,000 communities nationwide have joined the NFIP. As of July 2010, all 100 counties and 438 municipalities in North Carolina participate. Community officials recognize the importance of protecting their citizens from the devastation a flood can bring. Today, many communities are recognizing that meeting the minimum requirements for participation does not provide the level of protection their citizens need and deserve. Every year, floods larger than the 1% annual chance event, upon which the NFIP is based, impact many communities. In addition, development continues, leading to higher flood levels and increased flooding risk.

The NFIP is a voluntary program; however, flood insurance and many types of State and Federal assistance grants are only available in communities that participate in the program. To participate, communities must adopt, implement, and enforce a floodplain management ordinance that meets or exceeds the minimum standards of the program. The minimum standards are included in 44 CFR 60(A) and (B). The regulations "encourage the formation and adoption of overall comprehensive management plans for flood-prone, mudslide-prone and flood-related erosion prone areas" (44 CFR 60.21 to 60.26). FEMA and the State have developed model flood damage prevention ordinances that reflect the minimum requirements to assist communities in their adoption of standards that meet minimum Federal and State criteria. This document provides ordinance language for many of the standards that can be adopted by communities wanting to go beyond the minimum. The North Carolina model ordinance minimum standards for Coastal and Non-Coastal communities are provided in **Appendix D**.

1. How are NFIP Floodplain Management Standards Related to Other North Carolina Regulations?

Several State agencies have promulgated regulations related to floodplain management that are more restrictive than minimum NFIP standards and requirements. When considering adoption of additional standards for floodplain management described in this guidebook, communities should review their current planning, zoning, subdivision, inspections, and floodplain management practices to ensure that they are already in compliance with all applicable State and Federal regulations. Examples of regulations established by State agencies related to flood hazard mitigation include the following:

- The Department of Insurance administers the State Building Code which applies to construction in all jurisdictions, not just those that participate in the NFIP. The State Building Code contains coastal and floodplain construction standards, including a requirement that a structure's lowest floor be elevated at or above the Base (1% annual chance) Flood Elevation (BFE). Appendix C of the "Regulations for Manufactured/Mobile Homes" contains guidance on setup when a manufactured home is placed in a regulatory floodplain.
- The Department of Agriculture and Consumer Services, Standards Division is responsible for enforcing provisions of the National Fire Protection Association Pamphlet No. 58, which applies to anchoring propane tanks "Where necessary to prevent flotation due to possible high flood waters around above-ground or mounded containers..." The Standards Division has developed guidelines on how propane tanks located in floodprone areas should be properly anchored.
- The Department of Environment and Natural Resources (DENR), Division of Coastal Management is responsible for enforcing the North Carolina Coastal Area Management Act of 1974 and the North Carolina Dredge and Fill Act of 1969. These acts require permits for development undertaken in Areas of Environmental Concern in the 20 coastal counties of North Carolina. "Development" includes dredging and filling coastal wetlands or waters, and construction of marinas, piers, bulkheads, oceanfront structures, and roads. In addition to obtaining a permit, a prospective developer must comply with the setback requirements established by the Coastal Resources Commission; these are based on erosion rates. For most single-family homes, the setback is determined by multiplying the average annual erosion rate by 30, with a minimum setback of 60 feet (based on a 2 foot minimum erosion rate) landward from the first line of stable natural vegetation. Greater setback distances apply for buildings larger than 5,000 square feet, or development in areas where the average annual erosion rate is greater than 3.5 feet.
- The On-site Wastewater Section of the DENR Division of Environmental Health regulates on-site wastewater systems, including residential and commercial septic systems. A structure cannot be built, located, or relocated in a place that is not already served by an approved wastewater system without a permit and an authorization from the local health department. According to State regulations 15 NCAC 18A.1950 (i), septic systems shall not be located in areas that have a 10% or greater annual likelihood of flooding unless they are designed to be watertight and remain operable during such flooding. The

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regulations also require mechanical and electrical components for treatment systems to be located above the 1% annual chance flood elevation.

- The DENR Division of Land Resources regulates activities related to mining, erosion and sediment control, and dam safety. Although no special regulations apply to these activities in 1% annual chance floodplains, communities still need to ensure that mining permits are obtained from the Division of Land Resources for land disturbing activities associated with mining, and that an erosion and sediment control plan is submitted to the field office Land Quality Regional Supervisor of the local government with an approved program at least 30 days prior to initiation of projects that disturb more than one acre of land. Control measures must provide protection from the calculated peak rate of runoff from a 10% annual chance rainfall event (4% annual chance event for projects within High Quality Water Zones).

A permit from DENR is also required for construction, repair, modification, or removal of a high hazard dam, defined as one whose failure could cause loss of life or severe property damage, or one that is 15 feet or higher and impounds 10 acre-feet or more. The permit application must be filed at least 60 days prior to activity start date. The application must be signed and sealed by a North Carolina registered professional engineer.

- The DENR Division of Water Quality (DWQ) regulates several activities related to development in floodplains. Construction of water supply wells is under the jurisdiction of the Groundwater Section of DWQ. 15A NCAC 2C .0010 contains standards for well construction, including a prohibition against locating a well "in an area generally subject to flooding...[including] those with concave slope, alluvial or colluvial soils, gullies, depressions, and drainage ways" (i.e., floodways). The Water Quality Section of DWQ administers wetland standards (15A NCAC 2B .0231) and the 401 Water Quality Certification Process (15A NCAC 2H .0500). The U.S. Army Corps of Engineers (USACE) regulates wetlands and streams at the Federal level, with the U.S. Environmental Protection Agency in an oversight role. Activities which impact more than 1/3 acre of wetland, 150 linear feet of a stream, or any area of a lake, pond, or other water body will typically require authorization from the USACE and the DWQ. The types of impact that typically require permit review include the following:

- Filling wetlands or waters;
- Excavation of wetlands and waters;
- Stream channelization or relocation;
- Draining or flooding wetlands; and
- Clearing and grubbing wetlands.

Activities such as silviculture, ongoing farming, and the routine maintenance of existing structures may be exempt from the permitting process but not from floodplain management regulations. Impacts to wetlands exceeding 1 acre in size or impacts to permanent streams exceeding 150 feet in length require compensatory mitigation in the form of new wetland creation at an approved site or payment into the State Wetland Restoration Program.

- The Water Quality Section of DWQ also administers the “Riparian Buffer Protection Rules” (commonly referred to as the “buffer rules”) that protect existing natural areas along waterways in the Neuse River and Tar-Pamlico River Basins. The buffers are intended to remove nitrogen, phosphorus, other nutrients, and pollutants from rainwater runoff that flow into streams, lakes, ponds, and estuaries. Similar rules as of August 2001 are being proposed for other basins in eastern North Carolina.

The rules require that the first 30 feet of vegetation (zone 1) remain essentially undisturbed. An additional 20-foot zone (zone 2) is to be vegetated, although certain uses are allowed in this zone. For each side of intermittent and perennial streams, zone 1 starts at the most landward limit of the top of the stream bank or the rooted vegetation line. For lakes and ponds, zone 1 starts at the most landward limit of the normal water limit or the rooted vegetation line. For estuarine waters, zone 1 starts at the most landward limit of the normal high water level or coastal wetlands, whichever is more restrictive.

The rules for the Tar-Pamlico River Basin are found in 15A NCAC 2B .0259. The rules for the Neuse River Basin are found in 15A NCAC 2B .0233. The rules include lists of activities that are exempt from the buffer protection requirement including existing, ongoing uses such as: agriculture; buildings; industrial, commercial, and transportation facilities; maintained lawns; utility lines; and on-site wastewater systems. New facilities including water-dependent structures (boat ramps, boathouses, docks, and bulkheads), roads, bridges, storm-water management facilities, ponds, and utilities may be allowed where no practical alternative exists.

- The Underground Storage Tank Section of the DENR Division of Waste Management enforces State and Federal regulations on underground storage tanks that store liquid petroleum products. There are no restrictions on the location of underground petroleum tanks, but owners of tanks that are properly constructed and registered with the State are eligible for reimbursement from a State fund if the tank has a spill due to a flood-related problem.
- A statute enacted by the North Carolina General Assembly (NCGS 143-215.51-.61) requires communities to include a provision in their flood hazard prevention ordinances that prohibits siting of landfills, hazardous waste management facilities, salvage yards, and chemical storage facilities in the 1% annual chance floodplain. And, as required prior to this new statute, chemical and fuel storage tanks still must be elevated above the base flood elevation or designed to be watertight and capable of resisting hydrostatic and hydrodynamic loads.

Although these activities are regulated by agencies outside of emergency management, they all require issuance of development permits through the local floodplain administrator of NFIP-participating communities prior to the commencement of any development activities.

2. Why Should a Community Adopt Standards Beyond the Minimum Federal Requirements?

Communities should consider adopting enhancements to the minimum Federal and State standards in order to decrease their vulnerability to floods. The State “Model Ordinance,” which

SAFER DEVELOPMENT IN FLOODPRONE AREAS

most North Carolina communities adopted to join the NFIP, covers the minimum requirements necessary for a community to participate in the NFIP and therefore qualify citizens to purchase flood insurance. It was created with the intent of encouraging participation in the program and to balance the need to minimize long term flooding losses with the desire for some development in floodplain areas. The State of North Carolina has estimated that compliance with NFIP floodplain management criteria prevents approximately \$770 million in flood losses annually in North Carolina for the approximately 2 million buildings constructed to these requirements since 1975.

Implementation of the minimum NFIP floodplain management criteria is required within the boundaries of a Special Flood Hazard Area (SFHA) shown on a FIRM, Flood Boundary and Floodway Map (FBFM), and/or Flood Hazard Boundary Map (FHBM). However, because floods may exceed the 1% annual chance flood, many communities and states implement criteria and standards that are more restrictive than NFIP minimums to realize even greater benefits and to protect their citizens and property owners from flood losses. In a 50-year period, there is nearly a 40% chance that a flood equal to or greater than a 1% annual chance event will occur. Please see **Table 1** below. A Category 3 hurricane will typically cause 1% annual chance flood elevations to be exceeded in some areas of North Carolina. For example, Hurricane Floyd was a Category 3 just off of the State's coastline and then a Category 2 just before landfall, and flooding still exceeded the 1% annual chance event in many areas of eastern North Carolina.

Federal standards require that flood studies be based on some ideal conditions that can lead to underestimating the water levels actually seen during major floods. Typical standards for performing flood studies may not account for such factors as the following:

- Debris accumulation at bridges and culverts and beaver dams;
- Sedimentation, which can reduce channel capacity;
- Riverine erosion and typically coastal erosion; and
- Wave action from passing boats or vehicles.

Table 1: Natural Hazard Probabilities

Length of Period (Years)	Percentage Chance of Occurrence				
	10% Annual Chance (10-Year) Event	4% Annual Chance (25-Year) Event	2% Annual Chance (50-Year) Event	1% Annual Chance (100-Year) Event	0.2% Annual Chance (500-Year) Event
1	10	4	2	1	0.2
10	65	34	18	10	2
20	88	56	33	18	5
25	93	64	40	22	5
30	96	71	45	26	6
50	99+	87	64	39	10
70	99.94+	94	76	50	13
100	99.99+	98	87	63	18

Other actions allowed under NFIP regulations that may result in under prediction of flood levels include the following:

- Placement of fill material within the floodplain. Regulatory floodways are mapped based on the assumption that permitted fills within the floodplain are allowed to increase the 1% annual chance water surface elevation by no more than one foot. Since the minimum standards allow new construction to have the lowest floor elevations equal to the BFE, permitted fill in the floodplain could cause structures built to the minimum standards to flood during a 1% annual chance event.
- No safety factors are applied to the hydrologic and hydraulic models used to estimate the 1% annual chance flood. In most fields of engineering, a factor of safety is applied to the results. However, because the 1% annual chance event is the standard for flood insurance and minimum NFIP building criteria, safety factors are not used for flood mapping.
- Only existing development conditions at the time of mapping are considered. Over time, development and fill within a watershed and floodplains may increase flood levels in a river and most FIRMs in the State of North Carolina are over 10 years old.

As a result of these factors not addressed by NFIP regulations, new construction that meets the minimum Federal standards may still be at high risk during a 1% annual chance flood.

3. How is Participation in the NFIP Related to Eligibility for State Disaster Recovery Funds?

Recommendation Number 1 from the "Interim Report of the Legislative Study Commission on Disaster Response and Recovery," which was adopted June 15, 2001, and became effective July 1, 2001, calls for legislation to establish three types of disaster declarations for the State of North Carolina. The text of House Bill 451 which became effective on July 1, 2001, includes definitions of Type I, Type II, and Type III disasters. Further information on references mentioned in the guidebook can be found in **Appendix A**. The Governor can declare a Type I disaster when an event causes damages that exceed the criteria established for the Small Business Administration Disaster Loan Program or when uninsurable losses exceed \$10,000 or 0.5% of the community's operating budget. Under a Type I declaration, a local community will be eligible for public assistance program funds only if the community participates in the NFIP and if it has an approved hazard mitigation plan. Type II and Type III declarations apply to major disasters that meet the criteria for a Presidential disaster declaration. Participation in the NFIP is already a criterion for eligibility for Federal disaster recovery funds.

D. How Flood Insurance is Affected by Adoption of Higher Regulatory Standards

1. Flood Insurance Rates

Insurance against property losses caused by flooding is available through the NFIP for owners and lessees of property both within and outside of regulatory floodplains in participating

communities. First, within the SFHA, insurance premiums are highest for structures whose lowest floors are below the BFE, and progressively less as the lowest floor height increases above the BFE. Therefore, higher standards that require structures to be elevated to a specified height above the BFE result in direct savings to owners of structures that comply with the higher standard.

Second, other types of higher standards alert property owners outside a mapped floodplain that they are currently at high risk of flood damage, or are likely to be at high risk in the future. For example, if a community elects to include on its FIRM the boundaries of the 1% annual chance floodplain based on the fully built-out conditions in the watershed, property owners in this "future conditions" floodplain are made more aware of their current and future risk and spurred to take action. Property owners and lessees outside the SFHA are eligible for low-cost NFIP insurance at "preferred risk" rates. These rates are usually less than those paid by owners in the "current condition" floodplain.

2. Community Rating System

Property owners in communities participating in the NFIP that adopt higher standards have another way of potentially lowering their flood insurance premiums.

**For more information on the CRS, please visit the website at:
<http://www.fema.gov/nfip/crs.htm>**

A program known as the Community Rating System (CRS) was implemented in 1990. The National Flood Insurance Reform Act of 1994 codified the CRS in the NFIP. Flood insurance premium rates are adjusted in communities that participate in the CRS to reflect the reduced flood risk resulting from community activities that meet the three goals of the CRS:

- **Reduce flood damage to insurable property.** Communities are encouraged to map and provide regulatory flood data for all their flood hazards. The data should be used in their regulatory programs and shared with all users and inquirers. New buildings in mapped floodplains should be protected from the known local flood hazards, which may require setting standards higher than the minimum national criteria of the NFIP. Communities are encouraged to reduce the exposure of existing buildings to flood damage, especially repetitive loss properties.
- **Strengthen and support the insurance aspects of the NFIP.** Communities should encourage their residents to be aware of their flood risk and to purchase and maintain a flood insurance policy to protect themselves from the financial impacts of flooding. Communities should also help make the program more financially sound by implementing mapping and information programs that help to evaluate accurately the individual property risk for flood insurance rating purposes, expand the policy base, and reduce repetitive losses.
- **Encourage a comprehensive approach to floodplain management.** Insurable property is not the only floodplain management concern of communities, so the CRS recognizes efforts that protect lives; further public health, safety, and welfare; and protect natural floodplain functions. The community staff should understand the physical and biological processes that form and change floodplains and watersheds and take

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steps to deal with flooding, erosion, habitat loss, water quality, and special flood-related hazards. Floodplain management programs need to protect buildings, infrastructure, critical facilities, and natural functions and ensure that new development does not cause adverse impacts on others. A comprehensive approach uses all tools, including public information, planning, regulatory authorities, financial support, public works activities, and emergency management.

Participation in the CRS is voluntary; communities that elect to participate receive a classification between 1 and 10. The classification is based on how many credit points the community receives for recognized CRS activities and programs they implement that exceed minimum NFIP requirements. The more credit points a community receives, the lower the classification rank they achieve. As the classification level decreases, the premiums of all NFIP policyholders in the CRS community are discounted by 5% to a maximum of 45%. If the NFIP policyholder's structure is within a SFHA, then the discount would increase by an additional 5% for each decrease in classification level to a maximum of 45%. As for NFIP policyholders outside the SFHA, a 5% discount is awarded for Class 7-10 and a 10% discount applied for communities with a ranking of 6 or less. Most of the higher standards described in this guidebook, if adopted and enforced, qualify a community for additional credit points toward CRS discounts.

Table 2 below outlines credit points earned, classification awarded, and premium reductions given for communities in CRS.

Table 2: Premium Reduction			
Credit Points	Class	SFHA*	Non-SFHA**
4,500+	1	45%	10%
4,000 – 4,499	2	40%	10%
3,500 – 3,999	3	35%	10%
3,000 – 3,499	4	30%	10%
2,500 – 2,999	5	25%	10%
2,000 – 2,499	6	20%	10%
1,500 – 1,999	7	15%	5%
1,000 – 1,499	8	10%	5%
500 – 999	9	5%	5%
0 – 499	10	0	0

*Special Flood Hazard Area

**Preferred Risk Policies are available only in B, C, and X Zones for properties that are shown to have a minimal risk of flood damage. The Preferred Risk Policy does not receive premium rate credits under the CRS because it already has a lower premium than other policies. The CRS credit for AR and A99 Zones are based on non-SFHAs (B, C, and X Zones). Credits are: classes 1-6, 10% and classes 7-9, 5%. Premium reductions are subject to change.

As of May 2010, 78 North Carolina communities participate in the CRS. **Appendix C** shows the date of entry, current class, and applicable flood insurance discount for those North Carolina communities participating as of May 2010.

3. A Community's Flood Insurance Rate Map

Since a flood map is a cornerstone of a community's floodplain management program, the State and FEMA realize community specific modifications to a community's FIRM may sometimes be necessary to support some higher standards. These modifications are typically for informational purposes only because the FIRM is used to determine flood insurance requirements and rates. Two considerations are described below.

- Is There a Way to Depict the Impact of Future Development on a Printed FIRM?
In the past, FEMA regulations restricted what could be shown on printed FIRMs to depict SFHA boundaries and BFEs. At present the regulations allow depiction of a floodplain based on future conditions hydrology, in addition to the current conditions SFHA. FIRMs for several North Carolina counties, including Mecklenburg and Wake, depict floodplains based on future conditions hydrology. The 1 percent future conditions floodplains are shown as shaded Zone X areas on these maps. Examples can be viewed and/or downloaded from www.ncfloodmaps.com. The future conditions floodplain and elevations are used locally to regulate new development.
- Are There Other Ways to Show Higher Standard Options on FIRMs?
Because the new North Carolina FIRM panels are digital, it is possible to create a Geographic Information System (GIS) data layer that depicts boundaries of areas or zones where a community defined higher standard applies. The North Carolina Floodplain Mapping Program (NCFMP) can assist communities in creating such data layers and in superimposing them over community base maps to produce maps that can be used by local officials to enforce the community-adopted higher standards ordinance. In some cases, community-defined higher standards areas may also be shown on the FIRMs. One such example is community encroachment areas shown on the Mecklenburg County FIRMs. The community encroachment line is used to regulate development in Mecklenburg County.

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II. RECOMMENDATIONS

A. Considerations When Adopting Higher Standards

Many communities have already taken steps to reduce flood risks by adopting flood maps and/or floodplain management standards that are more conservative than the minimum Federal standards. To do so, communities must modify their ordinances to incorporate such safer standards. This guidebook includes suggested ordinance language for many of the higher standards presented. Because of recent changes to North Carolina's floodplain management statutes and new mapping methods implemented by the Floodplain Mapping Program, two ordinance changes are presented that are considered mandatory for all communities in the State.

This chapter of the guidebook provides a description of recommended higher standards as well as factors impacting a community's adoption of these standards.

Many of the standards discussed in this guidebook are applicable to all North Carolina communities. Others may not be appropriate for all communities. Below is a discussion of some of the factors that may influence a community's choice of standards that encourage safer development. Each community can tailor the requirements to meet its own specific needs, as long as they still meet the minimum Federal and State standards. These recommended higher standards are discussed in Part B of this chapter.

The State model ordinances and 44 CFR 60.6 set very stringent requirements for variances from the minimum requirements, including a requirement that variances must be approved by an administrative board. Communities must follow these requirements or risk the possibility of suspension from the NFIP. The community may want to set a more relaxed standard for granting variances for higher standards, and/or give a local official, such as their Public Works Director, or a group, such as Planning Commission, the authority to grant these variances. To avoid the NFIP variance process, some higher standards could be adopted into other parts of local code.

1. Mandatory Ordinance Changes

All North Carolina communities must adopt the following additional Flood Damage Prevention ordinance provisions in order to remain in compliance with current State floodplain management regulations:

- **Prohibit New Solid Waste Disposal Facilities, Hazardous Waste Management Facilities, Salvage Yards, and Chemical Storage Facilities in SFHAs.**

In 1999, widespread flooding caused by Hurricane Floyd inundated salvage yards, solid waste disposal facilities, and other facilities storing hazardous materials. Some of these facilities released contamination into the floodwaters that significantly increased the health risk to the general public and emergency responders. The releases also raised

concerns about the residual effects of contamination on agricultural lands inundated by floodwaters.

In response to the environmental concerns raised by Hurricane Floyd flooding, the North Carolina General Assembly enacted and the governor signed Session Law 2000-150. This legislation modifies Section 1, Part 6, Article 21 of Chapter 143 of the North Carolina General Statutes in part to prohibit certain uses of property in the "100-year floodplain." The new wording in the statute defines 100-year floodplain as "that area subject to a one percent (1%) or greater chance of flooding in any given year, as shown on the current floodplain maps prepared pursuant to the National Flood Insurance Program or approved by the Department." "Department" is further defined as the North Carolina Department of Crime Control and Public Safety.

With this state law, solid waste disposal facilities, hazardous waste management facilities, salvage yards, and chemical storage facilities are prohibited in SFHAs as shown on effective FIRMs. Structures or tanks used for chemical or fuel storage associated with activities in SFHAs that are allowed under State regulations or with the operation of a water treatment plant or wastewater treatment facility may be located in an SFHA if the structure or tank is either elevated above the BFE or designed to be watertight. A community may grant a variance for a prohibited use if: (1) the use serves a critical need in the community; (2) no feasible location exists for location of the use outside the SFHA; (3) the lowest floor of any structure is elevated above the BFE or is designed to be watertight; and (4) the use complies with all applicable laws and regulations. The community must notify the Secretary of the Department of Crime Control and Public Safety of its intention to grant a variance at least 30 days prior to granting the variance.

- **Regulation of Floodplain Development in Riverine Areas Where Floodways Are Not Shown on a FIRM.**

The NFIP is based on communities enforcing ordinances to ensure that 1% annual chance water-surface elevations do not increase more than 1 foot due to development in the floodplain. A detailed study for a stream typically includes determination and designation of a floodway, the area that must be reserved to discharge the base flood without cumulatively increasing the 1% annual chance water-surface elevation more than 1 foot. Enforcement of non-encroachment into a regulatory floodway by communities thus ensures that the 1% annual chance water-surface elevations are not increased more than the 1 foot surcharge maximum.

The State of North Carolina and FEMA have enacted a program of publishing FIRM panels showing 1% annual chance flood elevations in areas that were previously unnumbered A Zones based on limited detailed studies. Unnumbered A Zones are SFHAs whose boundaries were determined using approximate study methods which did not include a determination of BFEs. The SFHAs on FIRM panels were changed from Zone A to Zone AE based on limited detailed studies for a majority of Zone A areas in the state. These data are extremely valuable in that they assist local officials and property owners in: 1) establishing a minimum elevation for a new or improved construction to resist flood

damage; 2) benefiting from lower flood insurance rates; and 3) utilizing flood elevation data for Letters of Map Amendment and/or Letters of Map Revision – based on Fill. A regulatory floodway, which is discussed in 44 CFR 60, are not being mapped on the FIRM for the limited detailed study streams. Part 60 contains the following floodplain management requirement when flood elevations have been established but a regulatory floodway has not been identified.

The community shall...“require until a regulatory floodway is designated, that no new construction, substantial improvement, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community’s FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community” (44 CFR 60.3I(10)).

The North Carolina model Flood Damage Prevention Ordinance in **Appendix D** reflects this minimum standard.

Although regulatory floodways are not mapped on the FIRM for streams studied by limited detail methods, the accompanying Flood Insurance Study (FIS) Reports include Flood Hazard Data Tables that show a non-encroachment width at each cross section. The community floodplain administrator is able to use this information to regulate development on streams studied by limited detail study methods. New development within the SFHA, but outside of designated non-encroachment areas, will not require a no-impact or no-rise flood study.

2. Regional Differences

North Carolina is a diverse state. The geography, climate, and flood hazards vary significantly from one end of the State to the other. Some generalizations about which higher standards are appropriate for a particular region of the State can be made. More often, the choice of higher standards will be based on region-specific considerations. Higher standards that will be heavily influenced by regional differences include the following:

- Freeboard requirements – Coastal plain communities affected by riverine flooding may consider a lower freeboard requirement. Most rivers in this region of the State have wide floodplains that accommodate floodwaters. Modest increases in flows above the 1% annual chance event do not cause significant increases in the flood elevations of these rivers. In addition, freeboard requirements will impact more area along coastal streams than Piedmont-Blue Ridge streams. In the western portion of the State where topography is more varied, communities should consider a higher freeboard requirement. The exact amount will vary depending on the sizes and other characteristics of the flooding sources in the community.
- Future conditions mapping – Large rivers, especially in the coastal plains, should not be mapped for future conditions because the impact of land use changes is attenuated in

large watersheds. The peak of severe flooding on large rivers occurs days after the rain. By then, flooding on smaller streams, which could be impacted by development, has already receded.

- Restrictions on Recreational Vehicle (RV) parks in floodways – This safety standard is most appropriate in the western portions of the State where flash flooding is more likely to occur and adequate warning systems are not in place.
- Regulations based on soil types – This may be appropriate in the Piedmont or Blue Ridge Regions where alluvial soil types are limited to a narrow band along the streams, but may be too restrictive in the coastal plain where wetlands are more widely distributed.
- Prohibiting development in floodplains – Communities in the mountains with narrow floodplains or erosive soils may consider banning all development within the 1% annual chance floodplain, but this may be too restrictive in areas of flat terrain in the Piedmont and along the coast.

3. Flood History

Flood history should play a very important role in a community's choice of higher standards. There may be areas that have experienced flooding that are not shown as floodprone on FEMA's flood maps. The community can map these inundation areas, adopt them as local flood hazard areas, and regulate development accordingly. These may include areas that are susceptible to debris-related flooding and areas not directly associated with riverine or coastal flooding. These areas may also reflect flooding from other types of storm events which FEMA does not consider when studying a watercourse in detail. The community could adopt other maps already produced such as the surge maps for these coastal areas in addition to the FEMA flood maps to better predict the actual flooding of these areas. Although communities must use the FEMA maps while participating in the NFIP, they are not limited to regulating development only in floodprone areas mapped by FEMA.

Communities may wish to limit development within areas that have experienced threatening conditions during a flood greater than the base event. For example, in some areas the flood levels from Hurricane Floyd were 5 feet higher than the 1% annual chance flood elevation as mapped at the time. In those areas, the extent of the damages justified applying safer floodplain management standards to the known higher elevations. This is especially true in areas that have experienced more than one flood.

Another flood hazard area that should be identified and regulated is a low-lying land area that is separated from the floodplain by a natural bank that is only slightly higher than the base flood elevation. These areas could be flooded by local ponding of runoff or overwash that cannot enter the stream or sound, by storm drain system surcharging (interior drainage flooding which is surface water runoff through natural channels or pipes in a given tract of land located in the inside of a reference feature), or by a debris jam causing the natural bank to be overtopped. Interior drainage floodplains, when identified, are shown on the FIRMs; however, without prior knowledge of an interior drainage problem, these areas can be difficult to identify in a flood study and are often best identified from flood history.

The actual frequency of flooding during historic, greater than the base flood, events should be considered. There are some areas in North Carolina that have experienced multiple “100-year” events in the past decade. This is especially true in areas susceptible to tropical storm related flooding. Estimates of the 1% annual chance flood along streams and rivers are based on statistical analysis of long-term stream flow gage data. In some communities, tropical storms have occurred more frequently than predicted by statistical analysis. These areas may be more susceptible to these storms due to their location in the future.

4. Development Patterns

Projected development patterns will impact the choice of higher standards a community should consider. The amount of developable land in the watershed and the community’s comprehensive zoning plan should be used to decide which higher standards should be considered. Community officials should carefully and thoroughly consider whether a certain standard is applicable to their specific community based on expected development.

In rural areas, more developable land exists; therefore, development can cause a greater impact to flood hazard risks than in a more developed, urbanized area. It is also important to incorporate the local storm-water management practices into the current development standards. While the safer standards in this guidebook do not include storm-water related practices, if a community regulates storm runoff, the impact of new development may be mitigated.

“We continue to have extensive debates on how to construct in a floodplain, yet spend little time considering whether that construction itself is in fact making flooding conditions more severe.”

No Adverse Impact: A New Direction in Floodplain Management Policy

5. Financial Considerations

Communities should compare the benefits of safer standards to the possibility of increased construction costs that may result. Particular measures may be more appropriate for some areas but not others. For example, intense development may significantly increase flows in small watersheds, but would have proportionately less effect in large watersheds. Therefore, in a community impacted by riverine flooding sources with drainage areas less than 10 square miles, permitting only structures that are elevated above the future conditions 1% annual chance flood elevation could significantly protect new development from future flood hazards. This higher standard may not provide as much benefit along a river with a large drainage area for the additional upfront construction costs.

B. Recommended Higher Standards

The higher standards options in this section of the guidebook are described in detail because they are highly recommended for adoption by all North Carolina communities to which they apply. A list of other standards that communities may wish to consider is included in this Chapter of this guidebook. A comprehensive list of higher standards is also included in matrix format in **Appendix B**.

Each option in this section elaborates on 9 items related specifically to the standard to assist in its understanding and implementation. These items include the following:

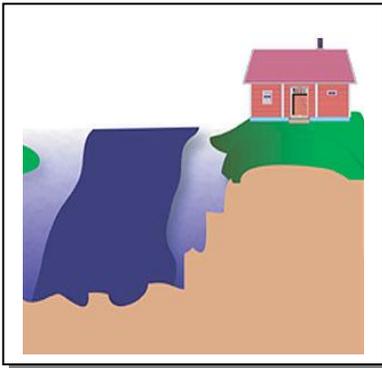
- Recommended Higher Standard
- Background of the Higher Standard
- Current Minimum Federal and/or State Standard
- Guidance on Selecting the Higher Standard
- Benefits
- Cost Impacts
- Mapping Impacts
- Information the Community Must Provide to the NCFMP
- Model Ordinance Language

For reference purposes, each type of recommended higher standard is represented by a corresponding icon. In the following section, each of the four types of recommended standards will be introduced and several of the standards will be discussed at length, including the 9 aforementioned items.



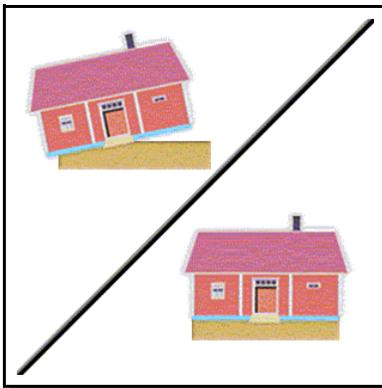
1. Requirements Impacting the Elevation of New Structures/Development

Build it Up



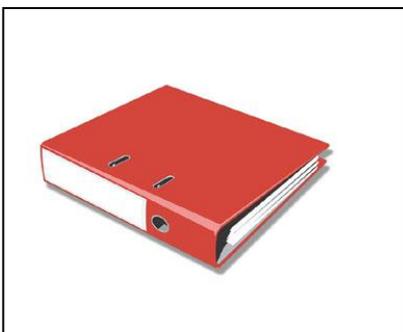
2. Requirements Impacting the Location of New Structures/Development

Build it Out



3. Requirements Impacting Existing or Reconstructed Structures

Build it Safer



4. Other Safer Requirements



Build it Up

1a. Require Structures and Substantial Improvements to be Elevated to a Specific Height Above the BFE



Recommended Higher Standard – A community should require new construction and substantial improvement of all structures to have the reference floor elevation at a minimum elevation above the 1% annual chance flood elevation. A community could also adopt this standard to or above the 0.2% annual chance (500-year) flood elevation, mapped currently on the FIRM as a B Zone or shaded X Zone, and given in the FIS Report. The vertical distance from the 1% annual chance water-surface elevation to the minimum required elevation is known as “freeboard.” This freeboard is a buffer zone to provide added protection for the structure to help prevent the entrance of floodwaters during a flood event. The amount of freeboard a community adopts depends on local considerations. Factors that may contribute to the selection of freeboard include the desired level of additional protection, the potential rise due to future development, how sensitive the flood level is to changes in flow, the amount of insurance rate reduction that is available through the NFIP’s CRS program, and economic impacts on development. Another major deciding factor found primarily along North Carolina’s coastline is development height limitations within a community.

Background of the Higher Standard – Some structures that are built to the minimum NFIP standards will be partially inundated during a 1% annual chance flood. With the reference floor elevated at the BFE, floodwater will be literally at door level under ideal conditions during a base flood. Any conditions that could increase flood levels such as debris accumulation at bridges and culverts, channel sedimentation, or wave action from passing boats or vehicles will cause further flood damage of the structure. Many communities have discovered this through lessons learned from Hurricanes Floyd, Isabel and Ivan, especially in areas that have shown high development since their current FIRM was actually published. The impervious surface areas added by these new developments increased runoff, possibly causing structures to be flooded even though they were constructed in compliance with minimum NFIP standards.

Current Minimum Standard – The NFIP requires “all new construction and substantial improvements of residential structures within Zones A1–30, AE, and AH zones on the community’s FIRM, have the lowest floor (including the basement) elevated to or above the base (1% annual chance) flood level” (44 CFR 60.3I(2)). Within riverine special flood hazard areas, commercial structures may be floodproofed in lieu of elevation. This minimum standard is also applicable to A and V Zones where BFE data is available from any source.

In coastal areas, the NFIP regulations require that “all new construction and substantial improvements in Zones V1-30 and VE, and also Zone V if base flood elevation data is available, on the community’s FIRM are elevated on pilings and columns so that (i) the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to or above the base flood level” (44 CFR 60.3(e)(4)).

Guidance on Selecting the Higher Standard – The amount of freeboard a community should adopt may vary, even by flooding source. In areas of very flat terrain, a large increase in flow may cause only a minor increase in flood levels. The flood profiles in the FIS Report may provide some guidance. If the difference between the 1% and 0.2% annual chance

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elevations is less than one foot, a community may choose to require only 1 or 2 feet of freeboard. Upper reaches of streams with drainage areas of less than 5 square miles may require less freeboard than major rivers.

Benefits – Adoption of the standard may prevent loss of life and property because elevated construction is safer during flood events. The reference floor elevation has a direct impact on the Federal flood insurance rates. For a one-floor, no basement structure, for example, the annual flood insurance policy costs for \$100,000 coverage on a home with \$25,000 coverage on contents, are shown below in **Table 4** (May 2010 rates):

Reference Elevation	AE Zone	Savings	VE Zone	Savings
One foot below the BFE*	\$3,765.00	N/A	\$5,130.00	N/A
Equal to the BFE	\$1,206.00	0	\$4,235.00	0
One foot above the BFE	\$574.00	\$632.00	\$3,220.00	\$1,015.00
Two feet above the BFE	\$355.00	\$851.00	\$2,217.50	\$2,017.50
Three feet above the BFE	\$271.00	\$935.00	\$1,722.50	\$2,512.50

*Reference floor elevation two feet or more below the BFE must be "Submit to Rate."

The increased freeboard will result in safer construction as well as direct reduction in flood insurance costs as shown above. Also, if a community enforces freeboard, disaster recovery efforts and costs will be reduced.

As of May 2010, 59 of the 78 of the North Carolina communities participating in the CRS are receiving credit for "freeboard" under the CRS. Each foot of freeboard provides 100 credits up to a maximum of 300 points and contributes to the communities overall class recognition and flood insurance rate reductions.

Cost Impacts – Requiring freeboard will increase the initial construction costs for structures in the regulated floodplain. The floor level can be raised by increasing the height of the foundation or raising the building pad elevation on properly compacted fill in A Zones (not permitted in V, VE, or V1-V30 Zones). Raising the footprint of a 1,500 square foot house by 1 foot would cost approximately \$4,100 at the time of initial construction. Elevating the same house by 1 foot after initial construction would cost approximately \$30,000.

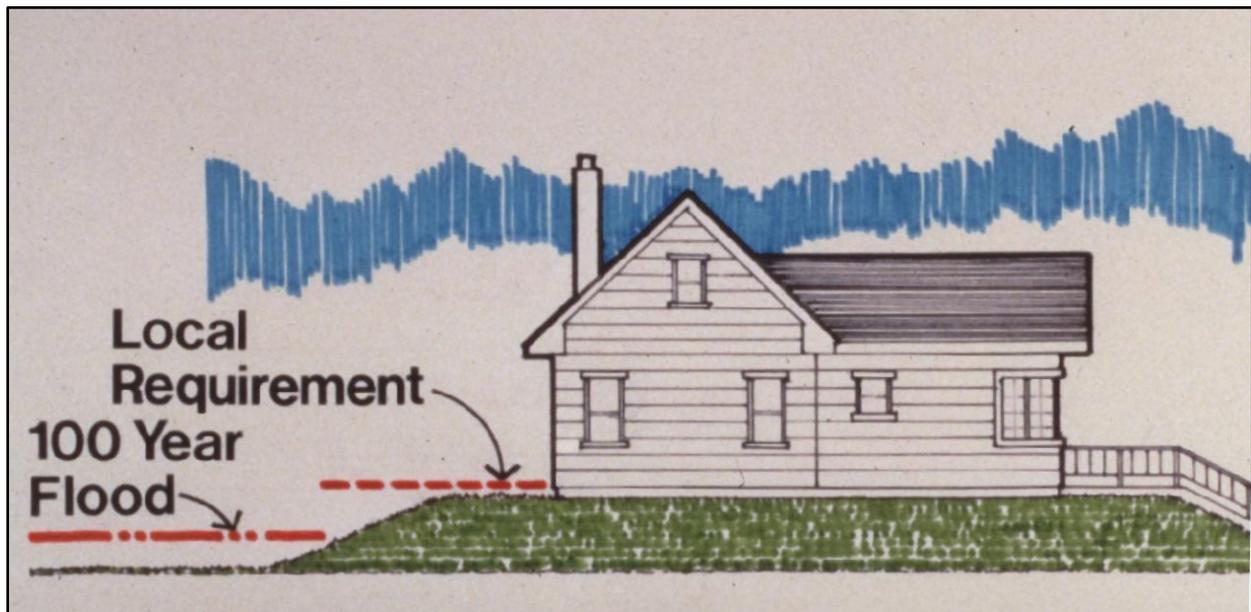
Mapping Impacts – None

Information the Community must Provide to the NCFMP – None

Model Ordinance Language – Article 5, Section B (Specific Standards) of the coastal and non-coastal North Carolina Model Flood Damage Prevention Ordinances include separate freeboard provisions for residential and non-residential structures as well as manufactured homes; communities can simply insert the amount of freeboard they determine is appropriate.

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Communities who have adopted this provision– Virtually all North Carolina communities have adopted freeboard requirements. Among just a few of the communities receiving credit under the CRS for adopting freeboard are: Town of Ocean Beach Isle, Craven County, City of Wilson, North Topsail Beach, City of Brevard, and Town of Boone.



1b. Require Elevation to Freeboard Height for Structures within “Freeboard Contour”



Recommended Higher Standard – A community should require elevation of the reference floor of all structures within the freeboard contours to be at or above the community adopted freeboard height. The previous higher standard (i.e., requirement of freeboard) only technically applies to structures and substantial improvements located in the mapped floodplain. Since an equal level of protection should be provided to structures located outside a mapped floodplain than those inside the floodplain, requiring freeboard height for structures with the freeboard contour is suggested.

Background of the Higher Standard – When a community adopts a freeboard standard using the model language in the North Carolina Model Flood Damage Prevention Ordinance, it only applies within the SFHA. If flood elevations reach the community-adopted freeboard elevation, structures inside these mapped boundaries will be properly protected, but structures outside these mapped boundaries with reference floor elevations below the freeboard elevation will be flooded because their construction standards were not regulated. Historically, almost 1/3 of all flood insurance claims are for damages to structures outside of SFHAs where more restrictive elevations do not normally apply.

With the more accurate topographic information developed for the North Carolina FIRMs, it is possible to delineate the boundary of the additional area outside of the SFHA that would be inundated if flood waters rise to the freeboard height. This boundary is referred to as the “freeboard contour.” Structures within the freeboard contour that have reference floor elevations at the freeboard height will be protected to the same degree as structures within the mapped SFHA.

Current Minimum Standard – The NFIP regulations require that “all new construction and substantial improvements of residential structures within Zones A1–30, AE, and AH zones on the community’s FIRM have the lowest floor (including the basement) elevated to or above the base (1% annual chance) flood level...” (44 CFR 60.3I(2)). However, within riverine SFHAs, commercial structures may be floodproofed in lieu of elevation. This standard is for all structures, not just residential. This minimum standard is also applicable to A Zones where BFE data is available from any source.

In coastal areas, the NFIP regulations require that “all new construction and substantial improvements in Zones V1-30 and VE, and also Zone V if base flood elevation data is available, on the community’s FIRM are elevated on pilings and columns so that (i) the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to or above the base flood level” (44 CFR 60.3(e)(4)).

Guidance on Selecting the Higher Standard – The number and extent of additional structures afforded protection by establishing and enforcing elevation requirements in a freeboard contour depends on the amount of freeboard that the community chooses to adopt, the steepness of the topography, and the level of current or anticipated development in the vicinity of the flood source. Generally speaking, coastal plain communities with a 1 or 2-foot

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freeboard standard that establish a freeboard contour will extend protection to a much larger area than Piedmont or Mountain communities with the same freeboard standard due to the flat topography of the coastal plain areas. If the area enclosed by the freeboard contour is only slightly larger than the 1% annual chance floodplain, the community should probably not consider establishing a freeboard contour or they may wish to evaluate possibly regulating to the next boundary mapped on their FIRM, for example, the 0.2% annual chance (500-year) flood zone designated as the B Zone or the shaded X Zone.

Benefits – Adoption of this more encompassing boundary to enforce safer development standards may prevent loss of life and property during flood events greater than the 1% annual chance flood. It will also alert owners and developers of properties adjacent to the 1% annual chance floodplain that they are at risk if flood levels exceed the BFE. In addition, it will provide CRS credits as a 410 Series activity.

Cost Impacts – Adoption of this standard would cause a moderate increase in the initial cost of construction for affected structures within the additional freeboard area between the SFHA boundary and the new freeboard contour. These property owners will also have to obtain an elevation certificate from a licensed surveyor as part of the floodplain development permit process. Owners of these structures would not benefit from lower flood insurance premiums because properties outside of mapped flood hazard areas qualify for Preferred Risk rates regardless of the elevation of the lowest reference floor. But, they may benefit from a CRS discount if within a community participating in the CRS.

To implement this standard, there will also be a cost to the community for the additional mapping needed to generate freeboard contours. This cost is estimated to be \$50 per stream or coastal mile for flood sources studied by detailed or limited detailed methods.

Mapping Impacts – Because of the need to standardize their appearance, FIRMs cannot depict freeboard contours. Instead, the freeboard contour can be mapped on a separate GIS layer by the community or by the State and provided to communities.

Information the Community Must Provide to the NCFMP – The community must provide a list of the flood sources for which it is requesting freeboard contours and the specific freeboard height that the community has adopted.

Model Ordinance Language – Implementation of this standard requires modification of the community's Flood Damage Prevention Ordinance to include the following language:

Non-Coastal Regular Phase Model Ordinance

(1) Under Article 2, add the following definitions:

“Freeboard contour” means the boundary of the additional area outside of an area of special flood hazard that would be inundated if flood waters rise to the freeboard elevation.

“Freeboard elevation” means the elevation above mean sea level equivalent to the base flood elevation plus freeboard.

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(2) Modify Article 3, Section A to read:

'This ordinance shall apply to all areas of special flood hazard area and areas bounded by freeboard contours within the jurisdiction of ____.'

(3) Modify the title of Article 3, Section B as follows:

'Basis for Establishing the Areas of Special Flood Hazard and Freeboard Contours.'

Add the following additional paragraph after first paragraph:

'The "Freeboard Contours" are those identified by the community or the State of North Carolina Floodplain Mapping Program in its Freeboard Contour Map(s), for ____ dated ____, which with accompanying supporting data, and any revision thereto, are adopted by reference and declared to be a part of this ordinance.'

(4) Under Article 4, Section B, add the following after the first sentence in item 1:

'A plot plan that shows the freeboard contour or a statement that the entire lot is within the freeboard contour must be provided by the development permit applicant when the lot is within or appears to be within the freeboard contour as mapped by the Community or the State of North Carolina Floodplain Mapping Program.'

(5) Under Article 4, Section C, modify item 10 to read:

'Where interpretation is needed as to the exact location of boundaries of the areas of special flood hazard or of freeboard contours (for example, where there appears to be a conflict between a mapped boundary and actual field conditions), make the necessary interpretation.'

(6) Under Article 5, Section A, modify the introductory sentence to read:

'In all areas of special flood hazard and in all areas bounded by freeboard contours the following provisions are required:'

(7) Under Article 5, Section B, modify the introductory sentence to read:

'In all areas of special flood hazard where base flood elevation data has been provided, as set forth in Article 3 Section B, or Article 4, Section C(10), and in all areas bounded by freeboard contours, the following provisions are required:'

Coastal Regular Phase Model Ordinance

(1) Make all of the modifications indicated above under Non-Coastal Regular Phase Model Ordinance.

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(2) Under Article 5, Section G, modify the opening sentence to read:

Coastal High Hazard Areas are Special Flood Hazard Areas and freeboard contour areas established in Article 3, Section B, and designated as Zones VE.

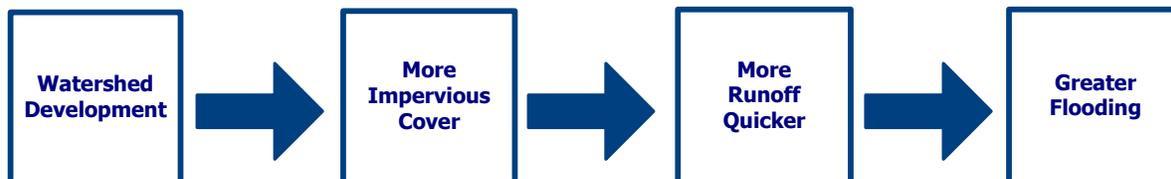
Communities who have adopted this provision– Among those communities who have adopted freeboard contour requirements are Moore County and several of the incorporated communities within it such as Carthage, Cameron, and Vass.

1c. Regulate Floodplain Development to the Future Hydrologic Conditions 1% Annual Chance Flood Elevation



Recommended Higher Standard – Communities that are experiencing rapid urban and suburban growth and development should require that all new construction and substantial improvement have the reference floor elevated to or above the future conditions 1% annual chance flood level. To encourage this standard, a 1% annual chance floodplain based on future hydrology conditions can be shown on a community’s FIRM. Future conditions hydrology means the flood discharges associated with projected land-use conditions based on a community’s zoning map and/or comprehensive land-use plans. Projected future construction of flood detention structures and projected future hydraulic modifications such as bridge and culvert construction, fill, and excavation are not considered when a future conditions hydrological analysis is performed. It is recommended that the future hydrologic conditions be determined based on maximum development in accordance with the community’s current zoning maps or comprehensive land-use plans.

Background of the Higher Standard – Future development in the drainage area of a stream will increase the amount of impervious area and reduce the timing of runoff, causing the peak flow in a stream to increase during heavy rains. When this happens, structures built to current standards (i.e., outside the existing conditions 1% annual chance floodplain area, and/or elevated above the BFE shown on the community’s FIRM) may be damaged by a storm that has the same or less probability used to study the stream on a FIRM.



Until recently, the NFIP regulations did not allow for mapping of floodplains on a FIRM based on future conditions; however, FEMA has issued new guidelines and promulgated regulation changes to allow new or updated FIRMs to show both the existing conditions 1% annual chance floodplain (designated as Zone A, Zone AE, Zone AO, Zone AH, or Zones A1-30) and the future conditions 1% annual chance floodplain. If a community or the State chooses to develop and submit the required information, FEMA will show the future conditions 1% annual chance floodplain as a shaded Zone X zone and designate it Zone X (future base flood). Only the existing conditions 1% annual chance flood elevation (i.e., BFEs) will be shown on the FIRM. The future conditions 1% annual chance flood elevations will be included in Flood profiles and data tables in the FIS Report. The BFEs will be used for Federal floodplain management and mandatory flood insurance purchase requirements of the NFIP. BFEs would only be shown on the FIRM for the existing conditions 1% annual chance flood for use in mandatory flood insurance determinations and managing floodplain development in compliance with NFIP regulations. The future conditions flood elevations will be included in the flood profiles and the flood hazard data table in the FIS Report. Local floodplain administrators can regulate development in the future conditions floodplain with proper ordinance adoption.

Current Minimum Standard – Floodplain management criteria in communities that participate in the NIFP must be based on the FIS Report and FIRM prepared by FEMA. FIS data are based on existing conditions because these data are also used to establish actuarial rates for flood insurance. FEMA’s Flood Insurance Study Guidelines and Specifications for Study Contractors (FEMA 37, January 1995) states: “Flood hazard determinations, to the extent possible, should be based on conditions that are planned to exist in the community within 12 months following completion of the draft FIS report.”

The NFIP regulations require that “all new construction and substantial improvements of residential structures within Zones A1–30, AE, and AH on the community’s FIRM have the lowest floor (including the basement) elevated to or above the base (1% annual chance) flood level” (44 CFR 60.3I(2)). However, within riverine special flood hazard areas, commercial structures may be floodproofed in lieu of elevation. This standard is for all structures, not just residential. This minimum standard is also applicable to A and V Zones where BFE data is available from any source.

Guidance on Selecting the Higher Standard – One of the most important considerations in choosing higher standards is the size of the watershed in which the development is occurring. This is especially true when deciding to map future conditions. In general, the larger the drainage area, the smaller the impact future development will have on the peak flows and flood levels in a stream. There are two reasons for this.

First, the percentage of the total basin that will become impervious is less for larger basins. For example, a large commercial or industrial development with 5 acres of impervious surfaces could increase the flows in the storm drainpipes immediately downstream by a factor of 5 or more. This impact, however, will decrease as the total area of the basin increases.

The second reason is the difference in timing between runoff from developed and undeveloped areas. Development speeds runoff. If the receiving stream has a large undeveloped watershed upstream of the urban area, the development could actually reduce the peak flow in the stream at the community.

Two methods are commonly used to predict future flood flows. The first method is to increase the impervious area percentage in the U.S. Geological Survey urban stream regression equations. The urban streams equations are not appropriate for basins with significant storage. The second method is to develop a rainfall-runoff model. The State is not planning to develop rainfall-runoff models for the current flood mapping project. Communities wanting to use rainfall-runoff models may need to contribute funds to the State to have the State’s contractors create the models or contract directly with another firm at the community’s expense.

The predicted future condition flow and flood elevation depends on the method of analysis and the assumptions made by the hydrologists and engineers preparing the flood study. The difference in the results could be dramatic. For example, one assumption that must be made in the analysis is the percentage of the floodplain storage that will be filled in by development. The most conservative approach would be to assume all areas not within a floodway would ultimately be filled. Technically, there is no prohibition on fill in riverine floodplains outside the

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floodway, so this is theoretically possible. However, developers typically use enough fill to raise only the building footprint to the required level; lawn and parking areas often remain below the BFE. In previously developed areas, even though it is allowed, property owners rarely bring in enough additional fill to entirely raise all of their land above the floodplain. Communities may also consider limiting the percentage of floodplain storage that can be filled on each parcel.

Another factor that should not be ignored is local requirements that may mitigate the flood impacts of future development. Many communities require new development to provide on-site or regional detention ponds or other water quality related practices. Even though these facilities are usually designed for smaller flood events, they may provide some flood control benefits during a large flood event.

There are other higher floodplain management standards that could be adopted to reduce the impacts of future development. These include limiting the percentage of fill within floodplain fringe areas or requiring compensatory excavation for fill, low density zoning within the floodplain, and minimum setbacks or local buffer zones for development along a stream. Adopting these higher standards would be less costly than determining future flood elevations. Adopting future conditions floodplains and enforcing floodplain management standards without adopting these other higher standards may prevent future structures from flooding, but it would not prevent future increases in the flood elevations from impacting existing structures.

Benefits – Adoption of this standard may prevent loss of life and property because elevated construction is safer during a flood event. The reference floor elevation has a direct impact on the flood insurance rates for a structure. Any structure built using future conditions standards will be rated based on its individual freeboard above the existing conditions BFE. In most cases, this would result in a lower flood insurance premium. It is also important to note that the “life” of a FIRM is extended if future conditions are mapped.

In addition to the direct flood insurance rate reduction for the additional elevation above existing conditions BFE, requiring more freeboard for structures within existing conditions SFHAs provides CRS credits as a 430 Series activity. Providing additional flood data based on future conditions hydrology also provides CRS credits as a 410 Series activity.

Cost Impacts – Requiring elevation to or above the future conditions 1% annual chance flood level may increase the initial construction costs for structures in the existing and future conditions floodplains. Raising the building pad on properly compacted fill for a footprint of a 1,400 square foot house by 1 foot would cost approximately \$1,500.

There will be no additional cost to the community to show future conditions floodplains on the new FIRM produced by the NCFMP for flooding sources that will be newly studied by detailed methods. If a community requests future conditions floodplains for previously studied flooding sources that have been identified for redelineation, a new detailed study will have to be performed costing between \$4,000 and \$8,000 per stream mile. If a future conditions floodplain is requested for a flooding source that is to be studied by limited detailed methods, the additional cost to the community will be \$200 to \$1,000 per stream mile. In addition, a community may incur cost for including future conditions in LOMR requests and other map changes.

Mapping Impact – The community FIRM will show both a 1% annual chance floodplain based on existing conditions and a 1% annual chance floodplain based on future conditions, if this is what the community requests. The existing conditions floodplain will be designated as Zone AE, and BFEs will be shown on the FIRM. The future conditions floodplain will be designated as a shaded Zone X (future base flood). The 1% annual chance water-surface elevations for the future conditions flood will be shown in the flood profiles and flood hazard data table in the FIS Report. The 0.2% annual chance floodplain will not be shown on the FIRM, but 0.2% annual chance water-surface elevation will still be shown on the flood profiles if the community so chooses.

Information the Community Must Provide to the NCFMP – For the flooding sources to be mapped under the North Carolina Floodplain Mapping Program based on future hydrologic conditions, a community must provide copies, preferably digital, of the currently adopted zoning maps and/or comprehensive land-use plans for the drainage areas of the flooding sources.

Model Ordinance Language –

Non-Coastal and Coastal Regular Phase Model Ordinances

(1) Under Article 2, add the following definitions:

“Area of future conditions flood hazard” means the land area that would be inundated by the one percent annual chance flood based on future conditions hydrology.

“Future conditions flood hazard area”, or “future conditions floodplain” – see “Area of future conditions flood hazard.”

“Future conditions hydrology” means the flood discharges associated with projected land-use conditions based on a community’s zoning maps or comprehensive land-use plans and without consideration of projected future construction of flood detention structures or projected future hydraulic modifications within a stream or other waterway, such as bridge and culvert construction, fill, and excavation.

(2) Modify Article 3, Section A to read:

This ordinance shall apply to all areas of special flood hazard and areas of future conditions flood hazard within the jurisdiction of _____ (local unit).

(3) Modify Article 3, Section B to read:

Section B. Basis For Establishing The Areas Of Special Flood Hazard And Areas Of Future Conditions Flood Hazard.

The “Areas of Special Flood Hazard” and “Areas of Future Conditions Flood Hazard” are those identified by the Federal Emergency Management Agency (FEMA) in its Flood Insurance Study and Flood Insurance Rate Map(s), or on the Flood Insurance Rate Map(s)

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and Flood Insurance Study produced under the Cooperating Technical State agreement between the State of North Carolina and FEMA, for _____ dated _____, which with accompanying supporting data, and any revision thereto, including Letters of Map Amendment or Revision, are adopted by reference and declared to be a part of this ordinance. The "Areas of Special Flood Hazard" and "Areas of Future Conditions Flood Hazard" also include those defined through standard engineering analysis for private developments or by governmental agencies, but which have not yet been incorporated in the FIRM. This includes detailed flood information generated as a requirement of Article 4, Section C (10) this Ordinance.

Municipal: In addition, upon annexation to _____, or inclusion in the Extraterritorial Jurisdiction, the Areas of Special Flood Hazard and "Areas of Future Conditions Flood Hazard" identified by the Federal Emergency Management Agency (FEMA) in its Flood Insurance Study and Flood Insurance Rate Map(s) or on the Flood Insurance Rate Map(s) and Flood Insurance Study produced under the Cooperating Technical State agreement between the State of North Carolina and FEMA for Unincorporated _____ County, with accompanying maps and other supporting data, and any revision thereto, are adopted by reference and declared to be a part of this ordinance.

(4) Modify the third sentence in Article 3, Section G to read:

This ordinance does not imply that land outside the areas of special flood hazard or areas of future conditions flood hazard or uses permitted within such areas will be free from flooding or flood damages.

(5) Modify the introductory sentence of Article 4, Section B(1) to read:

Application for a Floodplain Development Permit shall be made to the Floodplain Administrator prior to any development activities located within Special Flood Hazard Areas or areas of future conditions flood hazard.

(6) Modify the first sentence of Article 4, Section C(10) to read:

Where interpretation is needed as to the exact location of boundaries of the areas of special flood hazard or areas of future conditions flood hazard (for example, where there appears to be a conflict between a mapped boundary and actual field conditions), make the necessary interpretation.

(7) Modify the first sentence of Article 4, Section C(11) to read:

When the exact location of boundaries of the areas of special flood hazard, areas of future conditions flood hazard, floodways, or non-encroachment areas conflict with the current, natural topography information at the site the property owner may apply and be approved for a Letter of Map Amendment (LOMA) by FEMA.

(8) Modify the introductory sentence of Article 5, Section A to read:

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In all areas of special flood hazard and areas of future conditions flood hazard the following provisions are required:

(9) Modify the introductory sentence of Article 5, Section B to read:

In all areas of special flood hazard and areas of future conditions flood hazard where base flood elevation data has been provided, as set forth in Article 3, Section B, or Article 4, Section C(10), the following provisions are required:

Communities who have adopted this provision– include the City of Charlotte and Mecklenburg County, City of Greensboro, Wilmington, and all communities in Wake County.

1d. Require Elevation To or Above High-Water Marks for Flood of Record

Recommended Higher Standard – A community should require all new construction and substantial improvement of all structures to have the reference floor elevated to a minimum elevation above the flood levels experienced during the flood of record, where these levels exceed established 1% annual chance flood elevations. A community cannot regulate solely based on the flood of record, only where more stringent than the minimum NFIP criteria.



Background of the Higher Standard – North Carolina has experienced several major floods in recent years. In some cases, flood levels were higher than the predicted BFEs and flooding occurred in areas outside floodplains shown on current FIRMs. The USACE, United States Geological Survey, FEMA, and other agencies routinely document high-water marks in communities after major flood events. Their records usually include photographs, written descriptions, and elevation data of high-water marks certified by a licensed surveyor or registered engineer. The State encourages communities to have high water marks surveyed after a major flood because the aforementioned agencies may not be able to visit every community, and high water marks provide valuable flood risk information. Copies of these records can be obtained through the North Carolina Division of Emergency Management. Using topographic maps, the elevation of high-water marks for a particular flood can be used to establish the boundary of the floodplain for the flood of record.

Current Minimum Standard – In areas subject to riverine flooding, the NFIP requires “all new construction and substantial improvements of residential structures within Zones A1–30, AE, and AH zones on the community’s FIRM, have the lowest floor (including the basement) elevated to or above the base (1% annual chance) flood level” (44 CFR 60.3I(2)). However, within riverine special flood hazard areas, commercial structures may be floodproofed in lieu of elevation. This standard is for all structures, not just residential. This minimum standard is also applicable to A and V Zones where BFE data is available from any source. In coastal areas, the regulations require that “all new construction and substantial improvements in Zones V1-30, VE, and also Zone V if base flood elevation data is available, on the community’s FIRM, are elevated on pilings or columns so that (1) the bottom of the lowest horizontal structural member of the reference floor (excluding the pilings or columns) is elevated to or above the base flood level” (44 CFR 60.3(d)(4)).

Guidance on Selecting the Higher Standard – A community should consider adoption of this standard if all of the following apply: (1) the community has experienced flooding during one or more major flood events that equaled or exceeded the predicted 1% annual chance event; (2) areas of the community outside of the 1% annual chance floodplains mapped on the effective FIRM experienced flooding during any event(s) – major or minor; and (3) well documented high-water mark information is available to identify flood elevations and delineate flood hazard areas for the selected flood of record. This information can be used to produce a map showing the boundaries of areas subject to flooding during major storms. This new locally determined flood map does not have to be FEMA or State approved; it only has to be locally adopted for regulatory use.

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The community should obtain information on the estimated return period of recent flood events before selecting a particular event as the flood of record, and before determining whether to require elevation to or above the recorded high water level for the event. This information can be obtained from the State Climate Office of North Carolina. For instance, if the Climate Office estimates that local rainfall during a hurricane was a 1% annual chance annual event, and some areas of the community experienced higher flood elevations than predicted by their FIRM, the community should consider a standard that requires elevation at or one or more feet above the recorded high water marks. The additional foot or more of "freeboard" (see Recommended Higher Standard Number 1a) provides protection against higher flood levels that may occur due to increased runoff caused by future development of the drainage area or a more severe storm.



On the other hand, if local flooding caused by a hurricane is determined to be caused by a 0.2% annual chance flood or higher event, elevation to the recorded high water level may be considered adequate protection from future major flood events.

Benefits – This higher standard may prevent loss of life and property damage during flood events, since new and substantially improved structures in areas that have flooded in the past will be constructed to higher regulatory standards. Also, local and State emergency management agencies can include these areas in their emergency response and evacuation planning. Residents in the areas identified as flood hazard areas based on recorded high water mark data will be alerted to the need to obtain flood insurance. Because these areas are not identified as SFHAs on the community's FIRM, these residents will be able to obtain flood insurance at lower "preferred risk" or non-floodplain rates. This higher standard will provide CRS communities with CRS credits as a 410 Series Activity leading to a CRS discount on Federal flood insurance costs. Also, see Mapping Impacts below for possible additional CRS credits.

Cost Impacts – This standard would increase the number of structures affected by the floodplain development ordinance. The severity of the impacts will vary by area.

Mapping Impacts – The flood zone designations on the FIRMs will not be changed. These added flood hazard areas can be derived from the surveyed high water marks and then maintained locally as an additional GIS layer with the new digital flood maps being produced by NCFMP. If this is done, there may be additional CRS mapping credit for maintaining this additional flood data.

Information the Community Must Provide to the NCFMP – None

Model Ordinance Language –

Non-Coastal Regular Phase Model Ordinance

(1) Under Article 2, add the following definitions:

“Flood of record contour” means the boundary of the additional area outside of the area of special flood hazard that would be inundated if floodwaters rise to the flood of record elevation.

“Flood of record elevation” means the peak elevation of the water surface above mean sea level recorded during an historic flood, where the recorded elevation exceeds the base flood elevation.

(2) Modify Article 3, Section A (Lands to Which This Ordinance Applies) to read:

This ordinance shall apply to all areas of special flood hazard area and areas bounded by flood of record contours within the jurisdiction of _____.

(3) Modify the title of Article 3, Section B as follows:

Basis for Establishing the Areas of Special Flood Hazard and Flood of Record Contours.

(4) Add the following additional paragraph in Article 3, Section B after first paragraph:

The “Flood of Record Contours” are those identified by _____ in its Flood of Record Contour Map(s) dated _____, which with accompanying supporting data, and any revision thereto, are adopted by reference and declared to be a part of this ordinance.

[Insert the community name and effective date of the map(s) and/or other document(s) which describe the boundaries of the area(s) inundated by the flood of record and provide the flood of record elevation data, as determined from surveyed high water marks.]

(5) Under Article 4, Section B, add the following after the first sentence in item 1:

A plot plan that shows the flood of record contour or a statement that the entire lot is within the flood of record contour must be provided by the development permit applicant when the lot is within or appears to be within the flood of record contour as shown on the community’s Flood of Record Contour Map(s).

(6) Modify the introductory sentence of Article 4, Section B(1)(a)(v) to read:

the Base Flood Elevation (BFE) or flood of record elevation data where provided as set forth in Article 3, Section B; or Article 4, Section C; or Article 5, Section D;

(7) Under Article 4, Section C, modify item 10 to read:

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Where interpretation is needed as to the exact location of boundaries of the areas of special flood hazard or of flood of record contours (for example, where there appears to be a conflict between a mapped boundary and actual field conditions), make the necessary interpretation.

(8) Modify Article 4, Section E(7) to read:

Any applicant to whom a variance is granted shall be given written notice specifying the difference between the base flood elevation or flood of record elevation and the elevation to which the structure is to be built and that such construction below the Base Flood Elevation increases risks to life and property, and that the issuance of a variance to construct a structure below the Base Flood Elevation will result in increased premium rates for flood insurance up to \$25 per \$100 of insurance coverage. Such notification shall be maintained with a record of all variance actions, including justification for their issuance.

(9) Under Article 5, Section A (General Standards), modify the introductory sentence to read:

In all areas of special flood hazard and in all areas bounded by flood of record contours the following provisions are required:

(10) Modify Article 5, Section A (9) to read:

Non conforming buildings or uses may not be enlarged, replaced, or rebuilt unless such enlargement or reconstruction is accomplished in conformance with the provisions of this ordinance. Nothing in this ordinance shall prevent the repair, reconstruction, or replacement of a building or structure existing on the effective date of this ordinance and located totally or partially within the floodway or stream setback, provided that the bulk of the building or structure below base flood elevation or flood of record elevation in the floodway or stream set back is not increased and provided that such repair, reconstruction, or replacement meets all of the other requirements of this ordinance.

(11) Under Article 5, Section B (Specific Standards), modify the introductory sentence to read:

In all areas of special flood hazard where base flood elevation data has been provided, as set forth in Article 3, Section B, or Article 5, Section D, and in all areas bounded by flood of record contours, the following provisions are required:

(12) Modify Article 5, Sections B(1) and (2) to read:

In all areas of special flood hazard where base flood elevation data have been provided and in all areas bounded by flood of record contours, as set forth in Article 3, Section B, or Article 4, Section C(10), the following provisions are required:

- Residential Construction. New construction or substantial improvement of any residential structure (including manufactured homes) shall have the lowest floor, including basement, elevate no lower than _____ () feet above the base flood elevation or _____ () feet above the flood of record elevation, whichever is greater.

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- Non-Residential Construction. New construction or substantial improvement of any commercial, industrial, or non-residential structure shall have the lowest floor, including basement, elevated no lower than _____ () feet above the level of the base flood elevation or _____ () feet above the flood of record elevation, whichever is greater.

(13) Modify Article 5, Section B(3)(a) to read:

Manufactured homes . . . must be elevated on a permanent foundation such that the lowest floor of the manufactured home I elevated no lower than _____ () feet above the base flood elevation or _____ () feet above the flood of record elevation, whichever is greater, and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

(14) Modify Article 5, Section D introductory statement, (2)(a), (2)(c), and (2)(d) to state "...Base Flood Elevation (BFE) or flood of record elevation..." at each occurrence.

Coastal Regular Phase Model Ordinance

(1) Make all of the modifications indicated above under Non-Coastal Regular Phase Model Ordinance.

(2) Add the following statement to Article 5, Section B:

All buildings or structures shall be elevated so that the bottom of the lowest supporting horizontal member (excluding pilings or columns) is located no lower than _____ () feet above the base flood elevation level or _____ () feet above the flood of record elevation, whichever is greater, with all space below the lowest supporting member open so as not to impede the flow of water.

Communities who have adopted this provision– Moore County and some of its municipalities (Carthage, Cameron, and Vass) regulate to the flood of record.

1e. Require Elevation To or Above Predicted Category 3 Hurricane Flood Elevations (or Regulate Development within Category 3 Hurricane Inundation Areas)



Recommended Higher Standard – A community should require all new construction and substantial improvement of residential structures to have the top of the reference floor (or, in coastal areas, the bottom of the lowest horizontal structural member of the reference floor) elevated to, or a minimum elevation above, the predicted storm surge elevations for a Category 3 hurricane, where these levels exceed the 1% annual chance flood elevations shown on the community's FIRM.

Background of the Higher Standard – The FIRM for a community in a coastal area shows SFHAs (A1-30, AE, V1-30, and VE Zones) and BFEs based on predicted storm surge and wave effects from a 1% annual chance coastal storm. Hurricane storm surge inundation maps prepared by the USACE and FEMA also provide information on areas subject to coastal flooding. The maps show areas that are predicted to be flooded by hurricanes varying in intensity, based on the Saffir-Simpson Hurricane Damage Potential scale: Category 1 and 2 (4- to 8-foot storm surge), Category 3 (9- to 12-foot storm surge), and Category 4 and 5 (13-foot and higher storm surge). In North Carolina, State and local emergency management officials use these maps to prepare evacuation plans.

A Category 3 hurricane is considered the closest equivalent to a 1% annual chance coastal storm event. The Category 3 inundation area delineated on a USACE or FEMA storm surge inundation map may be larger or smaller than the SFHA shown on the corresponding FIRM, depending on the difference in predicted surge levels. Areas subject to rain induced (i.e., riverine) flooding are not shown on hurricane storm surge inundation maps.



Current Minimum Standard – In areas subject to riverine flooding and coastal flooding without wave action, the NFIP requires "all new construction and substantial improvements of residential structures within Zones A1–30, AE, and AH zones on the community's FIRM, have the lowest floor (including the basement) elevated to or above the base (100-year) flood level" (44 CFR 60.3I(2)). In coastal areas, the regulations require that "all new construction and substantial improvements in Zones V1-30, VE, and also Zone V if base flood elevation data is available, on the community's FIRM, are elevated on pilings and columns so that (1) the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to or above the base flood level" (44 CFR 60.3(d)(4)).

Guidance on Selecting the Higher Standard – A community should consider adoption of this standard if the most recent Hurricane Storm Surge Inundation Map shows that areas of the community outside of the 1% annual chance flood hazard areas mapped on the effective community FIRM are predicted to flood during a Category 3 hurricane.

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The community should also consider a standard that requires elevation one or more feet above the predicted storm surge elevation. The additional foot or more of “freeboard” (see Recommended Higher Standard Number 1a) provides protection against higher flood levels that may occur due to a more severe storm.

Benefits – This higher standard may prevent loss of life and property damage during flood events, since new and substantially improved structures in areas likely to be inundated by hurricane storm surge will be constructed to higher regulatory standards. Residents in the additional areas identified as flood hazard areas based on storm surge data will be alerted to the need to obtain flood insurance. Because these areas are not identified as SFHAs on the community’s FIRM, residents will be able to obtain flood insurance at lower “Preferred Risk” or non-floodplain rates. This higher standard will provide CRS credits as a 410 Series Activity. Also, see Mapping Impacts below for other possible CRS credit.

Cost Impacts – This standard would increase the number of structures affected by the floodplain development ordinance. The severity of the impacts will vary by area.

Mapping Impacts – None. The flood zone designations on the FIRM will not be changed. These added flood hazard areas can be maintained locally as an additional GIS layer with the new digital flood maps being produced by NCFMP. If this is done, there may be additional CRS mapping credit for maintaining this additional flood data.

Information the Community Must Provide to the NCFMP – None

Model Ordinance Language –

Coastal Regular Phase Model Ordinance

(1) Under Article 2, add the following definition:

“Storm surge contour” means the boundary of the additional area outside of the area of special flood hazard that would be inundated if floodwaters rise to the storm surge elevation.

“Storm surge elevation” means the peak elevation of the water surface above mean sea level during flooding caused by a landfalling hurricane or tropical storm.

(2) Modify Article 3, Section A (Lands to Which This Ordinance Applies) to read:

This ordinance shall apply to all areas of special flood hazard area and areas bounded by storm surge contours within the jurisdiction of _____.

(3) Modify the title of Article 3, Section B as follows:

Basis for Establishing the Areas of Special Flood Hazard and Storm Surge Contours.

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(4) Add the following additional paragraph in Article 3, Section B after first paragraph:

The "Storm Surge Contours" are those identified by _____ in its Storm Surge Contour Map(s) dated _____, which with accompanying supporting data, and any revision thereto, are adopted by reference and declared to be a part of this ordinance.
[Insert the community name and effective date of the map(s) and/or other document(s) which describe the boundaries and the surge elevation data for the area(s) that would be inundated by the storm surge produced by a Category 3 hurricane, as shown the most recent Hurricane Storm Surge Inundation Map produced by FEMA or the U.S. Army Corps of Engineers.]

(5) Under Article 4, Section B, add the following after the first sentence in item 1:

Application for a Floodplain Development Permit shall be made to the Floodplain Administrator prior to any development activities located within Special Flood Hazard Areas or the storm surge contour.

(6) Modify Article 4, Section B(1)(a)(v) to read:

the Base Flood Elevation (BFE) or storm surge elevation data where provided as set forth in Article 3, Section B; Article 4, Section C; or Article 5, Section D;

(7) Under Article 4, Section C, modify item 10 to read:

Where interpretation is needed as to the exact location of boundaries of the areas of special flood hazard or of storm surge contours (for example, where there appears to be a conflict between a mapped boundary and actual field conditions), make the necessary interpretation.

(8) Modify Article 4, Section E(7) to read:

Any applicant to whom a variance is granted shall be given written notice specifying the difference between the base flood elevation or storm surge elevation and the elevation to which the structure is to be built and a written statement that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation. Such notification shall be maintained with a record of all variance actions.

(9) Under Article 5, Section A (General Standards), modify the introductory sentence to read:

In all areas of special flood hazard and in all areas bounded by storm surge contours the following provisions are required:

(10) Modify Article 5, Section A(9) to read:

Non conforming buildings or uses may not be enlarged, replaced, or rebuilt unless such enlargement or reconstruction is accomplished in conformance with the provisions of this ordinance. Nothing in this ordinance shall prevent the repair, reconstruction, or

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replacement of a building or structure existing on the effective date of this ordinance and located totally or partially within the floodway or stream setback, provided that the bulk of the building or structure below base flood elevation or storm surge elevation in the floodway or stream set back is not increased and provided that such repair, reconstruction, or replacement meets all of the other requirements of this ordinance.

(11) Under Article 5, Section B (Specific Standards), modify the introductory sentence to read:

In all areas of special flood hazard where base flood elevation data has been provided, as set forth in Article 3 Section B, or Article 4, Section C(10), and in all areas bounded by storm surge contours, the following provisions are required:

(12) Modify Article 5, Sections B(1) and (2) to read:

(1) Residential Construction. New construction or substantial improvement of any residential structure (including manufactured homes) shall have the lowest floor, including basement, elevate no lower than ____ () feet above the base flood elevation or ____ () feet above the storm surge elevation, whichever is greater.

(2) Non-Residential Construction. New construction or substantial improvement of any commercial, industrial, or non-residential structure shall have the lowest floor, including basement, elevated no lower than ____ () feet above the level of the base flood elevation or ____ () feet above the storm surge elevation, whichever is greater.

(13) Modify Article 5, Section B(3)(a) to read:

Manufactured homes . . . must be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated no lower than ____ () feet above the base flood elevation or ____ () feet above the storm surge elevation, whichever is greater, and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

(14) Modify Article 5, Section D introductory statement, (2)(a), (2)(c), and (2)(d) to state "...Base Flood Elevation (BFE) or storm surge elevation..." at each occurrence.

Communities who have adopted this provision – As of the date of publication of this document, no communities within North Carolina are known to require elevation to or above predicted Category 3 hurricane flood elevations.

1f. Require Extra Elevation for Structures in A Zones (without BFEs)

Recommended Higher Standard – A community should require that all new construction and substantial improvement of structures in A Zones must have the reference floor elevation: 1) five feet above the Highest Adjacent Grade (HAG); 2) a minimum amount above the 1% annual chance flood elevation established by a flood elevation study using detailed study methods; or, 3) a minimum amount above the estimated 1% annual chance flood elevation determined by a FEMA-approved approximate method.



Background of the Higher Standard – BFEs are not provided on a community's FIRM for A Zones because the approximate study methods used to identify the boundaries of those SFHAs do not include the field surveys and the hydrology and hydraulic analyses needed to determine the 1% annual chance flood elevations. Therefore, the FIRM provides no guidance on where to locate a structure's reference floor to ensure that the structure will not be damaged by the 1% annual chance flood event.

The NFIP requires that a detailed study must be performed to determine the BFEs for subdivisions and other developments greater than 50 lots or 5 acres in A Zones, whichever is less. Detailed studies are not required for smaller developments or substantial improvement of existing structures. As a consequence, residents with structures in A Zones are required to pay much higher rates for flood insurance when no elevation data (i.e., the BFE on an Elevation Certificate) can be provided to the insurance agency.

The North Carolina model Flood Damage Prevention ordinance requires that new development in SFHAs be elevated to a minimum of 2 feet above the HAG where BFE data is not available (i.e., A Zones). By complying with this requirement, property owners will construct safer structures and be less prone to flood damages. In addition, property owners will qualify for a substantial reduction of their annual flood insurance rates. However, elevating a structure to 2 feet above the HAG could still place the reference floor elevation below the BFE, if determined. Therefore, the structure will be at a high risk of flood damage.

It is important to note that ground elevations may vary substantially within an A Zone. Requiring elevation to higher levels will decrease the risk of flooding and lower insurance costs further; we recommend an elevation of 5 feet. On the other hand, if the structure is located on a localized area of higher ground within the A Zone, 5 feet of additional elevation may not be justified. Therefore, knowing the BFE will provide important information on a structure's risk of flood damage.

An alternative to elevation above the HAG is requiring elevation to or above the 1% annual chance flood elevation. Flood elevation can be estimated using an approximate FEMA-approved method, or rigorously determined using the same methods that are used to develop FEMA-approved detailed study BFEs and flood profiles for AE Zones. Obviously, the rigorous methods give more reliable results, but an approximate method may be appropriate for isolated development. In either case, an Elevation Certificate completed by a licensed surveyor or registered engineer would be required by a local official to verify that the proper elevation standards are met. This Elevation Certificate would also assist property owners in obtaining

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lower flood insurance rates. Performing a detailed study and obtaining a LOMR from FEMA for the area where the development or individual structure is located converts the area from an A Zone to an AE Zone with detailed study BFEs that have the same level of credibility as those shown on a printed FIRM panel.

According to one of the approximate FEMA-approved methods, BFEs can be derived by determining the ground elevation along the A Zone boundary since the elevation along the boundary of the flood zone equals the approximate flood elevation. The ground elevation can be determined either by field survey or by comparing the boundary shown on the FIRM with an accurate topographic map, such as that developed by a community, or, if nothing more accurate is available, a USGS quad map. Detailed instruction for using the second FEMA-approved method, known as "contour interpolation," is provided in FEMA 265, titled "Managing Floodplain Development in Approximate Zone A Areas."

Requiring elevation above the BFE or estimated BFE (i.e., freeboard) is necessary to protect structures from inundation during a 1% annual chance flood event, for the same reasons described in Recommended Higher Standard Number 1a (i.e., blocked culverts, channel sedimentation, wave action from passing vehicles, increased runoff due to impervious surface added by new development). Therefore, communities are urged to require elevation to some specified amount above a BFE. The vertical distance between the BFE and the required elevation is similar to the "freeboard" standard that communities are recommended to adopt for structures in AE, A1-30, VE, and V1-30 Zones.

Current Minimum Standard – For developments smaller than 50 lots or 5 acres, the NFIP requires that the community "obtain, review and reasonably utilize any base flood elevation and floodway data available from a Federal, State, or other source...as criteria for requiring that new construction, substantial improvement, or other development in Zone A on the community's FHBM or FIRM meet the standards in paragraphs I(2), I(3), I(5), I(6), I(12), I(14), (d)(2) and (d)(3) of this section" that apply to all structures located in AE and A1-30 Zones (44 CFR 60.3). Article 5, Section C(2) of the North Carolina model Flood Damage Prevention Ordinance for non-coastal communities requires that "when base flood elevation data is not available from a Federal, State, or other source, the lowest floor, including basement shall be elevated at least 2 feet above the highest adjacent grade."

Guidance on Selecting the Higher Standard – If only isolated development is anticipated in A Zone areas that are currently undeveloped and there are relatively few elevation benchmarks available, a community should consider requiring elevation above the HAG. This will avoid the requirement of having a licensed surveyor complete an Elevation Certificate. Consideration should be given to requiring elevation to 5 feet above the HAG, since this offers property owners a significant level of flood protection and the greatest reduction in flood insurance rates (see **Table 5** below). On the other hand, 5 feet of elevation could cause higher initial construction costs. And, for manufactured home owners, an elevation of 3 feet or more above grade would require an engineered design. These factors must be considered when a community decides on an elevation requirement.

If more significant development is anticipated in A Zone areas, communities should consider requiring elevation above estimated BFEs determined either by contour interpolation or field

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survey and detailed study. Before deciding whether to accept estimated BFEs determined by contour interpolation, the community should compare the best available topographic map with the FIRM or FHBM for the particular A Zone flooding source(s) within the community's jurisdiction. FEMA 265 states that if the A Zone boundaries shown on the FIRM or the FHBM do not generally conform to the contour lines on the topographic map, then the contour interpolation method is not considered acceptable. The criteria for making this determination are described in detail in FEMA 265, along with illustrated examples. If the FEMA 265 criteria are not satisfied, then the community should require that BFEs be determined by conducting a field survey and detailed engineering analysis. A field survey would be performed by a licensed surveyor who could establish the ground elevation at the A Zone boundary closest to the structure.

The amount of freeboard that a community should adopt for elevation above a BFE may vary, depending on terrain and other factors. Communities may be able to obtain guidance from the flood profiles in the FIS Report for streams studied by detailed methods in the same vicinity. If the difference between the 1% and 0.2% annual chance elevations is less than 1 foot, then 2 feet of freeboard is recommended. If the difference is more than 1 foot, the community should consider using the amount of the difference plus 1 foot as the required additional elevation distance above the BFE.

Benefits – Adoption of this standard may prevent loss of life and property because elevated construction is safer during flood events. Also, elevation of the lowest floor above the BFE substantially lowers the annual Federal flood insurance rate. For example, the annual flood insurance policy costs for a one-floor, no basement structure with \$100,000 in coverage and \$25,000 in content coverage is shown below in **Table 5**. This information is based on May 1, 2002, rates.

Reference Elevation	Annual Rates	Annual Savings
No Elevation Certificate	\$2,205.00	N/A
Two to four feet above the HAG	589.50	\$1,615.50
Five or more feet above the HAG	372.00	1,833.00
Zero to one foot above the estimated BFE	533.50	1,671.50
Two or more feet above the estimated BFE	318.00	1,887.00
One foot above the detailed study BFE	431.00	1,774.00
Two feet above the detailed study BFE	284.00	1,921.00

If a community enforces an A Zone freeboard standard based on BFEs, disaster recovery efforts and costs will be reduced and the community could receive recognition for this, which in turn would further reduce the rates listed above. Each foot of freeboard adopted by the community provides the community with 100 CRS credit points. The CRS also credits communities that develop BFEs for unstudied areas under Activity 410.

Cost Impacts – Requiring additional elevation will probably increase the initial construction costs for structures in A Zones. The floor level of a residential structure can be raised by increasing the height of the foundation wall or by raising the building pad elevation by using properly compacted fill. Raising the footprint of a 1,400 square foot house by 1 foot would cost approximately \$1,500. In comparison, this initial construction cost would be easily recouped in flood insurance savings.

There will be an additional cost impact for field surveys if detailed studies are required. If the contour interpolation method cannot be applied, costs may range from \$1,000 to \$5,000 to determine the estimated BFE. All new structures or substantial improvements constructed according to the standard will require an Elevation Certificate that shows the elevation of the reference floor relative to the estimated BFE. The cost for a licensed surveyor to prepare the Elevation Certificate averages about \$300, but can increase drastically if benchmarks are not close to the individual property.

As shown above in **Table 5**, these initial costs will be offset partially or completely over time by cost savings resulting from lower insurance rates.

Mapping Impacts – None

Information the Community Must Provide to the NCFMP – None

Model Ordinance Language –

- **Option 1 – Lowest floor elevated a minimum amount above the HAG**

Coastal and Non-Coastal Regular Phase Model Ordinances

(1) Article 5, Section D(2) in the Coastal and Non-Coastal Regular Phase Model Ordinances already include a provision for a community to specify the number of feet that new construction and substantial improvements must be elevated above HAG where base flood elevation data is not available.

- **Option 2 – Lowest floor elevated a minimum amount above the estimated 1% annual chance flood elevation.**

Non-Coastal Regular Phase Model Ordinance

(1) Under Article 2 (Definitions), add the following definition:

“Estimated base flood elevation” means the estimated water surface elevation at the crest of the base flood, as determined using either the “Contour Interpolation” method described in the FEMA publication “Managing Floodplain Development in Approximate Zone A Areas” (FEMA 265, July 1995), or a field survey to determine the ground elevation at the boundary of the area of special flood hazard closest to the location where base flood elevation data is required.

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(2) Modify the introductory sentence of Article 4, Section B(1) to read:

The application for a Development Permit within the flood hazard area shall show:

(3) Add the following new subsection to Article 5, Section D:

(3) If Article 5, Section D(2) is satisfied and base flood elevation data is not available from a Federal, State, or other source, estimated base flood elevation data shall be provided for all new construction and substantial improvements within such areas. New construction or substantial improvement of any residential or non-residential structure (including manufactured homes) shall have the lowest floor, including basement, elevated no lower than _____ () feet above the estimated base flood elevation and shall comply with all other applicable flood hazard ordinance provisions of Article 5. Non-residential structures may be floodproofed to the flood protection level in lieu of elevation in accordance with the provisions of Article 5 Section B(2).

Coastal Regular Phase Model Ordinance

(1) Under Article 2 (Definitions), add the following definition:

“Estimated base flood elevation” means the estimated water surface elevation at the crest of the base flood, as determined using either the “Contour Interpolation” method described in the FEMA publication “Managing Floodplain Development in Approximate Zone A Areas” (FEMA 265, July 1995), or a field survey to determine the ground elevation at the boundary of the area of special flood hazard closest to the location where base flood elevation data is required.

(2) Modify the introductory sentence of Article 4, Section B(1) to read:

The application for a Development Permit within the flood hazard area shall show:

(3) Add the following new subsection to Article 5, Section D:

(3) If Article 5, Section D(2) is satisfied and based flood elevation data is not available from a Federal, State, or other source, estimated base flood elevation data shall be provided for all new construction and substantial improvements within such areas. New construction or substantial improvement of any residential or non-residential structure (including manufactured homes) shall have the lowest floor, including basement, elevated no lower than _____ () feet above the estimated base flood elevation and shall comply with all other applicable flood hazard ordinance provisions of Article 5. Non-residential structures may be floodproofed to the flood protection level in lieu of elevation in accordance with the provisions of Article 5 Section B(2).

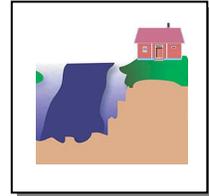
Communities who have adopted this provision – All communities within North Carolina regulate to two feet above the highest adjacent grade.



Build it Out

2a. Prohibit Manufactured Housing and Recreational Vehicles in V Zones

Recommended Higher Standard – A community should prohibit siting of manufactured homes and Recreational Vehicles (RVs) in V1-30, V, and VE Zones.



Background of the Higher Standard – Manufactured homes are typically more vulnerable to the effects of coastal storms than conventional coastal structures that are built in accordance with the local building code. Even when elevated on pilings, a manufactured home is extremely vulnerable to wind and wave damage if wave heights and/or storm surge exceed the required elevation height.

Recreational vehicles are similarly vulnerable to the effects of winds and waves. Current NFIP regulations do not require elevation to or above the BFE in V Zones as long as the vehicle is not permanently located at the site. The underlying assumption is that RVs can be moved out of V Zones to safer locations when a storm threatens. This places a burden on the local floodplain administrator to enforce the 180 days on site and highway-ready regulations for vehicles that may be located in remote areas and/or are difficult to move without prior notification. It also places a burden on local emergency management officials who must make allowances for evacuation of potentially large numbers of RVs on short notice over congested coastal evacuation routes.

Current Minimum Standard – The NFIP regulations require that “manufactured homes placed or substantially improved within Zones V1-30, V, and VE on the community’s FIRM on sites:

- i Outside of a manufactured home park or subdivision,
- ii In a new manufactured home park or subdivision,
- iii In an expansion to an existing manufactured home park or subdivision, or
- iv In an existing manufactured home park or subdivision on which a manufactured home has incurred ‘substantial damage’ as the result of a flood meet the standards of paragraphs (e)(2) through (7) of this section [elevated on pilings or columns, landward of mean high tide, etc.]” (44 CFR 60.3 (e)(8)).

The NFIP regulations also require that “recreational vehicles placed on sites within Zones V1-30, V and VE on the community’s FIRM either:

- i Be on the site for fewer than 180 consecutive days, and
- ii Be fully licensed and ready for highway use, or
- iii Meet the requirements in paragraphs (b)(1) [permitted by local floodplain administrator] and (e)(2) through (7) of this section” (44 CFR 60.3 (e)(9)),

which essentially state that the RVs are to meet Manufactured Home standards, but this would involve setup on pilings or columns, a V Zone certification, and wind zone construction for which RVs are not normally designed to meet.

Guidance on Selecting the Higher Standard – Communities that adopt this standard should designate locations outside of V Zones that are acceptable for manufactured homes and RVs. Since RVs are more mobile, it will probably be necessary to post notices in V Zone areas where RVs are not permitted. If a community is unable to enforce this provision in its entire jurisdiction, a floodplain administrator may wish to try to enforce this in more vulnerable V Zones such as the areas that are designated as Areas of Environmental Concern or areas that have higher erosion rates. A floodplain administrator may wish to designate a setback requirement from the primary frontal dunes, mean high tide, or some other reference point. For example, if there is another regulatory setback already enforceable, you may wish to double or triple this setback for manufactured homes and RVs to keep them further back from the higher levels of risk.

Benefits – Adoption of this higher standard may prevent loss of life and property during coastal storm and flood events. In addition, adoption of the standard will provide CRS credits as a 430 Series activity.

Cost Impacts – Owners of existing manufactured home parks or subdivisions in V Zones may be left with lots that cannot be occupied. Also, owners of existing RV parks in V Zones will be put out of business.

Mapping Impacts – None

Information the Community Must Provide to the NCFMP – None

Model Ordinance Language –

Coastal Regular Phase Model Ordinance

[Note: The model ordinance already prohibits manufactured homes in V Zones except for replacement manufactured homes in existing manufactured home parks or subdivisions.]

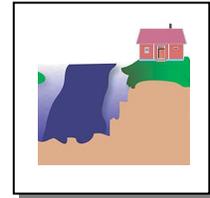
(1) Modify Article 5, Section B, item (6) to read:

No recreational vehicles shall be permitted in Coastal High Hazard Areas.

Communities who have adopted this provision - The North Carolina Building Code prohibits RVs in V Zones, so all coastal North Carolina communities have adopted this provision.

2b. Prohibit Manufactured Housing and Recreational Vehicles in Floodways

Recommended Higher Standard – A community should prohibit siting of manufactured homes and RVs in regulatory floodways and non-encroachment areas.



Background of the Higher Standard – A floodway is the area of the floodplain along a stream or river channel that is reserved to discharge a flood. The floodway is the area of the floodplain where the velocity of the floodwaters will be the highest. Under the current NFIP regulations, a manufactured home can be located in a floodway just like any other development, if it is elevated at least to the BFE and in such a way (e.g., on a pile foundation) that the applicant can provide a no-impact certification from a registered professional engineer showing that this development will in no way increase the BFE. RVs can be located in floodways without being elevated or anchored as long they are on-site less than 180 days and are ready for highway use. It is also possible the RV can meet the manufactured housing requirements with a no rise certification. Both manufactured homes and RVs are highly vulnerable to damage caused by moving water and floating debris. Even if properly elevated and anchored according to NFIP requirements, a manufactured home in a floodway is extremely vulnerable to a flood. In mountainous areas, flash floods pose an additional hazard to manufactured homes and RVs since residents typically have little or no warning before floodwater collapses them or begins moving the structure downstream.

Current Minimum Standard – The NFIP regulations require that “manufactured homes that are placed or substantially improved within Zones A1-30, AH, and AE on the community’s FIRM on sites [located in the following areas]:

- i Outside of a manufactured home park or subdivision;
- ii In a new manufactured home park or subdivision;
- iii In an expansion to an existing manufactured home park or subdivision; or
- iv In an existing manufactured home park or subdivision on which a manufactured home has incurred ‘substantial damage’ as the result of a flood, be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely anchored to an adequately anchored foundation system to resist floatation collapse and lateral movement” (44 CFR 60.3 I(6)).

The NFIP regulations also require that “recreational vehicles placed on sites within Zones A1-30, AH and AE on the community’s FIRM either

- i Be on the site for fewer than 180 consecutive days,
- ii Be fully licensed and ready for highway use, or
- iii Meet the permit requirements of paragraphs (b)(1) of this section [permitted by local floodplain administrator] and the elevation and anchoring requirements for ‘manufactured homes’ in paragraph (c)(6) this section” (44 CFR 60.3 (c)(14)).

SAFER DEVELOPMENT IN FLOODPRONE AREAS

Section 60.3(d) of the NFIP regulations contains the requirements for development in floodways, but it does not contain any specific requirements related to manufactured homes or RVs. In general, development is permitted in floodways if it can be demonstrated that the encroachment would not increase flood levels in the community during a base flood discharge prior to issuance of a local floodplain development permit. Please note that the local floodplain administrator still has the right to deny the permit for this development.

Guidance on Selecting the Higher Standard – Communities that adopt this standard should designate locations outside of floodways and also floodplains that are acceptable for manufactured homes and RVs. Since RVs are more mobile, it may be necessary to post notices in floodways that RVs are not permitted.

Benefits – Adoption of this higher standard may prevent loss of life and property during flood events. In addition, adoption of the standard will provide a community participating in CRS with credits as a 430 Series Activity.

Cost Impacts – Owners of existing manufactured home parks or subdivisions in floodways may be left with undevelopable lots. Owners of existing RV parks in floodways will be put out of business, but they may be able to turn these parks into other, safer forms of open space and recreation. Prohibiting RVs from the floodway or also floodplains may also detract from community tourism and/or recreation.

Mapping Impacts – None

Information the Community Must Provide to the NCFMP – None

Model Ordinance Language –

Non-Coastal and Coastal Regular Phase Model Ordinance

[Note: The model ordinance already prohibits manufactured homes in floodways, except for replacement manufactured homes in existing manufactured home parks or subdivisions.]

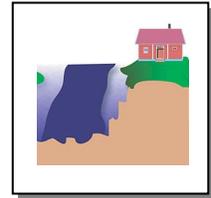
(1) Under Article 5, Section B, item (6), add new sub-item:

(c): No recreational vehicles shall be permitted within a floodway.

Communities who have adopted this provision - The North Carolina Building Code prohibits RVs in floodways, so all coastal North Carolina communities have adopted this provision.

2c. Increase Width of Floodways Based on Reduced Surcharge Value

Recommended Higher Standard – A community should limit surcharge values to 0.5 foot or less (0.1 foot is the recommended maximum). The Federal maximum surcharge limit is 1 foot; therefore, most regulatory floodways in North Carolina have been analyzed using this standard. This standard will widen the floodways and non-encroachment areas on a community's FIRM. This increases the land area that is excluded from development that causes any increase in 1% annual chance water-surface elevations.



Background – Limiting development in the immediate vicinity of a river or stream channel is a fundamental requirement of NFIP floodplain management regulations. This restricted development area is referred to as the floodway. Since floodwaters are deepest and swiftest in the floodway, structures and other uses located in this area are subject to the highest risk of damage during major flood events. Development in the floodway also introduces obstructions that can cause floodwater to back up and increase flood elevations on adjacent properties. Development in areas identified as Zone AE or A1-30 on a community's FIRM is therefore limited to properties outside of the floodway, known as the "flood fringe."

Non-Encroachment Areas

For the new FIRM panels being produced by the North Carolina Floodplain Mapping Program, numerous streams are being studied by limited detailed methods. A regulatory floodway for these streams is not being mapped. Similarly, the widths of non-encroachment areas are being published in FIS Reports to help communities ensure that floodplain development does not cause an unacceptable rise in flood elevation.

The width of the floodway, or non-encroachment area for streams studied by limited detailed methods, is determined based on the amount that the BFE would increase if all of the properties in the flood fringe are filled in as a result of development. The allowable amount of increase in the BFE is referred to as "surcharge," and the NFIP maximum value for surcharge is 1 foot. Please see Figure 1 on page 8. As more and more property in the flood fringe is filled in, the BFE will continue to increase up to a maximum of 1 foot above the BFE shown on the FIRM, since the floodway must remain free of obstructions. Structures built in the flood fringe according to minimum NFIP standards with reference floor elevations at the BFE, could experience up to 1 foot of flooding during a 1% annual chance flood if the community allows extensive development of the flood fringe. In fact, hydrologic and hydraulic studies recently conducted by Charlotte-Mecklenburg indicate that the surcharge will actually be much higher than 1 foot in fully developed areas if traditional, FEMA-approved methods are used to set floodway and non-encroachment area widths.

Current Minimum Standard – In areas subject to riverine flooding, where BFEs are provided on the community's FIRM, the NFIP requires that the community shall "select and adopt a regulatory floodway based on the principle that the area chosen for the regulatory floodway must be designed to carry the waters of the base flood, without increasing the water surface elevation of that flood more than one foot at any point" (44 CFR 60.3 (d)(2)).

SAFER DEVELOPMENT IN FLOODPRONE AREAS

Guidance on Selecting Higher Standard – A community should consider adoption of this standard if there is concern that unrestricted development in the currently mapped flood fringe will adversely impact flood elevations. A lower surcharge value can be adopted for all streams within the community’s jurisdiction, or only for particular streams where development pressures are highest.

Benefits – This higher standard may prevent loss of life and property damage during flood events, since a larger portion of the flood hazard area is reserved to discharge a flood. This will limit the amount that flood levels might otherwise be increased above predicted BFEs due to placement of fill and other obstructions to the flow of floodwater. Also, this higher standard will provide CRS credits as a 420 Series Activity.

Cost Impacts – This standard would not directly increase development costs, since no additional requirements are placed on structures built in the flood fringe. However, excluding property in the flood fringe from development could increase development costs for property in other areas.

Mapping Impact – The floodway boundaries shown on a community’s FIRM will differ based on the amount of surcharge that the community adopts. This value will be used in the hydraulic analysis that determines the width of the floodway.

Information Provided to the NCFMP by the Community – The community must provide the surcharge value that it has adopted for specific flood sources that are to be restudied by detailed methods for a new edition of the community’s FIRM.

Model Ordinance Language –

Non-Coastal and Coastal Regular Phase Model Ordinances

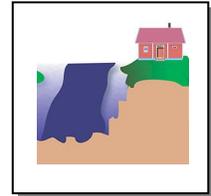
(1) Under Article 2, modify the definition of “Floodway” to read:

“Floodway” means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than _____ () feet.

Communities who have adopted this provision – include Charlotte - Mecklenburg.

2d. Prohibit or Require Elevation of Critical Facilities in 1% and 0.2% Annual Chance Floodplains

Recommended Higher Standard – A community should prohibit siting of critical facilities in areas subject to flooding by the 1% annual chance flood (SFHAs) and should discourage siting of critical facilities in areas subject to flooding by the 0.2% annual chance (500-year recurrence interval) flood. If no feasible alternative site is available for a newly constructed facility, or if an existing critical facility located in a SFHA or 500-year floodplain is substantially damaged or improved, it should be elevated to at least the 0.2% annual chance flood elevation and be accessible by road during a 0.2% annual chance flood event. If a proposed critical facility site is in or near a SFHA for which the 0.2% annual chance flood elevation is not determined and the 500-year floodplain has not been delineated, a flood study should be performed to determine this information before the facility is sited.



Background of the Higher Standard – Many public and commercial facilities serve vital functions for communities which, if interrupted due to flooding, would severely impact citizens. Also, some facilities house large numbers of people who would experience difficulty if required to evacuate before or during a severe flood. Special consideration should be given to requiring a higher level of protection from flooding for such facilities. Since flooding can prevent access to a critical facility even if the facility is elevated or floodproofed above the flood level, primary consideration should be given to locating critical facilities where the risk of flooding is minimal. Statistically, a facility located in a SFHA stands a 26% chance of experiencing the 100-year flood in a 30-year period. On the other hand, a facility located outside a 500-year floodplain (i.e., in a C Zone or “unshaded X Zone” as shown on the FIRM) stands less than a 6% chance of being flooded over a 30-year period.

However, locating critical facilities outside of 500-year or even 100-year floodplains may not be an option for some communities. In this situation, elevation to the level of the 0.2% annual chance flood offers almost the same level of protection from flooding for the facility and its contents. Requiring elevation above the 500-year flood level provides an additional level of protection if floodwaters rise higher than predicted 500-year levels due to debris accumulation or other factors (see Section II.B.1a). For some facilities, floodproofing to the same elevation will provide a similar level of protection. However, since all-weather access is generally necessary either to maintain operations or to evacuate the occupants, it will be necessary to provide an elevated access road to facilities located inside the 100-year or 500-year floodplain. When evaluating where to locate a critical facility, the additional cost to elevate or floodproof and to provide all-weather access if the facility is located in a floodplain should be fully considered.

For sites located in or near unnumbered A Zones on existing FEMA FIRMs, or AE Zones studied by limited detailed methods on newer FIRMs produced under the State of North Carolina/FEMA CTP agreement, the 500-year floodplain is not delineated on the FIRM, and the FIS Report does not include a stream profile showing the 0.2% annual chance flood elevation. A decision to site a critical facility in such an area should not be made until a flood study has been performed to determine this information and the potential flood risks and avoidance costs have been thoroughly evaluated. If a community has other reliable data such as high water mark

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information from a large magnitude (i.e., greater than 500-year) flood event, it may be acceptable to require that critical facilities be elevated to or above the high water mark elevation, in lieu of requiring flood studies.

Communities should consider requiring that the following categories of facilities be subject to these requirements:

- i Emergency response facilities, including rescue/emergency medical services, police departments, fire departments, hospitals, health clinics, emergency shelters, emergency management operations, and communication facilities.
- ii Facilities housing vulnerable occupants, such as nursing homes, prisons, jails, centers and group homes for the mentally and physically handicapped, and day-care centers.
- iii Public utilities, including power generating plants and transfer stations, public water supply plants, solid waste incinerators and waste transfer stations, and wastewater treatment plants.
- iv Facilities housing irreplaceable public documents, such as libraries, museums, courthouses, colleges, and schools.
- v Hazardous material facilities, such as liquid and gas fuel tanks, petrochemical facilities, chemical manufacturing and storage facilities, research laboratories testing infectious biological agents, explosive manufacturing and warehousing, toxic waste facilities, and landfills. [As described in Section II.A.1, recent state legislation prohibits location of this type of facility in SFHAs. Communities should consider further restricting the siting of these facilities to locations outside of 500-year floodplains.]

Current Minimum Standard – The NFIP regulations only require elevation of structures located in SFHAs to the BFE, regardless of the function they serve. Facilities belonging to agencies of the Federal Government are subject to Executive Order 11988, which requires rigorous alternative site evaluations before funding, leasing, or building any facility in the 100-year floodplain. The guidelines for implementing Executive Order 11988 set the 500-year flood as the standard for protecting “critical actions.” North Carolina Executive Order 123 contains similar requirements for State-owned facilities.

Guidance on Selecting the Higher Standard – It is advisable for all communities to adopt some form of this standard to provide increased protection for citizens served by or housed in critical facility structures. Wherever possible, the most restrictive form of the standard, which prohibits siting of critical facilities in 100-year and 500-year annual chance floodplains, should be adopted to provide the highest level of protection. Existing facilities located in floodplains that are substantially damaged or improved should be elevated or floodproofed to at least one foot above the 0.2% annual chance flood elevation and be connected to land outside the 500-year floodplain by an access road which is no lower than 6 inches below the 0.2% annual chance flood elevation.

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Communities where a large portion of the area under their jurisdiction is occupied by 100-year and 500-year floodplains should consider adopting a less restrictive standard that allows siting critical facilities in floodplains, but requires elevation or floodproofing to at least one foot above the 0.2% annual chance flood elevation. These communities should also require that elevated or floodproofed facilities be connected to land outside the 500-year floodplain by an access road which is no lower than 6 inches below the 0.2% annual chance flood elevation. Critical facilities that sustain substantial damage or are substantially improved should be required to comply with the elevation and access standards.



Communities where a portion of the area under their jurisdiction is occupied by unnumbered A Zones or limited detailed study AE Zones should require that a flood study be performed for critical facilities proposed for sites located in or near these areas to determine the 0.2% annual chance flood elevation and delineate the 500-year floodplain. If the proposed site is subject to flooding during the 0.2% annual chance event and no feasible alternative site exists, the facility should be required to comply with the elevation and access standards.

Benefits – Adoption of this higher standard may prevent loss of life and property during flood events by ensuring that services provided by critical facilities are not interrupted during and after major flood events. In addition, adoption of the standard will provide CRS credit points as a 430 Series activity. Communities that prohibit siting critical facilities in the 500-year floodplain will receive 100 CRS credit points; communities that only require protection from damage (i.e., elevation or floodproofing) and loss of access as a result of the 500-year flood or the flood of record, whichever is higher, will receive 50 CRS credit points.

[The FEMA publication [CRS Credit for Higher Regulatory Standards](#) notes that CRS credit is provided only if the community has adopted regulatory language that addresses protection of critical facilities. The fact that there are currently no critical facilities in the regulated floodplain may indicate community policy, but adopted regulations are required to receive CRS credit.]

Cost Impacts – Restricting critical facility sites to locations outside of SFHAs and 500-year floodplains may increase costs if land prices are higher in non-floodprone areas. Costs for facilities such as wastewater treatment plants located on higher ground may increase if lift stations are required and effluent must be piped further to a discharge location in a river or stream. Increased costs for private facilities will be offset to some extent by savings on flood insurance costs, since premiums are lowest for X Zone properties.

Requiring elevation or floodproofing and all-weather access for new and substantially improved structures built in SFHAs and 500-year floodplains will significantly increase facility costs. Increased costs for elevated private facilities constructed in SFHAs will be offset to some extent by lower flood insurance costs, since elevation above BFE reduces premiums. Private facilities built in 500-year floodplains will also benefit from lower X Zone flood insurance premiums.

Mapping Impacts – None

Information the Community Must Provide to the NCFMP – None

Model Ordinance Language –

Non-Coastal Regular Phase Model Ordinance

(1) Under Article 2, add the following definitions:

“Critical Facility” means any property that, if flooded, would result in severe consequences to public health and safety. Critical facilities include but are not limited to:

- Those structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic, and/or water-reactive materials;
- Hospitals, nursing homes, and housing likely to contain occupants who may not be sufficiently mobile to avoid death or injury during a flood;
- Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for flood response activities before, during, and after a flood; and
- Public and private utility facilities that are vital to maintaining or restoring normal services to flooded areas before, during, and after a flood.

“500-year flood” means that flood which has a 0.2% of being equaled or exceeded in any given year.

“500-year floodplain” means the floodplain that would be inundated by the 0.2% annual chance (500-year) flood. The 500-year floodplain is delineated on Flood Hazard Boundary Maps, Flood Insurance Rate Maps, and Flood Boundary and Floodway Maps as Zone B or Zone X (shaded).

(2) In Article 5, add the following:

Section H. Critical Facilities

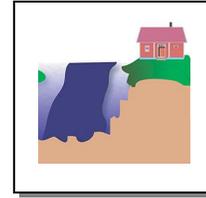
New construction or substantial improvement of any critical facility is prohibited in all areas of special flood hazard and in all 500-year floodplains, unless all of the following provisions are met:

SAFER DEVELOPMENT IN FLOODPRONE AREAS

- (1) No feasible alternative site exists for construction of an equivalent facility within the municipal or extraterritorial jurisdiction boundaries of _____ (local unit);
- (2) The facility has the lowest floor, including basement, of all structures elevated no lower than ____ (__) *foot (1 foot is the minimum requirement)* above the 500-year flood elevation. Should solid foundation perimeter walls be used to elevate a structure, openings sufficient to facilitate the unimpeded movements of floodwaters shall be provided. Structures may be floodproofed to the flood protection level in lieu of elevation provided that all areas of the structure below the required elevation are watertight with walls substantially impermeable to the passage of water, using structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effect of buoyancy. A registered professional engineer or architect shall certify that the standards of this subsection are satisfied. Such certification shall be provided to the official as set forth in Article 4, Section B(7). If the 500-year floodplain is not identified on the FIRM and the facility is located within ____ (__) feet of the boundary of an area of special flood hazard (*1,000 feet is the minimum requirement*) where no base flood data is provided, certification with supporting technical data by a registered professional engineer shall be provided that the facility is elevated or floodproofed no lower than one (1) foot above the 500-year flood elevation, unless it is certified that the facility located outside the 500-year floodplain; and
- (3) The facility has at least one access road connected to land outside the 500-year floodplain that is capable of supporting a 4,000-pound vehicle. The top of the access road must be no lower than ____ (__) feet ____ (*0.5 feet below is the minimum requirement*) the elevation of the 500-year flood.

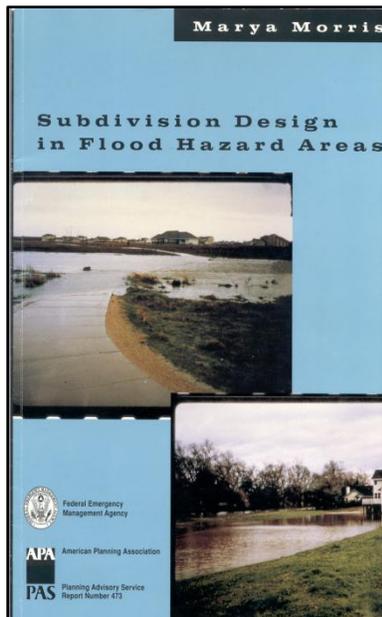
Communities who have adopted this provision - As of the date of publication of this document, no communities within North Carolina are known to prohibit or require elevation of critical facilities in 1% and 0.2% annual chance floodplains.

2e. Preserve Open Space



Recommended Higher Standard – A community should include a provision in its Flood Damage Prevention Ordinance that restricts development to keep vacant floodplain lands open. This can be accomplished by keeping the land publicly owned (such as a park, greenway, or golf course), by keeping it as a private preserve (such as hunting club lands), or by regulating development so that no new structures or fill can be placed in the subject land. Deeds for the parcels preserved as open space may have restrictions to prevent future owners from developing the land. The community may adopt an ordinance to maintain all SFHAs as open space. Ideally, open space areas should be preserved in their natural state, restored to a condition approximating their pre-development natural state, or designated as worthy of preservation for their natural and beneficial floodplain functions. To be termed “open space,” the land must be free from buildings, fill, or other encroachments to flood flows.

Background of the Higher Standard – One of the best ways to prevent flood damage is to keep floodprone areas free of development. Preserving open space is therefore recognized as a regulatory activity. In addition to the flood protection benefits, preserving open space can greatly enhance the natural and beneficial functions that floodplains serve.



Open space subdivision design is a regulatory approach that can require developers to set aside floodplains and other areas as dedicated open space. The areas may be deeded to the community or permanently protected under a conservation easement and maintained by the owner or a homeowners’ association.

Current Minimum Standard – The NFIP allows development within designated SFHAs, provided that the floodplain encroachment does not increase flood levels by more than one foot at any location. Greater restrictions apply to development within a floodway or non-encroachment area, although it still may be allowed with a no-rise certification or prior approval through the Conditional Letter of Map Revision process.

Guidance on Selecting the Higher Standard – Communities may zone specific areas to preserve as open space. Alternatively, a community may outright prohibit new structures within identified SFHAs. Also, a community may combine open space preservation with other higher standards, such as restricted development within a freeboard contour zone or 0.2% annual chance floodplain.

Benefits – Adoption of this higher standard may prevent loss of life and property during flood events by ensuring that property is kept clear of flood hazards. Homeowners can avoid costly flood insurance premiums. In addition, adoption of the standard will provide CRS credit points as a 420 Series activity. The credit points for preserving open space were significantly increased in 1999. Extra credit is provided for open spaces that are preserved in their natural

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state, have been restored to a condition approximating their natural pre-developed condition, or have been designated as worthy of preservation for their natural and beneficial floodplain functions by a federal, state, or nationally recognized private program. Such programs include but are not limited to:

- The U.S. Fish and Wildlife Service's Threatened and Endangered Species' Critical Habitat Designations;
- A Habitat Conservation Plan approved by the U.S. Fish & Wildlife Service or the National Marine Fisheries Service;
- State sensitive-areas programs that place development restrictions on designated properties; and
- The Nature Conservancy's Heritage Program Inventory.

[The FEMA publication National Flood Insurance Program Community Rating System Coordinator's Manual notes that areas for which open space CRS credit is requested must be excluded from any area credited for low density zoning.]

Cost Impacts – Owners of property within the SFHA may be left with undevelopable lots, although they may be able to turn these areas into parks or other safe forms of open space.

Mapping Impacts – None.

Information the Community Must Provide to the NCFMP – None.

Model Ordinance Language –

Coastal and Non-Coastal Regular Phase Model Ordinance

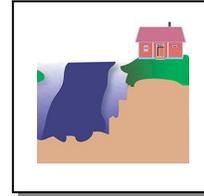
If the community chooses to target specific areas to preserve as open space, zoning maps may be the enforcement tool rather than revised model ordinance language. However, if the community wishes to restrict all development within the SFHA, the following should be added to Article 5, Section B (Specific Standards):

- (1) New structures generally prohibited within SFHAs. Within a Special Flood Hazard Area as defined in Article 3, Section B, no new structure may be constructed or located, and no substantial improvement of an existing structure may take place, unless and to the extent that the permit issuing authority for the proposed use determines that, in the absence of an authorization to do so, the owner would be deprived of all reasonable use of the subject property as demonstrated under the provisions of Article 4, Section E.

Communities who have adopted this provision – 57 of the 78 North Carolina communities in CRS have received credit for open space preservation. Each received a score of 725 points for this activity. This activity alone contributed to a full class reduction for each. In addition to the points awarded for open space preservation, 39 of the 57 communities received additional points for preserving the floodplains in a natural state, and/or for protecting natural and beneficial functions.

2f. Adopt Low Density Zoning

Recommended Higher Standard – A community should restrict development to a low density zoning standard that requires a minimum of 1 acre per building or unit. A 5- or 10-acre or larger minimum lot size are also options and highly recommended. Zoning an area for agriculture, conservation, or large residential lots preserves more open space than allowing for more intensive development.



Background of the Higher Standard –Low density zoning and other appropriate development criteria, like open space preservation, reduce the potential for flood damage by reducing the amount of development in the floodplain. They can also enhance natural and beneficial values and maintain floodplain storage capacity.

Current Minimum Standard – The NFIP does not address zoning density directly. Development within designated SFHAs is restricted to the extent that floodplain encroachment must not increase flood levels by more than one foot at any location. Greater restrictions apply to development within a floodway or non-encroachment area, although encroachment still may be allowed with a no-rise certification or prior approval through the Conditional Letter of Map Revision process.

Guidance on Selecting the Higher Standard – New locally determined zoning restrictions do not require FEMA or State approval. Communities may zone development at lower density, but may also take the further step of prohibiting new structures within the SFHA.

Benefits – Adoption of this higher standard may prevent loss of life and property during flood events by ensuring that property is kept clear of obstructions. Homeowners located outside the SFHA may avoid costly flood insurance premiums. Stormwater runoff and flood levels will not be exacerbated by development within the floodplain. In addition, adoption of the standard will provide CRS credit points as a 430 Series activity.

Cost Impacts – Developers may have unrealized profits through development limitations.

Mapping Impacts – None.

Information the Community Must Provide to the NCFMP – None.

Model Ordinance Language –

Coastal and Non-Coastal Regular Phase Model Ordinance

Add the following sentence to Article 5, Section B (1) and Article 5, Section D (1):

New construction shall be allowed at a density no greater than one structure per acre. Or,

New construction shall be allowed at a density no greater than one structure per (____) acre lot.

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Communities who have adopted this provision – Durham County, Guilford County, City of Charlotte, and Mecklenburg County are among the communities receiving credit under the CRS for low density zoning.

2g. Adopt Subdivision Development Standards

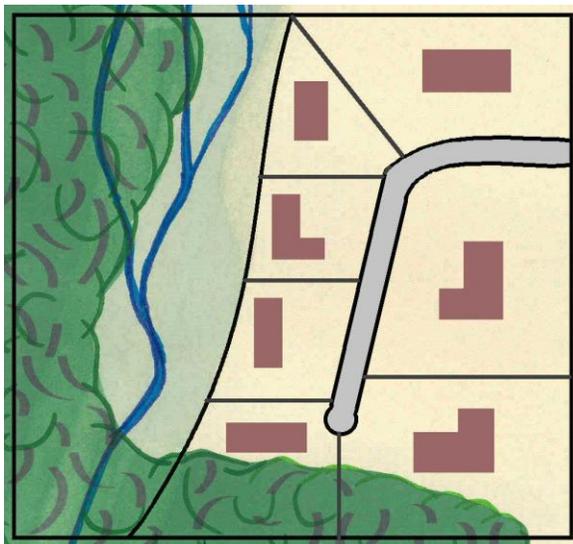
Recommended Higher Standard – Similar to the practices of preserving open space and low density zoning, subdivision regulations may help keep floodprone areas free of encroachment. One such practice is cluster development, the grouping of a particular development's residential structures on a portion of the available land, reserving a significant amount of the site free of obstruction. The design of stormwater management systems in cluster developments may maximize overland flow and combine the use of vegetation and landforms to slow, hold, and treat runoff. Subdivision regulations may mandate the creation of a homeowners association to manage the common open space.

Background of the Higher Standard – Subdivision regulations govern how land will be subdivided into individual lots and set the construction and location standards for the infrastructure the developer builds to serve those lots. This infrastructure includes the new roads, sidewalks, utility lines, storm sewers, and drainageways that the community will maintain after the subdivision is approved.

Current Minimum Standard – The NFIP does not address local subdivision regulations. Development within designated SFHAs is restricted to the extent that floodplain encroachment must not increase flood levels by more than one foot at any location. Greater restrictions apply to development within a floodway or non-encroachment area, although encroachment still may be allowed with a no-rise certification or prior approval through the Conditional Letter of Map Revision process.

Guidance on Selecting the Higher Standard – Subdivision regulations often have jurisdiction over larger projects, such as shopping centers and planned unit developments. Sometimes development standards are in separate ordinances, which are referred to in the subdivision regulations. Subdivision regulations may allow concentration of structures outside the hazard area and can include the following provisions:

- Allowing emergency vehicle dryland access during a flood by requiring streets to be at or above the base flood elevation
- Setting aside maintenance easements along all drainageways
- Requiring every lot to have a building site above the flood level or on natural high ground
- Requiring that final recorded plats show hazardous areas
- Requiring compensatory storage to offset the loss of flood storage capacity. The developer is required to offset new fill put in the floodplain by excavating an additional floodable area to replace the lost flood storage area, preferably at "hydrologically



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equivalent” sites. In some cases the developer must remove 1.5 or 2 times the amount of fill that is proposed to be placed in the flood fringe

Benefits – Adoption of this higher standard may prevent loss of life and property during flood events. Homeowners located outside the SFHA may avoid costly flood insurance premiums. Stormwater runoff and flood levels will not be exacerbated by structures within the floodplain. Developers are finding that linear parks and greenways that connect the open space areas through a community are becoming more and more popular and help sell new developments.

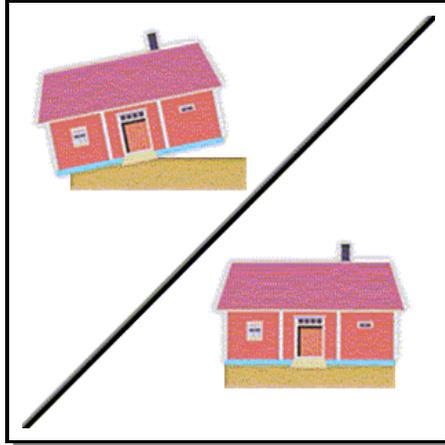
Cost Impacts – None. This is not a restriction on lot development; rather, structures will be located clear of flood hazards whereas other portions of the lot may be located within the SFHA.

Mapping Impacts – None.

Information the Community Must Provide to the NCFMP – None.

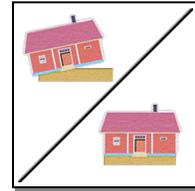
Model Ordinance Language – N/A. Restrictions are included in zoning regulations

Communities who have adopted this provision – The City of Carrboro has incorporated these standards into its zoning regulations.



Build it Safer

3a. Use Repetitive Loss Criteria to Determine Whether a Structure is Substantially Damaged



Recommended Higher Standard – A community should include a repetitive loss provision in its community Flood Damage Prevention Ordinance that specifies that a structure is substantially damaged if it sustains flood damage twice within a 10-year period, where the cost of repairing the flood damage, on the average, equaled or exceeded 25% of the value of the structure before the damage occurred.

Background of the Higher Standard – Under the standard NFIP substantial damage definition, flood-damaged structures with reference floor elevations below the BFE can be rebuilt at the same elevation any number of times, as long as the damage to the structure is less than 50% of the pre-damage market value of the structure on each occasion. This limits the incentive for property owners to reduce the risk of future damage or loss of life by rebuilding their residences at or above the BFE or other higher regulatory elevation. It also puts a burden on the NFIP to pay repetitive damage claims that may eventually exceed the total value of the structure, and it puts the neighboring property owners at higher risk of severe damages caused by flying or floating debris from the adjacent below-BFE structure.

Increased Cost of Compliance (ICC) coverage under the NFIP allows Federal flood insurance policy holders whose floodplain residences are substantially damaged by a flood to qualify for up to \$20,000 to pay for the costs of bringing their homes and businesses into compliance with their community's Flood Damage Prevention Ordinance. This payment is in addition to the flood insurance claim payment up to the policy cap and can be used to elevate a residence or business above the BFE, relocate the structure out of the flood zone, demolish the structure, floodproof it if it is a non-residential structure, or any combination thereof. Under the standard NFIP substantial damage definition, structures that are less than 50% damaged are not eligible for an ICC claim.

Current Minimum Standard – The NFIP regulations require that reconstruction of all structures within mapped SFHAs that have incurred "substantial damage" meet NFIP minimum standards for new construction and substantial improvements (i.e., have the reference floor elevated to or above the BFE in riverine areas; have the bottom of the lowest horizontal structural member of the reference floor elevated above the BFE in coastal areas). Substantial damage is defined as "damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50% of the market value of the structure before the damage occurred" (44 CFR 59.1).

Guidance on Selecting the Higher Standard – Communities that have numerous homes and businesses in mapped flood hazard areas with reference floor elevations below the BFE should consider adopting this higher standard. As with single loss substantial damage and substantial improvements, the local floodplain administrator must make a substantial damage determination for these repetitive loss structures and issue a letter stating this determination prior to any ICC claim payments. ICC claims cannot be filed without this determination letter from the local floodplain administrator. The community must develop and maintain a record system for tracking repetitive flood damage to structures in order to enforce this standard.

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Benefits – More damaged structures will either be brought up to minimum NFIP standards, relocated, or demolished so future property damage, post-disaster recovery efforts and loss of life will be avoided. More flood insurance policyholders will be able to file ICC claims to pay for up to \$20,000 of the costs of these activities. Property owners who choose to rebuild will qualify for lower flood insurance rates, since they will be required to elevate to at least the BFE or other higher regulatory elevation. ICC will pay for elevation to the local regulatory elevation requirement even if it is higher than the BFE. Adoption of this higher standard will also provide CRS credits as a 430 Series activity and additional CRS discounts if within a community participating in the CRS.

Cost Impacts – Adoption of this standard would cause a moderate increase in the cost of reconstruction for affected structures within the regulated floodplain. However, ICC coverage will pay for up to \$20,000 of these costs, so the overall cost impact should be minimal. Also, the community must develop and maintain a record system for flood damages to structures in order to enforce this standard.

Mapping Impact – None for the NCFMP, but there are mapping requirements involved with CRS activities for addressing repetitive loss properties. The community is expected to plot all of the repetitive loss properties to the best of its ability. The objective is to plot repetitive loss areas which are those areas that have been flooded two or more times over a 10-year period since 1978. The repetitive loss areas will include buildings (including uninsured ones) that were subject to the same flood as those on the FEMA repetitive loss list.

Information the Community Must Provide to the NCFMP – None

Model Ordinance Language –

Non-Coastal and Coastal Regular Phase Model Ordinances

(1) Under Article 2, add the following definition:

“Repetitive Loss” means flood-related damages sustained by a structure on two separate occasions during a 10-year period for which the cost of repairs at the time of each such flood event, on the average, equals or exceeds 25 percent of the market value of the structure before the damage occurred.

(2) Under Article 2, modify the definition of “Substantial Improvement” as follows:

“Substantial improvement” means any repair, reconstruction, rehabilitation, alteration, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the “start of construction” of the improvement. This term includes structures which have incurred “repetitive loss” or “substantial damage,” regardless of the actual repair work performed. The term does not, however, include either: (1) any project of improvement of a structure to correct existing violations of State or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to

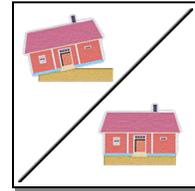
SAFER DEVELOPMENT IN FLOODPRONE AREAS

assure safe living conditions; or, (2) any alteration of a historic structure, provided that the alteration will not preclude the structure's continued designation as a historic structure.

Communities who have adopted this provision –Avery County uses repetitive loss criteria to determine whether a structure is substantially damaged.

3b. Require Enforcement of V Zone Standards in Coastal A Zones

Recommended Higher Standard – A community should modify its Flood Damage Prevention Ordinance such that NFIP regulations for V Zones also apply to coastal A Zones that are vulnerable to wave action under current or future (i.e., eroded) conditions.



Background of the Higher Standard – On FIRMs for coastal communities, areas where wave heights are estimated to be 3 feet or higher are designated as V Zones; areas where wave heights are estimated to be less than 3 feet are designated as A Zones. Therefore, even under the conditions that existed when the area was originally studied, structures in these A Zones are subject to moderate wave action during storm events and therefore are referred to as coastal A Zones. Coastal areas that are prone to rapid erosion become increasingly vulnerable to wave attack. Consequently, many homes and businesses located landward of the primary frontal dunes experience significant wave damage in storm events, even though these areas are usually designated as AE or AO Zones on a FIRM. Structures that are not elevated on pilings or columns are particularly vulnerable, as are piling-elevated structures with below-BFE enclosures that do not comply with V Zone requirements.

Current Minimum Standard – Structures in coastal AE and AO Zones must comply with the same NFIP regulations as structures in riverine AE and AO Zones: the reference floor elevation of residential structures in AE Zones must be at or above the BFE; the reference floor elevation of residential structures in AO Zones must be elevated at least 2 feet above the highest adjacent grade or the depth number specified on the FIRM; and non-residential structures must be elevated or floodproofed to these same levels. Elevation on piles or columns is not required, but proper venting is required within solid foundation walls.

Guidance on Selecting the Higher Standard – This higher standard should be applied selectively because all A Zones under a coastal community's jurisdiction may not be vulnerable to wave action, even under conditions of severe coastal erosion. The North Carolina Division of Coastal Management can provide guidance on particular A Zones where this higher standard should be applied.

Benefits – Adoption of this higher standard may prevent loss of life and property during coastal storms and flood events. Since pile-elevated structures are often significantly higher than the BFE, owners may also be eligible for lower flood insurance rates. In addition, adoption of this higher standard will provide CRS credits as a 430 Series activity.

Cost Impacts – Adoption of this standard would cause a significant increase in the initial cost of construction for structures in coastal A Zones. This cost will be partially offset by a decrease in flood insurance rates for structures elevated substantially above the BFE as well as possible CRS discounts in communities that participate in CRS. However, in coastal A Zones, residential structures are typically elevated on piles and no additional cost is involved.

Mapping Impacts – FEMA will be showing the boundary of the Limit of Moderate Wave Action (LimWA) on FIRMs to be released in 2011 -2012. See example provided at the end of this section.

Information the Community Must Provide to the NCFMP – None

Model Ordinance Language –

Coastal Regular Phase Model Ordinance

(1) Under Article 2 (Definitions), add the following definition:

“Coastal A Zone” means an area of special flood hazard designated as an A1-30 zone, AE zone, AH zone, AO zones AO zone, A99 zone, and A zone on the community’s FIRM that is subject to moderate wave action.

(2) Add the following paragraphs to Article 3, Section B:

The “Coastal A Zones” are those identified by _____ in its Coastal A Zone Map(s) dated _____, which with accompanying supporting data, and any revision thereto, are adopted by reference and declared to be a part of this ordinance.

[Insert the name of the community and the effective date(s) of the map(s) which describe the boundaries of the community-established Coastal A Zone(s).]

(3) Modify the opening paragraph of Article 5, Section B to read:

In all areas of special flood hazard where base flood elevation data has been provided, as set forth in Article 3, Section B; Article 4, Section C; or Article 5, Section D, except areas designated as Coastal High Hazard Areas or Coastal A Zones, the following provisions are required:

(4) Under Article 5, change the subheading of Section G from “Coastal High Hazard Areas” to “Coastal High Hazard Areas and Coastal A Zone Standards.”

(5) Modify the opening paragraph of Article 5, Section G to read:

Coastal High Hazard Areas (V Zones) and Coastal A Zones. Located within the areas of special flood hazard established in Article 3, Section B, are areas designated on the FIRM as coastal high hazard areas and on the Coastal A Zone Map(s) as Coastal A Zones. These areas have special flood hazards associated with wave wash. The following provisions shall apply within such areas:

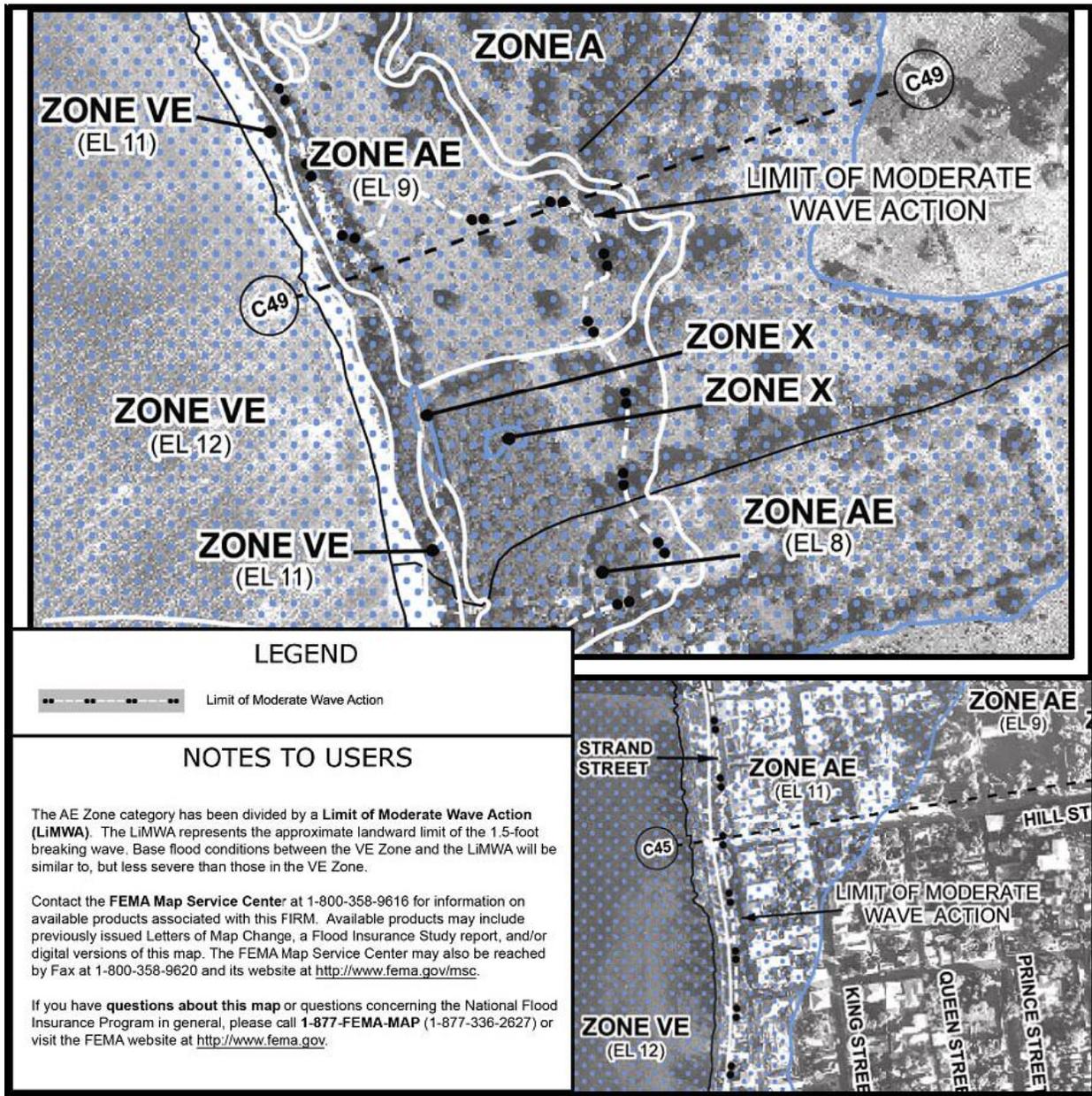
(6) Modify the opening paragraph of Article 5, Section H to read:

Located within the areas of special flood hazard established in Article 3, Section B, are areas designated as shallow flooding. These areas have special flood hazards associated with base flood depths of one (1) to three (3) feet where a clearly defined channel does not exist and where the path of flooding is unpredictable and indeterminate. The following provisions

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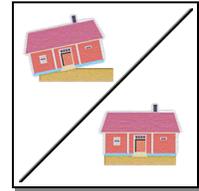
shall apply within such areas, except areas designated as Coastal A Zones, where the provisions of Article 5, Section G shall apply.

Communities who have adopted this provision- Include North Topsail Beach.



3c. Limit the Area of Below-BFE Enclosures

Recommended Higher Standard – A community should modify their community Flood Damage Prevention Ordinance to limit the area permitted below the BFE that can be enclosed on new and substantially improved structures.



Background of the Higher Standard – Property owners often convert enclosed areas below BFE to living spaces, making the structure non-compliant with NFIP regulations. If wall openings become permanently blocked, the foundation walls and superstructure become vulnerable to collapse due to hydrostatic and hydrodynamic pressures. Modifications made after the structure was inspected by the local floodplain administrator may be hard to detect, making enforcement of this provision difficult.

Current Minimum Standard – In Zones A, A1-30, AE, AO, and AH on the community's FIRM, NFIP regulations require "for all new construction and substantial improvements, that fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect, or meet or exceed the following minimum criteria: A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. The bottom of all openings shall be no higher than one foot above grade. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters" (44 CFR 60.3I(5)).

In Zones V, V1-30, and VE, NFIP regulations require "that all new construction and substantial improvements...have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls, open wood latticework, or insect screening intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system" (44 CFR 60.3(e)(5)).

Guidance on Selecting the Higher Standard – 299 square feet is suggested as an upper limit for the amount of area that can be enclosed when the lowest floor is ≥ 8 feet above grade. This is large enough to accommodate a small garage or a limited amount of storage, but yet too small to be of much value as living space. By keeping the area at or below 299 square feet, the flood insurance policy will not be subject to an enclosure loading factor resulting in a higher premium.

Benefits – Adoption of this higher standard will prevent loss of life and property during flood events. Property owners will be discouraged from converting enclosed areas to living space, thus disqualifying themselves from flood insurance coverage. This higher standard will also reduce potential damage to foundation walls and the superstructure from hydrostatic and hydrodynamic pressures. In addition, adoption of the standard will provide CRS credits as a

430 Series activity as well as Federal flood insurance cost reduction for both below BFE enclosure sizes and a possible CRS discount if within a community participating in CRS.

Cost Impacts – Adoption of this standard may cause a slight increase in the initial cost of construction of alternative foundation systems for structures in the floodplain, but it may give property owners a discount on their Federal flood insurance costs both for the limited size of below BFE enclosure as well as the community-wide CRS classification discount.

Mapping Impacts – None

Information the Community Must Provide to the NCFMP – None

Model Ordinance Language –

Non-Coastal Regular Phase Model Ordinance

(1) Modify Article 5, Section B (Specific Standards), item (5) to read:

Elevated Buildings. New construction or substantial improvements of elevated buildings that include fully enclosed areas that are usable solely for the parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to preclude finished living space and be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. The size of such enclosed areas shall not exceed 299 square feet except for buildings where the minimum clearance height of the enclosed area is less than seven (7) feet.

Coastal Regular Phase Model Ordinance

(1) Modify Article 5, Section B (Specific Standards), item (4) to read:

Elevated Buildings. New construction or substantial improvements of elevated buildings that include fully enclosed areas that are usable solely for the parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to preclude finished living space and be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. The size of such enclosed areas shall not exceed 299 square feet except for buildings where the minimum clearance height of the enclosed area is less than seven (7) feet.

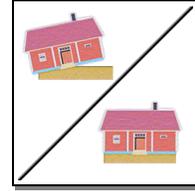
(2) Modify Article 5, Section G (Coastal High Hazard Areas), to include:

If aesthetic lattice work or screening is utilized, such enclosed space shall not be designed to be used for human habitation, but shall be designed to be used only for parking of vehicles, building access, or limited storage of maintenance equipment used in connection with the premises. The size of such enclosed space shall not exceed 299 square feet except for buildings where the minimum clearance height of the enclosed area is less than seven (7) feet.

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Communities who have adopted this provision- Communities receiving credit for adoption of enclosure limitations under the CRS include Carteret County, Town of Manteo, Town of Nags Head, and the City of Rocky Mount.

3d. Prohibit Repair/Reconstruction of Damaged, Non-Compliant, Below-BFE V Zone Enclosures



Recommended Higher Standard – A community should modify their community Flood Damage Prevention Ordinance to prohibit repair or reconstruction of non-compliant, below-BFE enclosures regardless of whether or not the damage to the structure exceeds 50% of the pre-damage market value of the structure. The property owner would be required to make the area below the reference floor free of obstruction, or to construct any enclosed area with breakaway walls that comply with the requirements of 44 CFR 60.3 (e)(5).

Background of the Higher Standard – It is not unusual for structures to sustain flood damage to enclosures below reference floor elevation that do not exceed 50% of the pre-damage market value of the structure. For structures built before the community received a FIRM (i.e. pre-FIRM), such enclosures may be non-compliant with the NFIP regulations that require breakaway walls, flood resistant materials, and no attendant utilities for V Zone enclosures. Under the current minimum NFIP standard, unless a structure is substantially damaged and/or improved, a property owner can restore the structure to its original, non-compliant condition and still be code compliant, thus qualifying for flood insurance coverage.

Current Minimum Standard – 44 CFR 60.3 requires that structures that are substantially damaged be brought into full compliance with NFIP regulations when they are repaired. Substantial damage is defined as “damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50% of the market value of the structure before the damage occurred” (44 CFR 59.1).

Guidance on Selecting the Higher Standard – Communities may wish to include a lower substantial damage threshold below which minor damage may be repaired without requiring the structure to be brought up to current code requirements. The community can make this lower threshold apply to the entire structure or they could apply this regulation to just the below-BFE portion(s) of the structures or any combination thereof. Of course, this means that the local floodplain administrator would have to review damage and improvement permits more closely to make a substantial damage and/or substantial improvement determination and, in turn, issue a letter stating his/her determination.

Benefits – More structures will be brought into compliance and potential future damage will be avoided, and thus, the structure would possibly be eligible for post-FIRM flood insurance rates, which could be much lower than the pre-FIRM rates. In addition, adoption of the standard will provide CRS credits as a 430 Series activity as well as possible Federal flood insurance cost reduction for a CRS discount if within a community participating in CRS.

Cost Impacts – The cost impact of this standard would be minimal, since costs of removing any remnants of the damaged enclosure may be covered by the property owner’s flood insurance policy.

Mapping Impacts – None

Information the Community Must Provide to the NCFMP – None

Model Ordinance Language –

- **Option 1 – Require damaged enclosures to be brought into compliance regardless of the amount of damage sustained.**

Coastal Regular Phase Model Ordinance

(1) Modify Article 5 Section A(9) as follows:

(9) Non-conforming buildings or uses may not be enlarged, replaced or rebuilt unless such enlargement or reconstruction is accomplished in conformance with the provisions of this ordinance. Where any amount of damage is sustained to the portion of a building or structure located in coastal high hazard areas that is below base flood elevation and is non-compliant with Article 5 Section C(2) or this ordinance, the below-base flood elevation portion of the building or structure shall be brought into full compliance with the provisions of Article 5 Sections C(2) and (8). Provided, however, nothing in this ordinance shall prevent the repair, reconstruction, or replacement of a building or structure existing on the effective date of this ordinance and located totally or partially within the floodway or stream setback, provided that the bulk of the building or structure below base flood elevation in the floodway or stream set back is not increased and provided that such repair, reconstruction, or replacement meets all of the other requirements of this ordinance.

- **Option 2 – Set a lower (< 50%) substantial damage threshold below which minor damage to an enclosure may be repaired without requiring the structure to be brought into full compliance.**

Coastal Regular Phase Model Ordinance

(1) Modify Article 5 Section A(9) as follows:

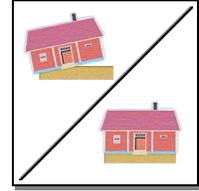
(9) Non-conforming buildings or uses may not be enlarged, replaced or rebuilt unless such enlargement or reconstruction is accomplished in conformance with the provisions of this ordinance. Where the amount of damage sustained to the portion of a building or structure located in coastal high hazard areas that is below base flood elevation and is non-compliant with Article 5 Section C(2) of this ordinance exceeds __ percent of the market value of the structure before the damage occurred, the below-base flood elevation portion of the building or structure shall be brought into full compliance with the provisions of Article 5 Sections C(2) and (8). Provided, however, nothing in this ordinance shall prevent the repair, reconstruction, or replacement of a building or structure existing on the effective date of this ordinance and located totally or partially within the floodway or stream setback, provided that the bulk of the building or structure below base flood elevation in the floodway or stream set back is not increased and provided that such repair, reconstruction, or replacement meets all of the other requirements of this ordinance.

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Communities who have adopted this provision - In all communities in North Carolina, repair and reconstruction of damaged, non-compliant, below-BFE V Zone enclosures is allowed as long as the structure does not become “more non-conforming”.

3e. Regulate Development Within Community-Established Flood Zones

Recommended Higher Standard – A community should require all new construction and substantial improvement of all structures in community-established flood zones to comply with regulations similar to the NFIP requirements for A Zones (i.e., SFHAs with no BFEs identified). This would include a requirement that residential structures have their reference floor elevated to, or a minimum elevation above, a designated flood elevation. Development of flood elevation data for subdivisions and other proposed developments over a specified size would also be required, as would proper certification of elevation or floodproofing of structures in these community-established flood zones.



Background of the Higher Standard – Some North Carolina communities experience significant flooding in isolated areas that are not designated as SFHAs on a community’s FIRM. These areas may not be near any watercourse and flooding may be due to flash flooding or local drainage problems. The flood elevations may be quite destructive, even during rainfall events less severe than the 1% annual chance storm. In some cases, these areas were not studied when the FIRM was produced because their drainage areas were below the minimum study criteria; or, development may have created a localized storm water drainage problem that results in flooding.

Current Minimum Standard – None; community-established flood zones are areas that are outside the SFHAs shown on a community’s FIRM, so there are no minimum standards for development in these floodprone areas.

Guidance on Selecting the Higher Standard – A community should consider adoption of this standard if: (1) one or more areas of the community outside of the 1% annual chance floodplains mapped on the community’s FIRM experience flooding during rainfall events less severe than the 1% annual chance event; (2) information is available to select a regulatory flood elevation (such as high-water mark data); and/or (3) information to delineate the flood hazard areas is available on a suitable map for adoption. This new locally determined floodprone map does not have to be FEMA or State approved. It only has to be locally adopted for regulatory use. This map can be maintained digitally with the official FIRM on a community’s GIS for extra CRS credit and ease of enforcement.

The community should obtain information on the estimated return period of historic flood events before selecting a regulatory flood elevation, and before determining whether to require elevation to or above this elevation, if elevation is to be used in lieu of a designated height above grade. This information can generally be determined from comparison of local rainfall records with regional climatological data.

Benefits – This higher standard may prevent loss of life and property damage during flood events, since new and substantially improved structures in areas that have flooded in the past will be constructed to higher regulatory standards. Also, local and State emergency management agencies can include these areas in their emergency response and evacuation planning. Residents in the areas identified as flood hazard areas based data will be alerted to the need to obtain flood insurance. Because these areas are not identified on the community’s

SAFER DEVELOPMENT IN FLOODPRONE AREAS

FIRM, residents will be able to obtain flood insurance at lower “Preferred Risk” or non-floodplain rates. This higher standard will provide CRS credits as a 410 Series Activity as well as Federal flood insurance cost reduction for a CRS discount if within a CRS community. See Mapping Impacts below for other possible CRS credit.

Cost Impacts – This standard would increase the number of structures affected by the floodplain development ordinance. The severity of the impacts will vary by area. These added areas can be derived from the surveyed high water marks and then maintained locally as an additional GIS layer with the new digital flood maps being produced by NCFMP. If this is done, there may be additional CRS mapping credit for maintaining this additional flood data.

Mapping Impact – None. The flood zone designations on the FIRM will not be changed. These added flood hazard areas can be derived from the surveyed high water marks and then maintained locally as an additional GIS layer with the new digital flood maps being produced by NCFMP. If this is done, there may be additional CRS mapping credit for maintaining this additional flood data.

Information the Community Must Provide to the NCFMP – None

Model Ordinance Language –

Coastal and Non-Coastal Regular Phase Model Ordinance

(1) Under Article 2, add the following definition:

“Regulatory flood elevation” means the elevation of the water surface above mean sea level identified as a reference level for regulation of development in community-established flood zones.

“Regulatory flood zone contour” means the boundary of an area outside of the area of special flood hazard that would be inundated if floodwaters rise to the regulatory flood elevation.

(2) Modify Article 3, Section A (Lands to Which This Ordinance Applies) to read:

This ordinance shall apply to all areas of special flood hazard area and areas bounded by regulatory flood zone contours within the jurisdiction of _____.

(3) Modify the title of Article 3, Section B as follows:

Basis for Establishing the Areas of Special Flood Hazard and Regulatory Flood Zone Contours.

(4) Add the following additional paragraph in Article 3, Section B after first paragraph:

The “Regulatory Flood Zone Contours” are those identified by _____ in its Regulatory Flood Zone Contour Map(s) dated _____, which with accompanying supporting data, and any revision thereto, are adopted by reference and declared to be a part of this ordinance.

SAFER DEVELOPMENT IN FLOODPRONE AREAS

[Insert the community name and effective date of the map(s) and/or other document(s) which describe the boundaries of the area(s) subject to significant and/or frequent flooding and provide the regulatory flood elevation data.]

(5) Under Article 4, Section B, add the following after the first sentence in item 1:

A plot plan that shows the regulatory flood zone contour or a statement that the entire lot is within the regulatory flood zone contour must be provided by the development permit applicant when the lot is within or appears to be within the regulatory flood zone contour as shown on the community's Regulatory Flood Zone Contour Map(s).

(6) Modify Article 4, Section B(1)(a)(v) to read:

Where base flood elevation data or flood of record elevation data are provided as set forth in Article 3, Section B; Article 4, Section C; or Article 5, Section D;

(7) Modify Article 4, Section B(1)(a) to include:

(viii) Where the base flood elevation data or regulatory flood elevation data are not provided, the application for a development permit must show construction of the lowest floor at least 2 feet above the highest adjacent grade.

(8) Under Article 4, Section C, modify item 10 to read:

Where interpretation is needed as to the exact location of boundaries of the areas of special flood hazard or of regulatory flood zone contours (for example, where there appears to be a conflict between a mapped boundary and actual field conditions), make the necessary interpretation.

(9) Modify Article 4, Section E(7) to read:

Any applicant to whom a variance is granted shall be given written notice specifying the difference between the base flood elevation or regulatory flood elevation and the elevation to which the structure is to be built and a written statement that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation. Such notification shall be maintained with a record of all variance actions.

(10) Under Article 5, Section A (General Standards), modify the introductory sentence to read:

In all areas of special flood hazard and in all areas bounded by regulatory flood zone contours the following provisions are required:

(11) Modify Article 5, Section A(9) to read:

Non-conforming buildings or uses may not be enlarged, replaced or rebuilt unless such enlargement or reconstruction is accomplished in conformance with the provisions of this

SAFER DEVELOPMENT IN FLOODPRONE AREAS

ordinance. Provided, however, nothing in this ordinance shall prevent the repair, reconstruction, or replacement of a building or structure existing on the effective date of this ordinance and located totally or partially within the floodway or stream setback, provided that the bulk of the building or structure below base flood elevation or regulatory flood elevation in the floodway or stream set back is not increased and provided that such repair, reconstruction, or replacement meets all of the other requirements of this ordinance.

(12) Under Article 5, Section B (Specific Standards), modify the introductory sentence to read:

In all areas of special flood hazard where base flood elevation data has been provided, as set forth in Article 3 Section B, or Article 5, Section D, and in all areas bounded by regulatory flood zone contours, the following provisions are required:

(13) Modify Article 5, Sections B(1) and (2) to read:

In all areas of special flood hazard where base flood elevation data have been provided and in all areas bounded by regulatory flood zone contours, as set forth in Article 3, Section B, or Article 5, Section D, the following provisions are required:

(1) Residential Construction. New construction or substantial improvement of any residential structure (including manufactured homes) shall have the lowest floor, including basement, elevate no lower than ____ () feet above the base flood elevation or ____ () feet above the regulatory flood elevation, whichever is applicable.

(2) Non-Residential Construction. New construction or substantial improvement of any commercial, industrial, or non-residential structure shall have the lowest floor, including basement, elevated no lower than ____ () feet above the level of the base flood elevation or ____ () feet above the regulatory flood elevation, whichever is applicable.

(14) Modify Article 5, Section B(3)(a) to read:

Manufactured homes . . . must be elevated on a permanent foundation such that the lowest floor of the manufactured home I elevated no lower than ____ () feet above the base flood elevation or ____ () feet above the regulatory flood elevation, whichever is applicable, and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

(15) Modify Article 5, Section B(3)(b) to read:

Manufactured homes . . . must be elevated on reinforced piers or other structural elements so that the lowest floor of the manufactured home is no lower than ____ () feet above the base flood elevation or ____ () feet above the regulatory flood elevation, whichever is applicable, and be securely anchored to an adequately anchored foundation to resist flotation, collapse, and lateral movement.

SAFER DEVELOPMENT IN FLOODPRONE AREAS

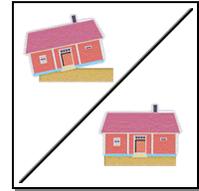
(16) Modify Article 5, Section B(8)(g) to read:

Openings to relieve hydrostatic pressure during a flood shall be provided below base flood elevation or regulatory flood elevation in conformance with Article 5, Section B(4).

Communities who have adopted this provision- Communities that regulate development within community-established flood zones include Charlotte - Mecklenburg.

3f. Regulate Development in Areas Where Alluvial Soil Types Predominate

Recommended Higher Standard – A community should prohibit residential and commercial development or require elevation to or above the BFE in areas where alluvial soil is present unless a flood study by a registered engineer determines that the proposed development is outside of the 1% annual chance floodplain. Properties with drainage areas below a specified size are recommended to be exempt from the prohibition.



Background of the Higher Standard – Floodprone areas can often be identified by the presence of layers of surface soil made up of materials (clay, silt, sand, gravel, organic material) that were carried downstream by rivers and streams during previous flood events and deposited on floodplains. Known as “alluvial” soils, they are identified in the county soil survey books published by the National Cooperative Soil Survey (NCSS), a joint effort of the Natural Resources Conservation Service (formerly the Soil Conservation Service), the North Carolina Agricultural Resources Service, and local agencies. Alluvial soils are identified in the ‘Soil and Water Features’ table of the county Soil Survey book as having a “rare” (defined as 0 to 5 percent annual chance), “common” (defined as 5 to 50 percent annual chance), or “frequent” (defined as greater than 50 percent annual chance) occurrence of flooding and in the ‘Building and Site Development’ table as having “severe” limitations regarding movement of footings, ease of excavation and construction, etc. for home sites and certain other exemplary uses because of flooding. The accompanying maps in the soil survey book show where specific soil types are found in the county.

It is not uncommon for alluvial soils to be found outside of SFHAs identified on a community’s FIRM. In some cases, these areas were not studied when the FIRM was produced because their drainage areas were below the minimum study criteria. Or, they may occur in low lying areas that are isolated from flood sources that were studied for the FIRM, but are occasionally flooded by overwash.

Current Minimum Standard – None; community-established flood zones are areas that are outside the SFHAs shown on a community’s FIRM, so there are no Federal or State minimum standards for development in these floodprone areas.

Guidance on Selecting the Higher Standard – A community should consider adoption of this standard if: (1) there are areas outside of the SFHAs on the community’s FIRMs that are floodprone; (2) the soils in these floodprone areas are predominantly alluvial soils; and (3) information to delineate the flood hazard areas is available on a map suitable for adoption. This new locally determined flood map does not have to be FEMA or State approved. It only has to be locally adopted for regulatory use. This map can be maintained digitally with the official FIRM on a community’s GIS for extra CRS credit and ease of enforcement.

According to the text in the NCSS Soil Survey books, the “severe” limitations of floodprone soils are an indication that “soil properties or site features are so unfavorable or difficult to overcome that special design, significant increases in construction costs, and possibly increases in maintenance are required.” For this reason, a community may wish to consider a complete

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prohibition of development on sites where alluvial soils are present. If an outright ban is not desirable, then the community should require that a flood study be performed to determine whether the proposed development is subject to flooding during a 1% annual chance flood event and that the proposed development be designed and certified by a registered professional engineer as reasonably safe from flooding.

Benefits – This higher standard may prevent loss of life and property damage during flood events, since new construction will be prohibited in areas that have flooded in the past or will be constructed to higher regulatory standards. Also, local and state emergency management agencies can include these areas in their emergency response and evacuation planning. Residents already living in the areas identified as floodprone based on alluvial soils data would be alerted to their actual flood risk and the need to obtain flood insurance. Because these areas may not be identified as SFHAs on the community's FIRM, residents will be able to obtain flood insurance at lower "preferred risk" or non-floodplain rates. This higher standard will provide CRS credits as a 410 Series Activity as well as flood insurance cost reduction for a CRS discount if within a CRS community. See Mapping Impacts for other possible CRS credit.

Cost Impacts – This standard would increase the number of structures affected by the floodplain development ordinance. The impacts will vary by area. In addition, the cost of hiring a soil engineer or soil scientist may be borne by the community and/or property owner.

Mapping Impacts – None. The flood zone designations on the FIRMs will not be changed. These added flood hazard areas can be derived from the soil survey for your community's county and then maintained locally as an additional GIS layer with the new digital flood maps being produced by the NCFMP. If this is done, there may be additional CRS mapping credit for maintaining this additional flood data.

Information the Community Must Provide to the NCFMP – None

Model Ordinance Language –

Non-Coastal Regular Phase Ordinance

(1) Under Article 2, add the following definitions:

"Flood hazard soils" means soils described in the 'Soil and Water Features' table of the Soil Survey as having a "rare", "common" or "frequent" occurrence of flooding and in the 'Building and Site Development' table as having "severe" limitations for home sites and certain other exemplary uses because of flooding.

"Flood hazard soils areas" means areas where flood hazard soils are located, as shown on the detailed soil maps included in the Soil Survey.

"Soil Survey" means the Soil Survey of _____ County, North Carolina, published by the National Cooperative Soil Survey, a joint effort of the Natural Resources Conservation Service (formerly the Soil Conservation Service), the North Carolina Agricultural Resources Service, and local agencies.

(2) Modify Article 3, Section B as follows:

Section B. Basis for Establishing the Areas of Special Flood Hazard

The Areas of Special Flood Hazard are:

- (1) Those areas identified by the Federal Emergency Management Agency (FEMA) in its Flood Hazard Boundary Map or Flood Insurance Study and Flood Insurance Rate Map(s), or in the Flood Insurance Study and Flood Insurance Rate Map(s) produced under the Cooperating Technical State agreement between the State of North Carolina and FEMA, for _____ dated _____, which with accompanying supporting data, and any revision thereto, including Letters of Map Amendment or Revision, are adopted by reference and declared to be a part of this ordinance; ~~and~~
- (2) Those areas defined through standard engineering analysis for private developments or by governmental agencies, but which have not yet been incorporated in the FIRM, including detailed flood information generated as a requirement of Article 4, Section C (10) this ordinance; and
- (3) Those areas where flood hazard soils are identified by the National Cooperative Soil Survey on the detailed soil maps in the Soil Survey of _____ County, North Carolina, dated _____. The Soil Survey, with accompanying supporting data and any revision thereto, is adopted by reference and declared to be a part of this ordinance. The boundaries of the flood hazard soil areas may be modified by field investigation by a licensed soil scientist. The report of the field investigation shall conclude with a description of the actual soil horizons that were encountered on the site. These soils shall be placed in a soil complex or major soil association as prescribed by the standards and guidelines of the American Registry of Certified Professionals in Agronomy, Crops, and Soils.

(3) Modify Article 4, Section B(1), to include:

A plot plan that shows the boundary of the area of special flood hazard or a statement that the entire lot is within the area of special flood hazard must be provided by the development permit applicant when the lot is within or appears to be within the area of special flood hazard shown on the community's Flood Hazard Boundary Map or Flood Insurance Rate Map, or the flood hazard soils areas shown on the Soil Survey detailed soil maps, or the area of special flood hazard identified pursuant to Article 3, Section B.

(4) If no development is to be allowed in flood hazard soils areas, add the following section at the end of Article 5:

Section H. Standards for Flood Hazard Soils Areas

No development shall be permitted in flood hazard soils areas unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with

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standard engineering practice that the site of the proposed development is not subject to inundation by the base flood, or the area where the proposed development is located has ____ () acres or less of drainage area. (*Four (4) acres is the recommended maximum value.*)

(5) If development is to be allowed, modify Article 4, Section C(11), as follows:

(10) When base flood elevation data or floodway data has not been provided in accordance with Article 3, Section B, obtain, review, and reasonably utilize any base flood elevation data, floodway data, and/or non-encroachment area data available from a Federal State, or other source, including data developed pursuant to Article 5, Section D(4), or Article 5, Section E (2), in order to administer the provisions of this ordinance.

And, add the following section at the end of Article 5:

Section H. Standards for Flood Hazard Soils Areas

(1) Development in flood hazard soil areas with ____ () acres or less of drainage area shall be exempt from the flood hazard reduction provisions of Article 5. (*Four (4) acres is the recommended maximum value.*)

(2) Development in flood hazard soil locations with more than ____ () acres of drainage area shall be subject to the following requirements:

(a) The proposed development shall be designed and certified by a registered professional engineer.

(b) The design shall be based upon the establishment of a temporary or permanent benchmark and an analysis of the effects of the proposed development to establish a base food elevation through hydrologic and hydraulic analyses performed in accordance with standard engineering practice.

(c) The proposed development shall comply with all applicable flood hazard ordinance provisions of Article 5.

Coastal Regular Phase Model Ordinance

(1) Make modifications (1) through (3) indicated above under Non-Coastal Regular Phase Model Ordinance.

(2) If no development is to be allowed in flood hazard soils areas, add the following section at the end of Article 5:

Section I. Standards for Flood Hazard Soils Areas

No development shall be permitted in flood hazard soils areas unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with

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standard engineering practice that the site of the proposed development is not subject to inundation by the base flood, or the area where the proposed development is located has ____ () acres or less of drainage area. *(Four (4) acres is the recommended maximum value.)*

(6) If development is to be allowed, modify Article 4, Section C(11), as follows:

(10) When base flood elevation data or floodway data has not been provided in accordance with Article 3, Section B, obtain, review, and reasonably utilize any base flood elevation data, floodway data, and/or non-encroachment area data available from a Federal State, or other source, including data developed pursuant to Article 5, Section D(4), or Article 5, Section E (2), in order to administer the provisions of this ordinance.

And, add the following section at the end of Article 5:

Section I. Standards for Flood Hazard Soils Areas

(3) Development in flood hazard soil areas with ____ () acres or less of drainage area shall be exempt from the flood hazard reduction provisions of Article 5. *(Four (4) acres is the recommended maximum value.)*

(4) Development in flood hazard soil locations with more than ____ () acres of drainage area shall be subject to the following requirements:

- (a) The proposed development shall be designed and certified by a registered professional engineer.
- (b) The design shall be based upon the establishment of a temporary or permanent benchmark and an analysis of the effects of the proposed development to establish a base food elevation through hydrologic and hydraulic analyses performed in accordance with standard engineering practice.
- (c) The proposed development shall comply with all applicable flood hazard ordinance provisions of Article 5.

Communities who have adopted this provision – Communities that regulate development in areas where alluvial soil types predominate include Charlotte - Mecklenburg.



Other Safer Requirements

4. Other Safer Requirements



The following other higher standards are suggested for evaluation and discussed briefly below. To assist a community in reviewing these options, a matrix that summarizes the recommended higher standard, current minimum requirements, implications, CRS impacts, flood insurance rate impacts, flood mapping impacts, advantages, and disadvantages for each of the higher standards below and in the previous section are provided in **Appendix B**.

4a. Require elevation determinations for all development in Zone A areas or for unstudied flooding sources

A good floodplain management program will have procedures and requirements to obtain the data necessary to manage new development in approximate Zone A Zones and outside the mapped floodplain. One means of obtaining this necessary data is to require the developer provide detailed flood data for all development regardless of size. The NFIP only requires elevation data for developments larger than 50 lots or 5 acres.

4b. Consider cumulative substantial damage/improvement determinations

The NFIP allows improvements valued at up to 50% of the building's pre-improvement value to be permitted without meeting the flood protection requirements. Over the years, a community may issue a succession of permits for different repairs or improvements to the same structures. This can greatly increase the overall flood damage potential within a community as well as the insurance liability to FEMA. This higher standard encourages close monitoring to ensure that the total value of all improvements or repairs permitted over the years does not exceed 50% of the value of the structure. When the total value does exceed 50%, the original building must be protected according to the ordinance requirements for new buildings.

4c. Lower the threshold for substantial damage/substantial improvement determinations

A variation on the provision is to set a lower threshold for substantial improvements (e.g. 40%).

4d. Protect floodplain storage capacity

Although a building built on fill and elevated above the base flood elevation meets the NFIP rules, filling a substantial portion of the floodplain reduces storage for flood water and tends to increase peak flows downstream. Prohibiting fill will reduce this

problem, as will requiring the provision of a similar volume of compensatory storage if fill is placed in the floodplain.

4e. Implement a flood warning program

The National Weather Service issues specific flood warnings for specific locations along major rivers and coastlines. There is a small but growing number of communities with their own flood threat recognition systems, which enable advance identification of floods on smaller rivers. The full benefit of early flood warning is only realized if the community disseminates the warning to the general public and to critical facilities. Additional flood damage can be prevented if the community has a flood response plan that includes appropriate tasks, such as directing evacuation, sandbagging, and moving building contents above flood levels.

4f. Mandatory floodplain administrator training and certification through ASFPM

The Association of State Floodplain Managers (ASFPM) and several states including North Carolina have created floodplain manager certification programs with requirements similar to the EMI course graduation criteria. Communities that have highly trained staff directly involved in the permit review process have been shown to have fewer non-compliant buildings and floodplain development violations. A CFM should review each project in the floodplain before it is permitted and should conduct an inspection or review inspection reports after the project is completed (e.g., before a certificate of occupancy is issued).

4g. Regulate development to ensure that stormwater runoff is equal to or less than predevelopment runoff

Unless care is taken to avoid it, each new development in a watershed increases the runoff from the newly developed area, and flood peaks and flood volumes increase farther down the watershed as development continues. Many communities and some states now require that the runoff from new development be managed to reduce this increase in runoff.

The term "stormwater management" is also widely used in programs intended to maintain or improve the quality of stormwater runoff. Such water quality programs frequently regulate a relatively small level of runoff, such as the first half-inch of runoff or the runoff from a 2-year storm. An effective Stormwater management program considers both water quality while regulating new development to prevent future increases in flood damage that result from development in the watershed. Standard practice is to regulate to the 10-year storm or larger.

III. STRATEGIES FOR ADOPTION AND IMPLEMENTATION OF HIGHER FLOODPLAIN MANAGEMENT STANDARDS

A. Gaining Support from Local Officials and Policy Makers

All of the enhanced floodplain management standards described in the previous chapter can be implemented within the existing NFIP regulatory framework. What is needed is for the local governing body to modify the community's flood damage prevention ordinance to include language requiring enforcement of a particular standard, and for the appropriate local agency to begin enforcing the new standard for new and/or existing development in or near floodplains.

This chapter of the guidebook provides the local floodplain administrator, planner, zoning official, or manager with strategies for responding to the concerns of citizens or local elected officials and gaining their support for adoption and enforcement of better floodplain management through higher regulatory standards.

Both of these tasks, adoption and implementation of a new standard, may be easy or difficult, depending on the particular circumstances of the community. For example, if the community recently experienced a severe flood event that caused significant property damage and other losses, local officials may be very receptive to adopting a measure (or measures) that would prevent similar damage in the future. On the other hand, officials in communities that have not experienced a significant flood in several years may be less willing to consider adoption of higher regulatory standards that are perceived as placing a financial burden on property owners or perhaps making it more difficult to attract residential, commercial, or industrial development into the community.

1. Adoption Issues and Strategies

Issues that local officials responsible for floodplain management are most likely to confront when proposing adoption of a standard that goes beyond the FEMA minimums include:

- **No recent flooding**

Issue: If the community has not experienced a major flood in many years, there may be a misconception that the risk of a major flood occurring in the future is low; therefore, the public and elected officials may feel there is no need to require additional flood protection, especially if it increases costs or restricts development.

Response: First, the floodplain administrator may need to research the flood history of their community. A good place to begin is the flood history section of the community's FIS Report. It should contain information on previous floods that may have faded from local memory. Second, more than half of the counties in North Carolina have experienced major flooding from recent hurricanes and tropical storms after many years on the downward side of the long cycle that governs hurricane activity. Similar cycles apply to other weather patterns; therefore, years of mild weather are no guarantee of similar weather in the future.

In communities that have recently experienced a major flood, there may be a belief that the next “100-year” flood won’t occur until another 100 years have passed. Try comparing the chance of a 1% annual chance (100-year) flood occurring this year to the chance of picking the black marble out of a bowl containing 1 black marble and 99 white marbles. If the community is unlucky enough to pick the black marble this year, it has to put the black marble back in the bowl before it picks again next year. The chances of experiencing a major flood are the same year after year, regardless of how much time has passed since the last flood. And, unfortunately, a community can be hit with several major floods in any one year.

- **Increased development costs**

Issue: Some of the recommended higher standards described in Chapter II will increase development costs for both residential and commercial structures. Often, these increases are attributable to higher labor and materials costs associated with elevating structures to a level above the BFE. There may also be costs associated with additional professional services and/or certificates needed for enforcement or engineering studies to determine BFEs.

Response: The easiest response to this concern is that the higher the structure is elevated above the BFE, the safer the property owners and the structure will be during a flood. Therefore, elevated development has lower costs of flood insurance for an equivalent amount of coverage. If adoption of one or more higher standards qualifies the community for a higher CRS rating, there will be an additional reduction in everyone’s flood insurance rates. This discount for a community’s CRS rating is in addition to the already lowered flood insurance premiums based on the lower risk of the structure being constructed to safer construction standards. Fact sheets are available from FEMA that illustrate the amount of savings that can be achieved which, over time, can offset part or all of the higher elevation costs. Also, since the structure is more resistant to flooding, its resale value may increase.

Issue: Some property owners outside of a mapped flood hazard area will be required to elevate to a community-established flood level or build to new protective construction standards. These owners were not required to purchase flood insurance before, but the increased construction costs represent an unwelcome financial burden.

Response: It is important to make these owners aware that their property is actually at a moderate risk of flooding even though the risk is not identified on the FIRM. Officials need to defend the fact that the local government is more familiar with the hazards of their community than FEMA at the time the last flood study was conducted and that the majority of FEMA’s maps are based on approximate studies. Information on historical flooding, including high water mark data, should be made readily available to convince property owners that elevation or some other form of floodproofing is necessary to protect their investment from future damage.

- **Increased administrative costs**

Issue: The community may incur costs for engineering studies and surveying to establish and delineate new or expanded flood hazard areas when initiated by the community and not a particular development. In addition, there may be ongoing expenses for additional staff time devoted to enforcement of regulations in these areas.

Response: By encouraging safer development practices in floodprone areas, the community is making itself more disaster resistant and meeting the goal of its ordinance – to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas. Higher costs to establish and maintain these practices will be offset by lower future costs for emergency recovery and response.

- **Discourages development**

Issue: Requiring elevation at or above the BFE, or identification of new or expanded flood hazard areas can impede a community's ability to attract new development.

Response: The response to this concern should involve open discussion with prospective developers. The fact that the community is taking steps to decrease its vulnerability to flooding should be a positive factor in attracting development. Community officials should be willing to consider modifying zoning or land use plans to allow for higher levels of development in less floodprone areas to compensate for restricted development in high-risk areas.

2. Implementation Issues and Strategies

Once higher standards have been adopted, the community is faced with ensuring that the standards are uniformly implemented and enforced. Challenges may include:

- **Limited staff**

Issue: The existing staff is not able to handle the increased administrative and enforcement burden imposed by the new standards.

Response: The local governing body will need to be convinced that expenditures for additional personnel are justified. Emphasize future cost reductions for emergency response and costs for avoided infrastructure replacement by limiting development in floodprone areas. Small communities are encouraged to work with other communities and primarily their county to try to implement these standards uniformly and possibly through an interlocal agreement. Counties usually have staff who are already trained and prepared; it is not much more of an effort for them to implement a safer standard for a small town at the same time the county implements the same standard. A county's program is already established and they are usually already providing building inspections for the smaller towns. Counties may be able to justify the need for additional personnel if they have to implement such an important program for other municipalities in addition to their own. One additional county staff person full-time could be able to implement these standards for the county and several small towns as well. This is much more efficient than each municipality trying to enforce new standards on their own.

- **Identification of affected properties**

Issue: Properties in areas where new standards will apply should be identified and property owners be notified about the new standards.

Response: Communities could develop maps that overlay the boundaries of new or revised flood hazard areas on parcel maps. Owners of affected properties could be notified by mail of the new standard and provided with a local point of contact that can

answer questions and provide additional information. Impacted property owners can also be invited by the community to a forum where information is presented.

B. Outreach/Education for Impacted Citizens and Business Owners

Achieving success during the process of adopting and implementing a new floodplain management standard often depends on how it is received by those most affected. For a residential property with an occupied house, affected parties may include the property owner, his or her tenants if it is a rental property, the lending institution that holds the mortgage on the property, and the insurance company that insures it against flood damage. For a commercial or industrial property, the owner, board of directors, or group of shareholders may be most affected by a newly adopted floodplain management standard. For an undeveloped property, those impacted by floodplain management requirements may include a developer and a builder or contractor, in addition to the property owner. All of these parties may react negatively or positively to the news that there is a new regulation that affects their particular piece of property. How and when that information is provided to them will affect how it is received. This section of the guidebook offers some strategies to ensure that every opportunity is taken to give affected property owners and others accurate information about: (1) how the new standard affects them; (2) the benefits of the safer standard; and (3) what resources are available to ease any inconvenience or financial impact.

1. Outreach Strategies

It is important to develop a comprehensive outreach strategy for your community to identify stakeholders and two-way communication mechanisms, assess information exchange needs, consider the possibility of networking with other agencies, design and create outreach toolkits, assign resources and coordinate efforts, evaluate successes, and implement feedback. Successful outreach for floodplain management involves extensive coordination among homeowners, developers and realtors, lenders, insurers, media representatives, and others. Each stakeholder has specific needs and interests affected by decisions regarding the adoption of higher standards.

In developing a comprehensive strategy, it is important to understand the needs of each affected party and the assets they can bring to the process in terms of two-way information exchange. True outreach extends beyond one-way communication of educational information and should include mechanisms for affected parties to share their knowledge, provide their feedback, ideas, and concerns. Then, the process of identifying venues for information exchange such as public meetings, radio call-in shows, websites, kiosks, etc., can begin. Existing venues should be considered as well as the possibility of creating new opportunities for stakeholder involvement, education, and outreach. Media relations are key in ensuring that stakeholders are informed and given advance notice of opportunities for involvement, and to provide accurate, up-to-date information on progress made and planned activities.

Outreach tools can include presentation and briefing materials, fact sheets, brochures, pamphlets, training and technical assistance materials, press releases, newsletters, journal articles, poster displays, and websites. Topics to be addressed could include:

- Natural and Beneficial Functions of Floodplains
- Basic Principles of Floodplain Management
- Opportunities for Local Involvement
- Background Information on the Cooperating Technical State (CTS) Floodplain Mapping Program
- Minimum State and Federal Floodplain Management and Mitigation Standards
- Higher Standards and the Benefits of Going Beyond Minimum Requirements
- Factors to Consider When Adopting Higher Standards
- Developing and Implementing Ordinances
- Available Resources
- Success Stories and Lessons Learned

These topics can be addressed to various stakeholders in varying levels of detail depending on their interest and level of expertise. Ideally, outreach materials should be inter-related and include clearly identify appropriate information on who to contact for more information on each topic. Individual fact sheets and stand-alone pieces can be carefully selected and put into folders or notebooks as toolkits or briefing packages suitable for a wide range of outreach needs. This maximizes flexibility and reduces costs associated with generating different packages to meet different outreach needs.

2. Resources

Communities are often keenly interested in finding out about available resources they can access such as technical assistance, etc., to ease inconveniences associated with adoption of higher standards. Such resources include:

Technical Assistance (State)
North Carolina Division of Emergency Management
1830-B Tillery Place
Raleigh, NC 27604-1356
Person to Contact: NFIP State Coordinator
(919) 715-8000



Technical Assistance (Federal)
Federal Emergency Management Agency
Atlanta Regional Office
Koger Center-Rutgers Building
3003 Chamblee-Tucker Road
Atlanta, GA 30341
Person to Contact: NFIP Specialist
(770) 220-5440



FEMA

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These resources can be referenced during meetings and informational exchanges and in all written materials provided in floodplain management toolkits to the media, homeowners, government officials, lenders, the general public, and all other affected stakeholders.

IV. COMMUNITY SUCCESS STORIES

Communities can reduce their exposure to possible future natural hazards by managing the location and construction of both the existing and future built environment. By selecting suitable locations and using appropriate construction techniques, a community can mitigate negative impacts and reduce future damage to human lives, property, and the environment.

As the costs of disasters continue to rise, local governments must find ways to reduce risks. As communities plan for new development and improvements to existing infrastructure, mitigation can and should be an important component of the planning effort. This means taking action to reduce or eliminate long-term risk from hazards and mitigating their effects.

The case studies that follow highlight several communities that have enacted higher standards to reduce flood risks to their community.

Town of Carrboro

The Town of Carrboro is located in southeast Orange County in north-central North Carolina. Carrboro is located immediately west of the Town of Chapel Hill, home of the University of North Carolina. Raleigh is about 30 miles to the east, Hillsborough 10 miles to the north, and Durham about 15 miles to the northeast. Despite its location in a large metropolitan area, Carrboro is known for its well-managed growth and small-town flavor. The Town's population in 2010 was approximately 19,500.

The Town of Carrboro has in place significant restrictions on new development in floodplains and adjacent areas. In the late 1980s, the Town enacted floodplain regulations that are more restrictive than State or Federal standards in order to protect human life and safety, to minimize taxpayer expenditures for costly flood control projects and rescue/relief efforts, to protect water quality, and to mitigate damage to public facilities and utilities. These regulations remain in effect today.

The Town has prevented development in its floodplains through a multi-tiered approach. New structures are generally prohibited within an SFHA, as described in the following excerpt from the Town's Flood Damage Prevention, Stormwater Management, and Watershed Protection ordinance.

City of Carrboro Land Use Ordinance, Article XVI

Section 15-251.9 Specific Standards for Flood Hazard Reductions

(a) New structures generally prohibited within SFHAs. Within a Special Flood Hazard Area, no new structure (as defined in this part) may be constructed or located, and no substantial improvement of an existing structure may take place, unless and to the extent that the permit issuing authority for the proposed use determines that, in the absence of an authorization to do so, the owner would be deprived of all reasonable use of the subject property. Notwithstanding the foregoing, manufactured homes that are nonconforming because they are located within a SFHA may be replaced with another manufactured home. If such construction (or replacement of manufactured homes) is authorized, all such construction (or replacement) shall be in conformity with the remaining provisions of this section in addition to those set forth in Section 15-251.8.

Impervious surface limitations confine the "built-upon area." These restrictions further ensure that floodplain areas in the Town's water supply watershed protection districts, which comprise 22 percent of the Town's jurisdiction, are not heavily encroached upon. The built-upon area means that portion of a development project that is covered by impervious or partially impervious cover, including buildings, pavement, gravel areas (e.g. roads, parking lots, paths), recreation facilities (e.g., tennis courts), etc.

Other provisions of the Town's land use regulations restrict the permitted residential density of developments of five or more lots or dwelling units in certain zones based upon the presence of a floodway, a 1-percent-annual-chance (100-year) floodplain, wetlands, steep slopes, and other criteria.

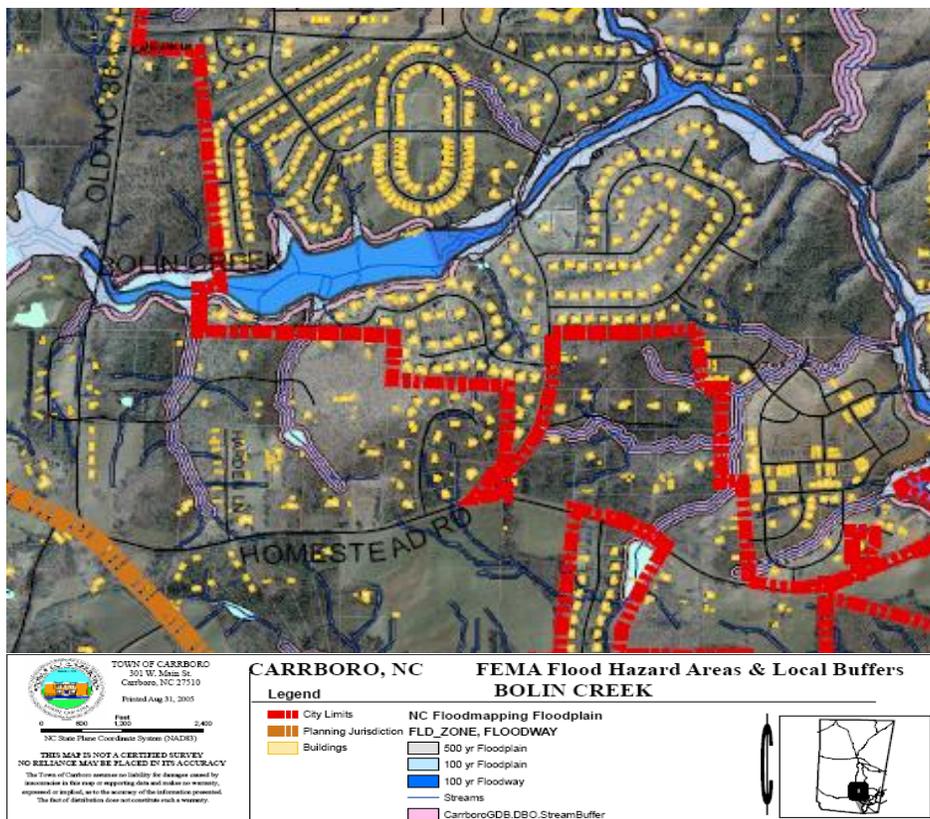
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A requirement for the set-aside of common areas in almost all residential development has been in place since the mid-1980s. In 1995, the requirement was increased to 40 percent. This requirement mandates the set-aside of primary conservation areas, including floodways, 1-percent-annual-chance floodplains, steep slopes, and hardwood areas.

The final provision limiting floodplain development is water-quality buffer restrictions that prohibit disturbance of the area within those buffers. Buffers are established adjacent to all surface waters designated as such on the most recent version of the soil survey map prepared by the Natural Resources Conservation Service, or the 1:24,000 scale (7.5-minute) quadrangle topographic maps prepared by the U.S. Geologic Survey; or other more accurate mapping approved by the North Carolina Environmental Management Commission.

The Town of Carrboro has greatly benefited from the open space and flood storage capacity preserved through its adoption of higher regulatory standards. These actions have resulted in many environmental and recreational benefits within the Town, including the framework for an extensive network of greenway and bicycle facilities. Some segments of the greenway have been constructed as part of private development projects. The Town has begun the construction planning process for three other major segments, with construction scheduled to take place within the next few years.

No legal challenges have been made to the SFHA restrictions since the ordinance was enacted. The development community is in tune with the provisions and is generally accepting of this approach as the way the Town does business.



Town of North Topsail Beach

The FEMA 2000 *Coastal Construction Manual* recommends constructing buildings in areas designated as Coastal AE Zones on Flood Insurance Rate Maps (FIRMs) so they are more resistant to coastal flood forces. Coastal A Zones are those areas located landward of an open coast (with or without mapped V Zones) where the principal sources of flooding are tides, storm surges, seiches or tsunamis instead of riverine sources. Coastal AE Zones are subject to wave effects, velocity flows, erosion, scour, and all combinations. These areas are expected to receive 1.5 to 3 foot breaking waves during a 100-year storm event.

FEMA's recommendations in the *Coastal Construction Manual* are further supported by the Nation's private sector building code organizations and consensus standards groups (i.e., IBC, IRC, NFPA 5000, ASCE 7, ASCE 24). These organizations recognize the Coastal AE Zone hazard and require appropriate design and construction requirements similar to those established for VE zones under the NFIP. Nonetheless, these requirements for Coastal AE Zones have yet to be included in the NFIP regulations. As a result, regulating these areas to higher standards is left to the discretion of the community.

The Town of North Topsail Beach has adopted the higher standard of development enforcement within all Coastal High Hazard Areas. These areas are held to V/VE Zone requirements, which are the most restrictive. In addition, the Town has adopted a freeboard requirement of 2 feet above the BFE for construction within all floodprone areas of the community.

The following portions of the community's Flood Damage Prevention Ordinance illustrate how construction in Coastal A Zones is held to V Zone standards.

North Topsail Beach – Chapter 8, Flood Damage Prevention Ordinance

Article 1, Sec. 8-3

It is the purpose of this ordinance to promote public health, safety, and general welfare and to minimize public and private losses due to flood conditions within flood prone areas by provisions designed to:

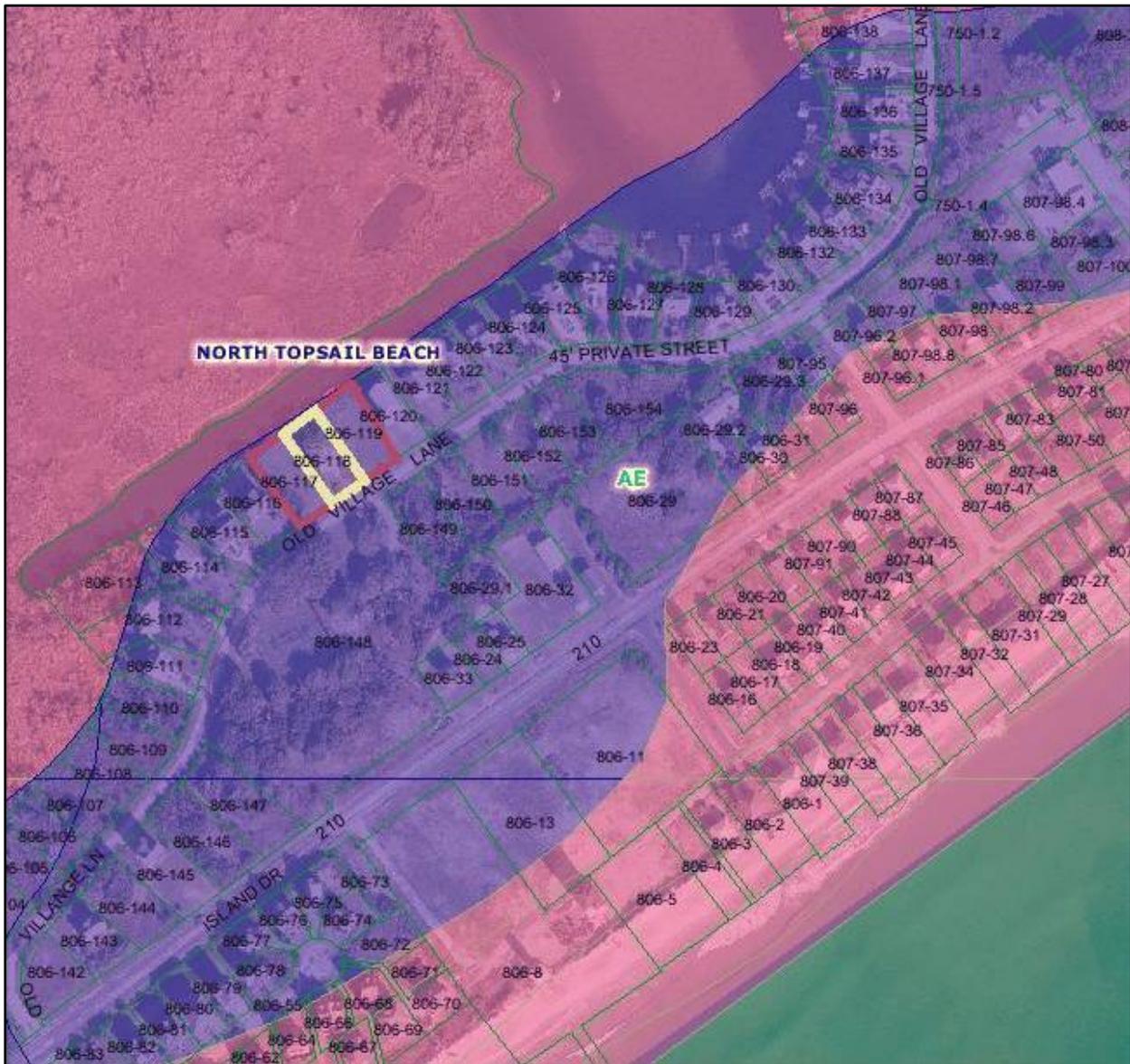
- (6) Extend V-Zone standards for coastal storm surge and wind protection farther inland to include coastal A Zones.*

Article 4 , Section 8-14(3)(f)

*A V-Zone Certification with accompanying design plans and specifications is required prior to issuance of a Floodplain Development permit within coastal high hazard areas.
(Continued)*

The figures below show an aerial view and a photograph of a house located within a Coastal AE Zone. The home was built in 2001 to V-Zone construction standards, with engineered breakaway walls and flood vents. The first floor is elevated to more than 2 feet above the BFE.

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Property located in Coastal AE Zone



Street view of home with breakaway walls and elevated first floor

Adoption of this higher standard may prevent scour and undermining of foundations caused by wave action and reduce the likelihood of property damage during coastal storms and flood events. Also, the higher elevation standard has a direct beneficial impact on flood insurance rates for the owner.

Because the community is a participant in the CRS, this floodplain management practice contributes in part to a CRS classification of 7 with a flood insurance premium reduction of 15% for policy-holders within the SFHA (5-percent reduction for non-SFHA policyholders).

City of Brevard

In recent years the City of Brevard has experienced significant pressure to allow development within floodprone areas because most other prime development locations within the community have been built out. However, Transylvania County, of which the City of Brevard is the county seat, is one of the wettest places in the United States. Only the Pacific Northwest averages more annual rainfall. In addition, the headwaters of most of the streams in Brevard begin in higher terrain, allowing floodwaters to reach hazardous velocities before reaching the city.

After examination of the NFIP standards for floodplain development, the City Council of the City of Brevard determined that because of its geographic location, topography, and the extensive riverine floodplain systems within its jurisdiction, the minimum standards of the NFIP were not wholly sufficient to protect its citizens and their properties from the effects of flooding. This was especially the case in situations where flooding could be exacerbated by development that would otherwise be allowable under the minimum standards of the NFIP.

The Brevard City Council concluded that additional protections must be employed to protect lives and property within the City's jurisdiction. Therefore, more stringent floodplain management criteria have been adopted, including adoption of No Adverse Impact floodplain management, which is defined as follows.

No Adverse Impact floodplain management takes place when the actions of one property owner are not allowed to adversely affect the rights of other property owners. The adverse effects or impacts can be measured in terms of increased flood peaks, increased flood stages, higher flood velocities, increased erosion and sedimentation, or other impacts the community considers important.

Specific requirements adopted by the City of Brevard are as follows:

- Development within an SFHA is regulated to floodway standards. All new development requires no-rise certification by a North Carolina registered professional engineer.
- Proposed development within an SFHA must have a No Adverse Impact statement signed and sealed by a P.E., supported by a full hydrologic and hydraulic analysis.
- Structures must be elevated to a freeboard of 2 feet above the BFE.
- Manufactured housing must include 2 feet of freeboard for the lowest structural member or hanging ductwork, whichever is lower.

The following portion of Brevard's floodplain management ordinance illustrates how the community has adopted the No Adverse Impact principal.

**City of Brevard Unified Development Ordinance, No. 20-09
Chapter 34, Article 5, Section C (2) *partial***

No structure or land shall be located, extended, converted, altered, or developed in any way within the Special Flood Hazard Area, nor shall any floodplain development permit be issued except as otherwise provided in this ordinance, until the Administrator makes a determination that the project would not increase danger to life or property and would have no adverse impact based upon the affirmative findings that:

- a) The granting of the floodplain development permit will not create a danger that fill, construction materials or other debris or construction spoils may be swept onto properties upstream from, downstream from, or adjacent to the project area, or increase erosion and sedimentation; and*
- b) The granting of the floodplain development permit will result in no rise in the base flood elevation as defined by this ordinance; and*
- c) The granting of the floodplain development permit will not result in increased flood peaks, increased flood stages, or increased flood velocities during the base flood discharge; and*
- d) The granting of the floodplain development permit will not increase or alter the width or extent of the floodway or special flood hazard area except within the property or properties upon which the floodplain development is located or the property of a consenting owner, where such property is protected from future development by means of a conservation easement or other, similar restriction that is acceptable to the Administrator; and*
- e) The granting of the floodplain development permit will not increase the susceptibility of any property to flooding during the base flood except the property or properties upon which the floodplain development is located or the property of a consenting owner, where such property is protected from future development by means of a conservation easement or other, similar restriction that is acceptable to the Administrator; and*
- f) The granting of the floodplain development permit will not increase the susceptibility of existing or proposed structure to flooding during the base flood; and*

(Continued)

Adoption of the No Adverse Impact higher standard may prevent the loss of life and property during flood events. In addition, the higher finished floor elevation standard has a direct beneficial impact on flood insurance rates for the homeowner.

Because the community is a participant in the CRS, this floodplain management practice contributes in part to a CRS classification of 8 with a flood insurance premium reduction of 10 percent for policyholders within the SFHA (5-percent reduction for non-SFHA policyholders).

Charlotte/Mecklenburg County

Charlotte-Mecklenburg was FEMA's second Partner to sign a Cooperating Technical Program agreement in 1999. Eight local floodplain ordinances are enforced by Mecklenburg County: Charlotte, Cornelius, Davidson, Huntersville, Matthews, Mint Hill, Pineville, and Mecklenburg County (Unincorporated Areas). Since the agreement, these communities have jointly adopted several regulations that are more restrictive than the minimum requirements of the NFIP, as shown below.

- A future conditions/community flood fringe, a 0.1-foot community floodway encroachment area, and a 0.5-foot FEMA floodway encroachment area have been added to the FIRM.
- All new construction/substantial improvement projects must abide by the minimum flood protection elevation (the community floodplain/future conditions elevation plus 1 or 2 feet of freeboard, depending on the community) determined for that area.
- Parking spaces for non-single family buildings habitable buildings must be no less than 6 inches below the future BFE.
- Cumulative substantial improvement is tracked.
- New buildings must have dry-land access to a dry street.
- Construction of levees is highly restricted.
- Critical facilities must be located outside of the 0.2-percent floodplain

Another effort aimed at keeping development out of harm's way is the Charlotte-Mecklenburg Floodplain Buyout (Acquisition) Program. Charlotte-Mecklenburg Storm Water Services has purchased more than 200 structures that were located in the floodplain. Property purchased by Storm Water Services through the Hazard Mitigation Program must meet criteria set by the Federal and/or State government. Buildings purchased through the Buyout Program are demolished, and the land will remain forever as open space. In some cases, wetlands, rain gardens, or greenways may be built on the property.



Floodplain acquisition program (buy-outs)

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Those not eligible for the buy-out program have been encouraged to elevate their non-compliant structures

Adoption of these standards may prevent the loss of life and property during flood events. The preservation of open space will maintain flood storage capacity and benefit the environment. Also, the higher finished floor elevation standard has a direct beneficial impact on flood insurance rates for the homeowner. Homeowners who sell off their home to the community and move outside of designated flood zones will avoid flood insurance requirements.

The development community has generally accepted the higher standards. Education and early involvement in the process were key to gaining acceptance by the building/development community.

Stakeholders in the building/development community were brought into the process early as County staff began to investigate the need for, and the pros and cons of, higher floodplain development standards. After numerous presentations to various stakeholders and committees and at public hearings, the development community members reached a general consensus that they did not want to construct buildings or infrastructure based on today's conditions, as these standards could put occupants and others in harm's way in the future.

County staff have flagged all properties adjoining the floodplain in the community's GIS. This stops all permits until a floodplain development permit has been received and places an automatic hold on each Certificate of Occupancy to verify that the conditions of the permit were met.

Because the City of Charlotte is a participant in the CRS, these floodplain management practices contribute to a CRS classification of 5 with a flood insurance premium reduction of 25 percent for policyholders within the SFHA (10-percent reduction for non-SFHA policyholders). The Town of Pineville and Mecklenburg County each have a CRS classification of 6, for a premium reduction of 20-percent SFHA and 10-percent non-SFHA.

APPENDIX A

Annotated Bibliography

The following are materials used in this guidebook as references and/or sources of further information related to safer development:

Building Public Support for Floodplain Management. Association of State Floodplain Managers. Available: http://www.floods.org/n-publicdocumentlibrary/dkfiledownload.asp?ftpfile=Publications%5CBPS_Guidebook_2_1_10.pdf; February 2010 Version. (Site Accessed: September 2010).

Provides guidance on effective public outreach for floodplain management issues, including general communication best practices and ways to convey messages effectively through different methods and sources.

Coastal No Adverse Impact Handbook. Association of State Floodplain Managers, National Oceanic and Atmospheric Administration. Available: <http://www.floods.org/index.asp?menuid=340>; May 2007. (Site Accessed: September 2010).

This handbook introduces local officials and concerned citizens to No Adverse Impact (NAI) concepts and suggests how coastal communities can use this approach to minimize risk and maximize the benefits of their coastal environments. Rather than depending on minimum requirements of federal or state programs, the NAI approach provides tools for communities to provide a higher level of protection for their citizens and to prevent increased flooding now and in the future.

Community Rating System. Federal Emergency Management Agency, National Flood Insurance Program. Available: <http://www.fema.gov/business/nfip/crs.shtm> (Site Accessed: September 2010).

The Community Rating System (CRS) was implemented in 1990 as a program for recognizing and encouraging community floodplain management activities that exceed the minimum National Flood Insurance Program standards. The National Flood Insurance Reform Act of 1994 codified the CRS in the NFIP. Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet the following goals: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance. There are ten CRS classes: Class 1 requires the most credit point and gives the largest premium reduction; Class 10 receives no premium reduction. The CRS recognizes 18 creditable activities, organized under four categories: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness.

Future Conditions Hydrology. Federal Emergency Management Agency. Available: <http://www.fema.gov/library/viewRecord.do?id=2218> (Site Accessed: November 6, 2001).

This website discusses a draft document produced by FEMA concerning future conditions hydrology, one of the Federal Emergency Management Agency's objectives through the Map Modernization Plan. Since flood hazards can change quickly as development occurs, communities are given information related to regulating watershed development based on future conditions rather than existing conditions. The draft document, titled *Modernizing the Federal Emergency Management Agency's Flood Hazard Mapping Program: Recommendation for Using Future Conditions Hydrology for the National Flood Insurance Program* is included, as well as links to other sites related to rapid growth and the effects that this growth has on safe development.

Hazard Mitigation in North Carolina. North Carolina Emergency Management. Available: <http://www.nccrimecontrol.org/Index2.cfm?a=000003,000010,001623,000177> (Site Accessed: September 2010)

North Carolina's Hazard Mitigation Program seeks to actively reduce the negative impacts of natural hazards on the state. Their comprehensive approach includes innovative programs and initiatives to minimize the loss of life and damage to housing, infrastructure, businesses, and the environment. This site includes mitigation funding sources, floodplain management and mitigation planning information, legal services, risk determination of natural hazards, home protection methods, and other helpful information and links.

Hazard Mitigation Successes in the State of North Carolina. North Carolina Department of Crime Control and Public Safety, Emergency Management Division: 1999. <http://www.p2pays.org/ref/24/23234.pdf> (Site Accessed: September 2010).

This report discusses at length the successes that the State of North Carolina has had by implementing mitigative measures through State and local government. The report is divided into three sections including: the concept of sustainable hazard mitigation and the role of State and Federal programs as resources; eight specific communities that have made hazard mitigation a priority; and, a view of future issues and challenges related to reducing the vulnerability of North Carolina communities to natural disasters.

Interim Report to the 2001 Session of the General Assembly of North Carolina. North Carolina. General Assembly, Commission on Disaster Response and Recovery. Available: <http://www.ncleg.net/documentsites/legislativepublications/Study%20Reports%20to%20the%202001%20NCGA/NCGA%20Study%20Reports%20%28All%29%20%2701/Legislative%20Study%20Commission%20on%20Disaster%20Response%20and%20Recovery.pdf> (Site Accessed: September 2010).

This report is based on six findings and recommendations by the Disaster Response and Recovery Commission established by the General Assembly. The Commission had met six times prior to the date of this document to hear emergency management experts,

government officials, and Hurricane Floyd victims. The report includes the following: a tiered disaster proclamation dividing disasters into three levels; the Disaster Reserve Fund; information on long-term recovery; a proposed disaster institute; a performance audit of Hurricane Floyd relief and recovery programs and recommendations that local governments can take to strengthen local emergency management.

Managing Floodplain Development in Approximate Zone A Areas: A Guide for Obtaining and Developing Base (100-year) Flood Elevations. Federal Emergency Management Agency, Publication Number 265: 1995. Available: http://www.fema.gov/pdf/fhm/frm_zna.pdf (Site Accessed: September 2010).

This publication provides guidelines for community officials, property owners, developers, surveyors, and engineers for determining base flood elevations in Special Flood Hazard Areas studied only by approximate methods.

Mecklenburg County Storm Water Services. Available: <http://www.charmeck.org/stormwater/Pages/default.aspx> (Site Accessed: September 2010).

Mecklenburg County Storm Water Services works with other county and city agencies to manage, protect, and improve local water resources through voluntary, regulatory, and educational efforts. Their website provides numerous links and recommendations for various levels of assistance, and information related to regulating floodplain development, preventing flooding of structures, and reducing erosion.

Mitigation Success Stories in the United States, 4th Edition. Association of State Floodplain Managers, Flood Mitigation Committee, and the Federal Emergency Management Agency Mitigation Directorate: 2002. Available: http://www.floods.org/PDF/MSS_IV_Final.pdf (Site Accessed: September 2010).

The goals of this highly useful reference are to publicize the benefits of mitigative successes across the country and to serve as a model for those making decisions related to mitigative measures. This document is organized by state and includes specific information related to mitigative measures taken by communities. Community information includes background, projects implemented, costs, benefits, and sources of funding. The Association of State Floodplain Managers website is an excellent source of other information and publications as well.

National Flood Insurance Reform Act of 1994. Public Law 103-325, Section 511. Available: <http://www.fema.gov/pdf/nfip/riegle.pdf> (Site Accessed: September 2010).

Includes information on the National Flood Insurance Program, including flood insurance requirements, mitigation of flood risks and mitigation assistance, and ratings and incentives for community floodplain management programs including the Community Rating System.

North Carolina Floodplain Mapping Program. State of North Carolina and FEMA. Available: www.ncfloodmaps.com (Site Accessed: September 2010).

Provides numerous links and information related to flood mapping and floodplain management.

"No Adverse Impact: A New Direction in Floodplain Management Policy." Larson, Larry and Doug Plasencia. *Natural Hazards Review* 2 (no.4) November 2001. Available: http://www.rio.iowa.gov/wrcc/assets/No_Adverse_Impact.pdf (Site Accessed: September 2010).

This document was co-authored by Larry Larson, Executive Director of the ASFPM. It points out the excessive losses that the United States continues to experience, and outlines the "No Adverse Impact" (NAI) approach to floodplain management.

No Adverse Impact: A Toolkit for Common Sense Floodplain Management. Association of State Floodplain Managers, 2003. Available: (Site Accessed: September 2010). http://www.floods.org/NoAdverseImpact/NAI_Toolkit_2003.pdf

Designed to assist local and state floodplain managers in implementing the NAI approach to floodplain management.

Technical Bulletins. Federal Emergency Management Agency, Flood Insurance Administration: Dates Vary. Available: <http://www.fema.gov/plan/prevent/floodplain/techbul.shtm> (Site Accessed: September 2010).

Specific bulletins include:

- *Openings in Foundation Walls and Walls of Enclosures (2008)*
Provides guidance on the NFIP regulations concerning the requirements for openings in below-Base Flood Elevation foundation walls for building located in Zones A, AE, A1-A30, AR, AO, and AH.
- *Flood-Resistant Materials Requirements (2008)*
Provides guidance on the NFIP regulations concerning the required used of flood-damage resistant construction materials for building components located below the Base Flood Elevation in Special Flood Hazard Areas (both A and V zones).
- *3-93 Non-Residential Floodproofing-Requirements and Certification*
Provides guidance on the NFIP regulations concerning watertight construction and the required certification for floodproofed non-residential buildings in Zones A, AE, A1-A30, AR, AO, and AH whose lowest floors are below the Base Flood Elevation.
- *Free-of-Obstruction Requirements (2008)*

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Provides guidance on the NFIP regulations concerning obstructions to flood waters below elevated buildings and on building sites in coastal high hazard areas.

- *6-93 Below-Grade Parking Requirements*
Provides guidance on the NFIP regulations concerning the design of below-grade parking garages beneath buildings located in Zones A1-A30, AR, AO, and AH.
- *7-93 Wet Floodproofing Requirements*
Provides guidance on the NFIP regulations concerning wet floodproofing of certain types of structures located in Zones A1-A30, AR, AO, and AH.
- *10-01 Ensuring that Structures Built on Fill In or Near Special Flood Hazard Areas are Reasonably Safe From Flooding*
This technical bulletin discusses building techniques, including the use of fill, that can be used to ensure structures are reasonably safe from flooding.

House Bill 451: Amend North Carolina Emergency Management Laws. North Carolina General Assembly, Legislative Study Commission on Disaster Response and Recovery. Filed February 28, 2001. Introduced by Arnold, Gene C.; R. Eugene Rogers; Ronald L. Smith; Thomas E. Wright. Available:
[http://www.ncleg.net/documentsites/legislativepublications/Study Reports to the 2001 NCGA/NCGA Study Reports \(All\) '01/Legislative Study Commission on Disaster Response and Recovery.pdf](http://www.ncleg.net/documentsites/legislativepublications/Study%20Reports%20to%20the%202001%20NCGA/NCGA%20Study%20Reports%20(All)%20'01/Legislative%20Study%20Commission%20on%20Disaster%20Response%20and%20Recovery.pdf) (Site Accessed: September 2010)

This bill proposes a three-tiered system of disaster severity declaration: Type I, Type II, and Type III. This system will determine the severity of the disaster and standardize the types of assistance that may become available to individuals and public entities during the recovery stage. Type I declarations occur when the level and extent of destruction is insufficient to support a presidential disaster declaration that qualifies the affected area for benefits under the federal Stafford Act; funding for a Type I declaration lies with the State. Type II declarations occur when a presidential disaster declaration is issued and state and local recovery needs can be addressed by disaster programs that currently exist within the State and Federal government. Type III declarations are reserved for events so devastating that conventional programs leave significant unmet needs. In a Type II declaration, exemplified by Hurricane Floyd, the State should be expedited to create new, time-limited programs to address unique aspects of the disaster. Funding for Type II and Type III Declarations is a combination of State and Federal.

APPENDIX B

Recommended Higher Standards Matrix

The following matrix provides a comprehensive list of higher standards that communities can adopt to increase the level of flood protection in their communities above the current Federal and State requirements. In addition to the higher standards described in detail in Chapter II, Part B, several additional standards are listed along with brief descriptions of the relevant minimum NFIP requirements, implications of adopting the standard, CRS impacts, other flood insurance rate impacts, and advantages/disadvantages of adopting the standard.

The list of standards is organized according to the same categories used in Chapter II, Part B:

1. Build it Up – Requirements Impacting the Elevation of New Structures/Development
2. Build it Out – Requirements Impacting the Location of New Structures/Development
3. Build it Safer – Requirements Impacting Existing or Reconstructed Structures
4. Other Safer Requirements

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	Higher Standard	Minimum NFIP Requirements	Implications*	CRS Impacts*	Flood Insurance Rate Impacts[‡]	Flood Mapping Impacts	Advantages	Disadvantages
1. Build it Up – Requirements Impacting the Elevation of New Structures/Development								
a	Require structures and substantial improvements to be elevated to a specific amount above the BFE	No NFIP freeboard requirement; 44 CFR 60.3(c)(2) states all new construction and substantial improvements in Zones A1-30, AE, and AH have lowest floor elevated to or above the BFE	1 and 3	430	Lower rate; compliant structures rated on individual freeboard	None	<ul style="list-style-type: none"> • May prevent loss of life and property damage during a flood event • Flood insurance rates decrease 	<ul style="list-style-type: none"> • May cause moderate increase in initial construction costs
b	Require elevation to freeboard height for structures within "freeboard contour"	44 CFR 60.3(c)(2) states that all new construction and substantial improvements in Zones A1-30, AE, and AH have lowest floor elevated to or above the BFE	3	430	None	None; freeboard contour information is kept in a database for use as a GIS layer	<ul style="list-style-type: none"> • May prevent loss of life and property damage during a flood event • Alert property owners adjacent to the 1% annual chance floodplain that they are at risk if flood levels exceed the BFE 	<ul style="list-style-type: none"> • May cause moderate increase in initial construction costs • Community may pay for additional mapping services
c	Regulate floodplain development to the future hydrological conditions 1% annual chance flood elevation	Flood hazard determinations should be based on conditions that are planned to exist in the community following completion of a draft Flood Insurance Study	1 and 3	430	Compliant structures rated on individual freeboard above existing conditions flood elevation	FIRM may show 1% annual chance floodplain based on existing conditions and future hydrological conditions	<ul style="list-style-type: none"> • May prevent loss of life and property damage during a flood event • "Life" of FIRM is extended if future conditions are mapped • Flood insurance rates decrease 	<ul style="list-style-type: none"> • May cause moderate increase in initial construction costs • May cause increased study costs for previously studied flooding sources identified for redelineation
d	Require elevation to or above high-water marks for flood of record	44 CFR 60.3(c)(2) states that all new construction and substantial improvements in Zones A1-30, AE, and AH have lowest floor elevated to or above the BFE	3	410 and 430	Flood insurance available at lower "preferred risk" or non-floodplain rates	None	<ul style="list-style-type: none"> • May prevent loss of life and property damage during a flood event • Areas included in emergency response and evacuation planning • Flood hazard area residents will be alerted to the need to obtain flood insurance 	<ul style="list-style-type: none"> • May increase the number of structures affected by the floodplain management ordinance
e	Require elevation to or above predicted category 3 hurricane elevations (or regulate development within category 3 hurricane inundation areas)	44 CFR 60.3(c)(2) states that all new construction and substantial improvements in Zones A1-30, AE, and AH have lowest floor elevated to or above the BFE	3	410 and 430	Flood insurance available at lower "preferred risk" or non-floodplain rates	None	<ul style="list-style-type: none"> • May prevent loss of life and property damage during a flood event • Residents in category 3 hurricane inundation areas will be alerted to need to obtain flood insurance 	<ul style="list-style-type: none"> • May increase the number of structures affected by the floodplain management ordinance

SAFER DEVELOPMENT IN FLOODPRONE AREAS

	Higher Standard	Minimum NFIP Requirements	Implications*	CRS Impacts*	Flood Insurance Rate Impacts[‡]	Flood Mapping Impacts	Advantages	Disadvantages
f	Require extra elevation for structures in A Zones (without BFEs)	No NFIP freeboard requirement	1 and 3	430	Flood insurance available at lower "preferred risk" or non-floodplain rates	None	<ul style="list-style-type: none"> • May prevent loss of life and property damage during a flood event • Flood insurance rates decrease 	<ul style="list-style-type: none"> • May cause moderate increase in initial construction costs
2. Build it Out – Requirements Impacting the Location of New Structures/Development								
a	Prohibit manufactured housing and recreational vehicles in V Zones	44 CFR 60.3(e)(2) through (9) requires the elevation of mobile homes that are on-site less than 180 consecutive days; must be fully licensed and ready for highway use, anchored, and fit required structural guidelines	1 and 3	430	None	None	<ul style="list-style-type: none"> • May prevent loss of life and property during coastal storm and flood events 	<ul style="list-style-type: none"> • Owners of parks in V Zones may be left with undevelopable lots or may be put out of business
b	Prohibit manufactured homes and recreational vehicles in floodways		1 and 3	430	None	None	<ul style="list-style-type: none"> • May prevent loss of life and property during a flood event • Space previously used by mobile home parks could be turned into safer forms of open space and recreation 	<ul style="list-style-type: none"> • Tourism and/or recreation may be affected • Excluding property in the floodway from development could increase costs for property in other areas
c	Increase width of floodways based on reduced surcharge value	44 CFR 60.3(d)(2) requires the community to adopt a floodway based on its designation to carry waters of the base flood without increasing the water-surface elevation of that flood more than 1.0 foot at any point	1 and 3	420 and 430	None	The width of a regulatory floodway depicted on a FIRM will differ based on the surcharge that the community adopts	<ul style="list-style-type: none"> • May prevent loss of life and property during a flood event 	<ul style="list-style-type: none"> • Excluding property in the floodway from development could increase costs for property in other areas
d	Prohibit or require elevation of critical facilities in 1% and 0.2% annual chance floodplains	44 CFR 60.3(d)(2) requires the community to adopt a floodway based on its designation to carry waters of the base flood without increasing the water-surface elevation of that flood more than 1.0 foot at any point	1 and 3	420 and 430	None	None	<ul style="list-style-type: none"> • May prevent loss of life and property during a flood event • Future increases to water-surface elevations will be reduced 	<ul style="list-style-type: none"> • Excluding property in the flood fringe from development could increase costs for property in other areas • May be challenged as "taking" of property
e	Preserve Open Space	None	1 and 3	420	None	None	<ul style="list-style-type: none"> • May prevent loss of life and property during a flood event • Future increases to water-surface elevations will be reduced • Maintains/restores natural and beneficial floodplain functions 	<ul style="list-style-type: none"> • Owners of property within the SFHA may be left with undevelopable lots • May be challenged as "taking" of property

SAFER DEVELOPMENT IN FLOODPRONE AREAS

	Higher Standard	Minimum NFIP Requirements	Implications*	CRS Impacts*	Flood Insurance Rate Impacts*	Flood Mapping Impacts	Advantages	Disadvantages
f	Adopt Low Density Zoning	None	3	430LD	None	None	<ul style="list-style-type: none"> • May prevent loss of life and property during a flood event • Future increases to water-surface elevations will be reduced • Maintains/restores natural and beneficial floodplain functions 	<ul style="list-style-type: none"> • Owners of property within the SFHA may be left with undevelopable lots • May be challenged as "taking" of property
g	Adopt Subdivision Development Standards	None	3	430LD	None	None	<ul style="list-style-type: none"> • May prevent loss of life and property during a flood event • Future increases to water-surface elevations will be reduced • Maintains/restores natural and beneficial floodplain functions 	<ul style="list-style-type: none"> • Owners of property within the SFHA may be left with undevelopable lots • May be challenged as "taking" of property
3. Build it Safer – Requirements Impacting Existing or Reconstructed Structures								
a	Use repetitive loss criteria to determine whether a structure is substantially damaged	NFIP regulations require that "substantially damaged" reconstruction within mapped SFHAs meet NFIP minimum standards for new construction and substantial improvement (44 CFR 59.1)	1 and 3	430	More flood insurance policyholders will be able to file Increased Cost of Compliance claims to pay up to \$20,000 of costs	None	<ul style="list-style-type: none"> • More damaged structures will be improved, relocated, or demolished; therefore, loss of life and property during a flood event will be mitigated 	<ul style="list-style-type: none"> • May cause moderate increase in cost of reconstruction for affected structures within the floodplain
b	Require enforcement of V Zone standards in coastal A Zones	Structures in coastal AE and AO Zones must comply with same NFIP regulations as structures in riverine AE and AO Zones	1 and 3	430	Decreased flood insurance rates	None	<ul style="list-style-type: none"> • Cost of initial construction will be offset by a decrease in flood insurance rates for elevated structures • May prevent loss of life and property damage during a flood event 	<ul style="list-style-type: none"> • May cause moderate increase in initial construction costs

SAFER DEVELOPMENT IN FLOODPRONE AREAS

	Higher Standard	Minimum NFIP Requirements	Implications*	CRS Impacts*	Flood Insurance Rate Impacts*	Flood Mapping Impacts	Advantages	Disadvantages
c	Limit the area of below-BFE enclosures	Areas below lowest floor designated to automatically equalize hydrostatic flood forces on exterior walls	1 and 3	430	Federal flood insurance cost reduction	None	<ul style="list-style-type: none"> • May prevent loss of life and property damage during a flood event • Reduces damage to foundation walls and superstructure 	<ul style="list-style-type: none"> • May cause moderate increase in initial construction costs due to alternative foundation systems
d	Prohibit repair/reconstruction of damaged, non-compliant, below-BFE V Zone enclosures	44 CFR 60.3 requires that substantially damaged structures be brought into full compliance with NFIP regulations upon repair	1 and 3	430	Structure may be eligible for post-FIRM insurance rates	None	<ul style="list-style-type: none"> • May prevent loss of life and property damage during a flood event • Structures will be brought into full compliance and potential future damage will be avoided 	<ul style="list-style-type: none"> • May cause moderate increase in repair and reconstruction costs
e	Regulate development within community-established flood zones	None; community-established flood zones are areas outside SFHAs shown on FIRM	1 and 3	410	None	None	<ul style="list-style-type: none"> • May prevent loss of life and property damage during a flood event • Inclusion in emergency response and evacuation planning • Residents in community established flood zone areas will be alerted to the need to obtain flood insurance 	<ul style="list-style-type: none"> • Increased number of structures affected by floodplain management ordinance
f	Regulate development in areas where alluvial soil types predominate	No NFIP requirement	3 (if map is maintained digitally)	410	Flood insurance lower "preferred risk" or non-floodplain rates	None	<ul style="list-style-type: none"> • May prevent loss of life and property damage during a flood event • Inclusion in emergency response and evacuation planning 	<ul style="list-style-type: none"> • Increased number of structures affected by floodplain development ordinance
4. Other Safer Requirements								
a	Require elevation determinations for all development in Zone A areas or for unstudied flooding sources	Required only for development greater than 5 acres of 50 lots	1 and 3	410	Lower rate, if elevated to BFE	Additional Data could be used to update flood map	<ul style="list-style-type: none"> • May prevent loss of life and property during a flood event 	<ul style="list-style-type: none"> • May cause increase in construction costs
b	Consider cumulative substantial damage/improvement determinations	NFIP requirements apply only to individual occurrences of damage	1 and 3	430	Lower rate, if elevated to BFE	None	<ul style="list-style-type: none"> • Addresses repetitive loss issue • Minimum requirements will apply to more repaired structures, so greater future damages will be avoided • Will make repetitive loss structures eligible for Increased Cost of Compliance flood insurance coverage 	<ul style="list-style-type: none"> • May cause increase in construction costs • Requires community monitoring and tracking

SAFER DEVELOPMENT IN FLOODPRONE AREAS

	Higher Standard	Minimum NFIP Requirements	Implications*	CRS Impacts*	Flood Insurance Rate Impacts†	Flood Mapping Impacts	Advantages	Disadvantages
c	Lower the threshold for substantial damage/substantial improvement determinations	Substantial damage is damage (from any source) the repair from which costs 50% or more of the market value of the structure prior to reconstruction	1 and 3	430	Lower rate, if elevated to BFE	None	<ul style="list-style-type: none"> Minimum requirements will apply to more repaired structures, so more potential damage will be avoided 	<ul style="list-style-type: none"> May cause increase in construction costs Requires community monitoring and tracking
d	Protect floodplain storage capacity	No NFIP requirement	1 and 3	450	None	None	<ul style="list-style-type: none"> Ensures stream carrying capacity 	<ul style="list-style-type: none"> May cause increase in construction costs Community Administrative review costs
e	Implement a flood warning program	No NFIP requirement	3	610	None	None	<ul style="list-style-type: none"> Allows evacuation/relocation of people and movable property in non-flash flood areas 	<ul style="list-style-type: none"> May give false sense of security and discourage better floodplain management
f	Mandatory floodplain administrator training and certification through ASFPM	No NFIP requirement	3	430	None	None	<ul style="list-style-type: none"> Ensures minimum level of knowledge for a floodplain administrator 	<ul style="list-style-type: none"> None
g	Regulate development to ensure that stormwater runoff is equal to or less than predevelopment runoff	No NFIP requirement	3	450	None	None	<ul style="list-style-type: none"> Preserves water quality May prevent loss of life and property during a flood event 	<ul style="list-style-type: none"> Community Administrative review costs

***Notes**

Implications:

1. Requires ordinance changes by local jurisdiction and/or State.
2. Requires change in flood hazard mapping.
3. CRS credit given.
4. Requires changes in Federal Statutes.

The list above does not include storm-water regulatory, structural (i.e., levee or floodwall), or acquisition and relocation options.

CRS Impacts:

CRS activities and associated numbers include the following:

- 300 Public Information Activities:
 - 310 Elevation Certificates
 - 320 Map Information
 - 330 Outreach Projects
 - 340 Hazard Disclosure
 - 350 Flood Protection Library
 - 360 Flood Protection Assistance
- 400 Mapping and Regulatory Activities:
 - 410 Additional Flood Data
 - 420 Open Space Preservation
 - 430 Higher Regulatory Standards
 - 440 Flood Data Maintenance
 - 450 Stormwater Management
- 450SH Credit for Special Hazard Areas
 - 410SH Additional Flood Data
 - 410SH Open Space Preservation
 - 430SH Regulation
 - 440SH Flood Data Maintenance
 - 450SH System Maintenance
- 500 Flood Damage Reduction Activities:
 - 510 Floodplain Management Plan
 - 520 Acquisition Relocation
 - 530 Retrofitting
 - 540 Drainage System Maintenance
- 600 Flood Preparedness Activities:
 - 610 Flood Warning Program
 - 620 Levee Safety
 - 630 Dam Safety

* **Flood insurance rate impacts other than CRS discount**

SAFER DEVELOPMENT IN FLOODPRONE AREAS

APPENDIX C

Community Rating System Overview for North Carolina (as of May 2010)

CID	Community Name	Current Effective Date	Current Class	Credit for SFHA	Credit for Non-SFHA
370404	ALLIANCE, TOWN OF	10/1/1992	9	5	5
370044	ATLANTIC BEACH, TOWN OF	10/1/1993	8	10	5
370183	BAYBORO, TOWN OF	10/1/1992	9	5	5
375346	BEAUFORT, TOWN OF	10/1/2005	8	10	5
370015	BELHAVEN, TOWN OF	10/1/1994	8	10	5
370253	BOONE, TOWN OF	10/1/2000	7	15	5
370231	BREVARD, CITY OF	10/1/2007	8	10	5
370036	CABARRUS COUNTY	5/1/2007	8	10	5
370039	CALDWELL COUNTY	4/1/2000	9	5	5
370046	CAPE CARTERET, TOWN OF	10/1/2003	8	10	5
375347	CAROLINA BEACH, TOWN OF	4/1/1999	7	15	5
370043	CARTERET COUNTY	10/1/1992	8	10	5
370391	CASWELL BEACH, TOWN OF	10/1/2000	7	15	5
370465	CEDAR POINT, TOWN OF	10/1/2007	8	10	5
370159	CHARLOTTE, CITY OF	5/1/2006	5	25	10
370263	CLINTON, CITY OF	5/1/2009	8	10	5
370037	CONCORD, CITY OF	10/1/2003	8	10	5
370072	CRAVEN COUNTY	10/1/2001	8	10	5
370443	CRESWELL, TOWN OF	10/1/1999	8	10	5
370076	CUMBERLAND COUNTY	10/1/1996	9	5	5
370078	CURRITUCK COUNTY	5/1/2008	8	10	5
375348	DARE COUNTY	5/1/2008	8	10	5
370085	DURHAM COUNTY	10/1/2008	8	10	5
370062	EDENTON, TOWN OF	10/1/1993	9	5	5
370047	EMERALD ISLE, TOWN OF	10/1/2003	7	15	5
375349	FORSYTH COUNTY	5/1/2008	8	10	5
370255	GOLDSBORO, CITY OF	5/1/2003	8	10	5
370191	GREENVILLE, CITY OF	10/1/2007	7	15	5
370111	GUILFORD COUNTY	10/1/2008	8	10	5
370265	HAVELOCK, CITY OF	10/1/1999	8	10	5
375352	HOLDEN BEACH, TOWN OF	10/1/1992	8	10	5

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CID	Community Name	Current Effective Date	Current Class	Credit for SFHA	Credit for Non-SFHA
370133	HYDE COUNTY	10/1/1992	9	5	5
370178	JACKSONVILLE, CITY OF	10/1/2005	8	10	5
375353	KILL DEVIL HILLS, TOWN OF	10/1/2001	7	15	5
370145	KINSTON, CITY OF	5/1/2006	5	25	10
370439	KITTY HAWK, TOWN OF	10/1/2002	6	20	10
370144	LENOIR COUNTY	5/1/2006	7	15	5
370081	LEXINGTON, CITY OF	5/1/2008	7	15	5
375355	MANTEO, TOWN OF	5/1/2008	8	10	5
370158	MECKLENBURG COUNTY	5/1/2006	6	20	10
370418	MINNESOTT BEACH, TOWN OF	10/1/1992	9	5	5
370048	MOREHEAD CITY, TOWN OF	10/1/1993	8	10	5
375356	NAGS HEAD, TOWN OF	10/1/2001	6	20	10
370167	NASHVILLE, TOWN OF	5/1/2005	8	10	5
370168	NEW HANOVER COUNTY	5/1/2008	8	10	5
370049	NEWPORT, TOWN OF	10/1/2007	8	10	5
370466	NORTH TOPSAIL BEACH, TOWN OF	10/1/2002	7	15	5
370523	OAK ISLAND, TOWN OF	5/1/2008	8	10	5
375357	OCEAN ISLE BEACH, TOWN OF	5/1/2008	8	10	5
370279	ORIENTAL, TOWN OF	10/1/1997	9	5	5
370181	PAMLICO COUNTY	10/1/1997	9	5	5
370267	PINE KNOLL SHORES, TOWN OF	10/1/2002	7	15	5
370160	PINEVILLE, TOWN OF	5/1/2006	6	20	10
370372	PITT COUNTY	10/1/2004	8	10	5
370249	PLYMOUTH, TOWN OF	10/1/1999	8	10	5
370243	RALEIGH, CITY OF	10/1/2006	7	15	5
370432	RIVER BEND, TOWN OF	5/1/2010	8	10	5
370092	ROCKY MOUNT, CITY OF	5/1/2008	7	15	5
370421	ROPER, TOWN OF	10/1/1999	8	10	5
370430	SOUTHERN SHORES, TOWN OF	10/1/1996	6	20	10
370028	SOUTHPORT, CITY OF	10/1/2005	8	10	5
370437	STONEWALL, TOWN OF	10/1/1992	9	5	5
375359	SUNSET BEACH, TOWN OF	10/1/2000	8	10	5
370187	TOPSAIL BEACH, TOWN OF	10/1/2002	6	20	10
370438	VANDEMERE, TOWN OF	10/1/1992	9	5	5

SAFER DEVELOPMENT IN FLOODPRONE AREAS

CID	Community Name	Current Effective Date	Current Class	Credit for SFHA	Credit for Non-SFHA
370247	WASHINGTON COUNTY	10/1/1999	8	10	5
370268	WASHINGTON PARK, TOWN OF	10/1/2007	8	10	5
370017	WASHINGTON, CITY OF	10/1/2002	8	10	5
370251	WATAUGA COUNTY	10/1/1991	9	5	5
370254	WAYNE COUNTY	5/1/2003	7	15	5
370071	WHITEVILLE CITY OF	10/1/2005	8	10	5
370270	WILSON, CITY OF	10/1/2005	7	15	5
375360	WINSTON-SALEM, CITY OF	5/1/2008	8	10	5
375361	WRIGHTSVILLE BEACH, TOWN OF	5/1/2008	8	10	5

This table, and updated version thereof, can be viewed online at the following address:
<http://www.fema.gov/nfip/northcarolina.htm>.

APPENDIX D

North Carolina Model Flood Damage Prevention Ordinances

Coastal Regular Phase

Non-Coastal Regular Phase

FLOOD DAMAGE PREVENTION ORDINANCE

Coastal Regular Phase

ARTICLE 1. STATUTORY AUTHORIZATION, FINDINGS OF FACT, PURPOSE AND OBJECTIVES.

SECTION A. STATUTORY AUTHORIZATION.

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

County: The Legislature of the State of North Carolina has in Part 6, Article 21 of Chapter 143; Parts 3 and 4 of Article 18 of Chapter 153A; and Part 121, Article 6 of Chapter 153A of the North Carolina General Statutes, delegated to local governmental units the responsibility to adopt regulations designed to promote the public health, safety, and general welfare.

Therefore, the _____ (*governing body*) of _____ (*community*), North Carolina, does ordain as follows:

SECTION B. FINDINGS OF FACT.

- (1) The flood prone areas within the jurisdiction of _____ (*community*) are subject to periodic inundation which results in loss of life, property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures of flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety, and general welfare.
- (2) These flood losses are caused by the cumulative effect of obstructions in floodplains causing increases in flood heights and velocities and by the occupancy in flood prone areas of uses vulnerable to floods or other hazards.

SECTION C. STATEMENT OF PURPOSE.

It is the purpose of this ordinance to promote public health, safety, and general welfare and to minimize public and private losses due to flood conditions within flood prone areas by provisions designed to:

- (1) restrict or prohibit uses that are dangerous to health, safety, and property due to water or erosion hazards or that result in damaging increases in erosion, flood heights or velocities;
- (2) require that uses vulnerable to floods, including facilities that serve such uses, be protected against flood damage at the time of initial construction;

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- (3) control the alteration of natural floodplains, stream channels, and natural protective barriers, which are involved in the accommodation of flood waters;
- (4) control filling, grading, dredging, and all other development that may increase erosion or flood damage; and
- (5) prevent or regulate the construction of flood barriers that will unnaturally divert floodwaters or which may increase flood hazards to other lands.

SECTION D. OBJECTIVES.

The objectives of this ordinance are to:

- (1) protect human life, safety, and health;
- (2) minimize expenditure of public money for costly flood control projects;
- (3) minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- (4) minimize prolonged business losses and interruptions;
- (5) minimize damage to public facilities and utilities (i.e. water and gas mains, electric, telephone, cable and sewer lines, streets, and bridges) that are located in flood prone areas;
- (6) help maintain a stable tax base by providing for the sound use and development of flood prone areas; and
- (7) ensure that potential buyers are aware that property is in a Special Flood Hazard Area.

ARTICLE 2. DEFINITIONS.

Unless specifically defined below, words or phrases used in this ordinance shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application.

“Accessory Structure (Appurtenant Structure)” means a structure located on the same parcel of property as the principal structure and the use of which is incidental to the use of the principal structure. Garages, carports and storage sheds are common urban accessory structures. Pole barns, hay sheds and the like qualify as accessory structures on farms, and may or may not be located on the same parcel as the farm dwelling or shop building.

“Addition (to an existing building)” means an extension or increase in the floor area or height of a building or structure.

“Appeal” means a request for a review of the Floodplain Administrator's interpretation of any provision of this ordinance.

“Area of Shallow Flooding” means a designated Zone AO on a community's Flood Insurance Rate Map (FIRM) with base flood depths determined to be from one (1) to three (3) feet. These areas are located where a clearly defined channel does not exist, where the path of flooding is unpredictable and indeterminate, and where velocity flow may be evident.

“Area of Special Flood Hazard” see “Special Flood Hazard Area (SFHA)”.

“Basement” means any area of the building having its floor subgrade (below ground level) on all sides.

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“Base Flood” means the flood having a one (1) percent chance of being equaled or exceeded in any given year.

“Base Flood Elevation (BFE)” means a determination of the water surface elevations of the base flood as published in the Flood Insurance Study. When the BFE has not been provided in a “Special Flood Hazard Area”, it may be obtained from engineering studies available from a Federal, State, or other source using FEMA approved engineering methodologies. This elevation, when combined with the “Freeboard”, establishes the “Regulatory Flood Protection Elevation”.

“Breakaway Wall” means a wall that is not part of the structural support of the building and is intended through its design and construction to collapse under specific lateral loading forces without causing damage to the elevated portion of the building or the supporting foundation system.

“Building” see “Structure”.

“CAMA” – North Carolina’s Coastal Area Management Act. This act, along with the Dredge and Fill Law and the Federal Coastal Zone Management Act, is managed through North Carolina Department of Environment and Natural Resources’ (NCDENR’s) Division of Coastal Management (DCM).

“CBRS” means Coastal Barrier Resources System.

“Chemical Storage Facility” means a building, portion of a building, or exterior area adjacent to a building used for the storage of any chemical or chemically reactive products.

“Coastal Barrier Resources System (CBRS)” consists of undeveloped portions of coastal and adjoining areas established by the Coastal Barrier Resources Act (CoBRA) of 1982, the Coastal Barrier Improvement Act (CBIA) of 1990, and subsequent revisions, and includes areas owned by Federal or State governments or private conservation organizations identified as Otherwise Protected Areas (OPA).

“Coastal High Hazard Area” means a Special Flood Hazard Area extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources. The area is designated on a FIRM, or other adopted flood map as determined in Article 3, Section B of this ordinance, as Zone VE.

“Development” means any man-made change to improved or unimproved real estate, including, but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, or storage of equipment or materials.

“Disposal” means, as defined in NCGS 130A-290(a)(6), the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste into or on any land or water so that the solid waste or any constituent part of the solid waste may enter the environment or be emitted into the air or discharged into any waters, including groundwaters.

“Elevated Building” means a non-basement building which has its lowest elevated floor raised above ground level by foundation walls, shear walls, posts, piers, pilings, or columns.

“Encroachment” means the advance or infringement of uses, fill, excavation, buildings, structures or development into a floodplain, which may impede or alter the flow capacity of a floodplain.

“Existing Manufactured Home Park or Manufactured Home Subdivision” means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) was completed before the initial effective date of the floodplain management regulations adopted by the community.

SAFER DEVELOPMENT IN FLOODPRONE AREAS

“Flood” or “Flooding” means a general and temporary condition of partial or complete inundation of normally dry land areas from:

- (1) the overflow of inland or tidal waters; and/or
- (2) the unusual and rapid accumulation of runoff of surface waters from any source.

“Flood Insurance” means the insurance coverage provided under the National Flood Insurance Program.

“Flood Insurance Rate Map (FIRM)” means an official map of a community, issued by the Federal Emergency Management Agency, on which both the Special Flood Hazard Areas and the risk premium zones applicable to the community are delineated.

“Flood Insurance Study (FIS)” means an examination, evaluation, and determination of flood hazards, corresponding water surface elevations (if appropriate), flood hazard risk zones, and other flood data in a community issued by the Federal Emergency Management Agency. The Flood Insurance Study report includes Flood Insurance Rate Maps (FIRMs).

“Flood Prone Area” see “Floodplain”

“Floodplain” means any land area susceptible to being inundated by water from any source.

“Floodplain Administrator” is the individual appointed to administer and enforce the floodplain management regulations.

“Floodplain Development Permit” means any type of permit that is required in conformance with the provisions of this ordinance, prior to the commencement of any development activity.

“Floodplain Management” means the operation of an overall program of corrective and preventive measures for reducing flood damage and preserving and enhancing, where possible, natural resources in the floodplain, including, but not limited to, emergency preparedness plans, flood control works, floodplain management regulations, and open space plans.

“Floodplain Management Regulations” means this ordinance and other zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances, and other applications of police power. This term describes Federal, State or local regulations, in any combination thereof, which provide standards for preventing and reducing flood loss and damage.

“Floodproofing” means any combination of structural and nonstructural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitation facilities, structures, and their contents.

“Floodway” means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one (1) foot.

“Flood Zone” means a geographical area shown on a Flood Hazard Boundary Map or Flood Insurance Rate Map that reflects the severity or type of flooding in the area.

“Freeboard” means the height added to the Base Flood Elevation (BFE) to account for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, blockage of bridge openings, and the hydrological effect of urbanization of the watershed. The Base Flood Elevation plus the freeboard establishes the “Regulatory Flood Protection Elevation”.

“Functionally Dependent Facility” means a facility which cannot be used for its intended purpose unless it is located in close proximity to water, limited to a docking or port facility necessary for the loading and unloading of cargo or

SAFER DEVELOPMENT IN FLOODPRONE AREAS

passengers, shipbuilding, or ship repair. The term does not include long-term storage, manufacture, sales, or service facilities.

“Hazardous Waste Management Facility” means, as defined in NCGS 130, Article 9, a facility for the collection, storage, processing, treatment, recycling, recovery, or disposal of hazardous waste.

“Highest Adjacent Grade (HAG)” means the highest natural elevation of the ground surface, prior to construction, immediately next to the proposed walls of the structure.

“Historic Structure” means any structure that is:

- (a) listed individually in the National Register of Historic Places (a listing maintained by the US Department of Interior) or preliminarily determined by the Secretary of Interior as meeting the requirements for individual listing on the National Register;
- (b) certified or preliminarily determined by the Secretary of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;
- (c) individually listed on a local inventory of historic landmarks in communities with a “Certified Local Government (CLG) Program”; or
- (d) certified as contributing to the historical significance of a historic district designated by a community with a “Certified Local Government (CLG) Program”.

Certified Local Government (CLG) Programs are approved by the US Department of the Interior in cooperation with the North Carolina Department of Cultural Resources through the State Historic Preservation Officer as having met the requirements of the National Historic Preservation Act of 1966 as amended in 1980.

“Lowest Adjacent Grade (LAG)” means the elevation of the ground, sidewalk or patio slab immediately next to the building, or deck support, after completion of the building.

“Lowest Floor” means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access, or limited storage in an area other than a basement area is not considered a building's lowest floor, provided that such an enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of this ordinance.

“Manufactured Home” means a structure, transportable in one or more sections, which is built on a permanent chassis and designed to be used with or without a permanent foundation when connected to the required utilities. The term “manufactured home” does not include a “recreational vehicle”.

“Manufactured Home Park or Subdivision” means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

“Market Value” means the building value, not including the land value and that of any accessory structures or other improvements on the lot. Market value may be established by independent certified appraisal: replacement cost depreciated for age of building and quality of construction (Actual Cash Value): or adjusted tax assessed values.

“Mean Sea Level” means, for purposes of this ordinance, the National Geodetic Vertical Datum (NGVD) as corrected in 1929, the North American Vertical Datum (NAVD) as corrected in 1988, or other vertical control datum used as a reference for establishing varying elevations within the floodplain, to which Base Flood Elevations (BFEs) shown on a FIRM are referenced. Refer to each FIRM panel to determine datum used.

SAFER DEVELOPMENT IN FLOODPRONE AREAS

“New Construction” means structures for which the “start of construction” commenced on or after the effective date of the initial floodplain management regulations and includes any subsequent improvements to such structures.

“Non-Encroachment Area” means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one (1) foot as designated in the Flood Insurance Study report.

“OPA” means an Otherwise Protected Area.

“Post-FIRM” means construction or other development for which the “start of construction” occurred on or after the effective date of the initial Flood Insurance Rate Map.

“Pre-FIRM” means construction or other development for which the “start of construction” occurred before the effective date of the initial Flood Insurance Rate Map.

“Primary Frontal Dune” means a continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward and adjacent to the beach and subject to erosion and overtopping from high tides and waves during major coastal storms. The inland limit of the primary frontal dune occurs at the point where there is a distinct change from a relatively steep slope to a relatively mild slope.

“Principally Above Ground” means that at least 51% of the actual cash value of the structure is above ground.

“Public Safety” and/or “Nuisance” means anything which is injurious to the safety or health of an entire community or neighborhood, or any considerable number of persons, or unlawfully obstructs the free passage or use, in the customary manner, of any navigable lake, or river, bay, stream, canal, or basin.

“Recreational Vehicle (RV)” means a vehicle, which is:

- (a) built on a single chassis;
- (b) 400 square feet or less when measured at the largest horizontal projection;
- (c) designed to be self-propelled or permanently towable by a light duty truck; and
- (d) designed primarily not for use as a permanent dwelling, but as temporary living quarters for recreational, camping, travel, or seasonal use.

“Reference Level” is the top of the lowest floor for structures within Special Flood Hazard Areas designated as Zone A1-30, AE, A, A99 or AO. The reference level is the bottom of the lowest horizontal structural member of the lowest floor for structures within Special Flood Hazard Areas designated as zone VE.

(Alternative acceptable language for Reference Level) “Reference Level” is the bottom of the lowest horizontal structural member of the lowest floor for structures within all Special Flood Hazard Areas.

“Regulatory Flood Protection Elevation” means the “Base Flood Elevation” plus the “Freeboard”. In “Special Flood Hazard Areas” where Base Flood Elevations (BFEs) have been determined, this elevation shall be the BFE *plus* _____ () *feet of freeboard*. In “Special Flood Hazard Areas” where no BFE has been established, this elevation shall be at least _____ () feet above the highest adjacent grade. *(Two (2) feet is a State-recommended minimum, greater than two (2) feet is OPTIONAL.)*

“Remedy a Violation” means to bring the structure or other development into compliance with State and community floodplain management regulations, or, if this is not possible, to reduce the impacts of its noncompliance. Ways that impacts may be reduced include protecting the structure or other affected development from flood damages, implementing the enforcement provisions of the ordinance or otherwise deterring future similar violations, or reducing Federal financial exposure with regard to the structure or other development.

“Riverine” means relating to, formed by, or resembling a river (including tributaries), stream, brook, etc.

SAFER DEVELOPMENT IN FLOODPRONE AREAS

“Salvage Yard” means any non-residential property used for the storage, collection, and/or recycling of any type of equipment, and including but not limited to vehicles, appliances and related machinery.

“Sand Dunes” means naturally occurring accumulations of sand in ridges or mounds landward of the beach.

“Shear Wall” means walls used for structural support but not structurally joined or enclosed at the end (except by breakaway walls). Shear walls are parallel or nearly parallel to the flow of the water.

“Solid Waste Disposal Facility” means any facility involved in the disposal of solid waste as defined in NCGS 130A-290(a)(35).

“Solid Waste Disposal Site” means, as defined in NCGS 130A-290(a)(36), any place at which solid wastes are disposed of by incineration, sanitary landfill, or any other method.

“Special Flood Hazard Area (SFHA)” means the land in the floodplain subject to a one percent (1%) or greater chance of being flooded in any given year, as determined in Article 3, Section B of this ordinance.

“Start of Construction” includes substantial improvement, and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition placement, or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading, and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of the building, whether or not that alteration affects the external dimensions of the building.

“Structure” means a walled and roofed building, a manufactured home, or a gas, liquid, or liquefied gas storage tank that is principally above ground.

“Substantial Damage” means damage of any origin sustained by a structure during any one-year period whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. See definition of “substantial improvement”. *Substantial damage also means flood-related damage sustained by a structure on two separate occasions during a 10-year period for which the cost of repairs at the time of each such flood event, on the average, equals or exceeds 25 percent of the market value of the structure before the damage occurred. (The last sentence is **OPTIONAL** but required for eligibility for Increased Cost of Compliance (ICC) benefits for repetitive losses.)*

“Substantial Improvement” means any combination of repairs, reconstruction, rehabilitation, addition, or other improvement of a structure, taking place during any one-year period for which the cost equals or exceeds 50 percent of the market value of the structure before the “start of construction” of the improvement. This term includes structures which have incurred “substantial damage”, regardless of the actual repair work performed. The term does not, however, include either:

- (a) any correction of existing violations of State or community health, sanitary, or safety code specifications which have been identified by the community code enforcement official and which are the minimum necessary to assure safe living conditions; or
- (b) any alteration of a historic structure, provided that the alteration will not preclude the structure's continued designation as a historic structure.

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“Variance” is a grant of relief from the requirements of this ordinance.

“Violation” means the failure of a structure or other development to be fully compliant with the community's floodplain management regulations. A structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in Articles 4 and 5 is presumed to be in violation until such time as that documentation is provided.

“Water Surface Elevation (WSE)” means the height, in relation to mean sea level of floods of various magnitudes and frequencies in the floodplains of coastal or riverine areas.

“Watercourse” means a lake, river, creek, stream, wash, channel or other topographic feature on or over which waters flow at least periodically. Watercourse includes specifically designated areas in which substantial flood damage may occur.

ARTICLE 3. GENERAL PROVISIONS.

SECTION A. LANDS TO WHICH THIS ORDINANCE APPLIES.

This ordinance shall apply to all Special Flood Hazard Areas within the jurisdiction, including Extra-Territorial Jurisdictions (ETJs) if applicable, of _____ (*community*) and within the jurisdiction of any other community whose governing body agrees, by resolution, to such applicability.

SECTION B. BASIS FOR ESTABLISHING THE SPECIAL FLOOD HAZARD AREAS.

The Special Flood Hazard Areas are those identified under the Cooperating Technical State (CTS) agreement between the State of North Carolina and FEMA in its Flood Insurance Study (FIS) and its accompanying Flood Insurance Rate Maps (FIRM), for _____ (*county*) dated _____, which are adopted by reference and declared to be a part of this ordinance. (*NOTE - If your community is adopting maps which precede the Cooperating Technical State agreement, or has never been mapped, please see the instructions for guidance in revising this Section.*)

The initial Flood Insurance Rate Maps are as follows for the jurisdictional areas at the initial date:
_____ County Unincorporated Area, dated _____ (*Initial date*)

For county ordinances which may be adopted by reference by municipalities within the county, also list each municipality and its initial FIRM date. See FIS-Map History, Community Status Book, or municipal FIRM for initial FIRM date.

*Special Flood Hazard Areas also include those identified by _____ (*county/municipality*) in its _____, dated _____, which with accompanying data are adopted by reference and declared to be part of this ordinance. (OPTIONAL – If adopting additional Special Flood Hazard Area, list the names and dates of all referenced engineering studies and maps.)*

SECTION C. ESTABLISHMENT OF FLOODPLAIN DEVELOPMENT PERMIT.

A Floodplain Development Permit shall be required in conformance with the provisions of this ordinance prior to the commencement of any development activities within Special Flood Hazard Areas determined in accordance with the provisions of Article 3, Section B of this ordinance.

SECTION D. COMPLIANCE.

No structure or land shall hereafter be located, extended, converted, altered, or developed in any way without full compliance with the terms of this ordinance and other applicable regulations.

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SECTION E. ABROGATION AND GREATER RESTRICTIONS.

This ordinance is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this ordinance and another conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

SECTION F. INTERPRETATION.

In the interpretation and application of this ordinance, all provisions shall be:

- (a) considered as minimum requirements;
- (b) liberally construed in favor of the governing body; and
- (c) deemed neither to limit nor repeal any other powers granted under State statutes.

SECTION G. WARNING AND DISCLAIMER OF LIABILITY.

The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering consideration. Larger floods can and will occur. Actual flood heights may be increased by man-made or natural causes. This ordinance does not imply that land outside the Special Flood Hazard Areas or uses permitted within such areas will be free from flooding or flood damages. This ordinance shall not create liability on the part of _____ (*community*) or by any officer or employee thereof for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made hereunder.

SECTION H. PENALTIES FOR VIOLATION.

Violation of the provisions of this ordinance or failure to comply with any of its requirements, including violation of conditions and safeguards established in connection with grants of variance or special exceptions, shall constitute a misdemeanor. Any person who violates this ordinance or fails to comply with any of its requirements shall, upon conviction thereof, be fined not more than \$50.00 or imprisoned for not more than thirty (30) days, or both. Each day such violation continues shall be considered a separate offense. Nothing herein contained shall prevent _____ (*community*) from taking such other lawful action as is necessary to prevent or remedy any violation.

ARTICLE 4. ADMINISTRATION.

SECTION A. DESIGNATION OF FLOODPLAIN ADMINISTRATOR.

The _____, hereinafter referred to as the "Floodplain Administrator", is hereby appointed to administer and implement the provisions of this ordinance.

SECTION B. FLOODPLAIN DEVELOPMENT APPLICATION, PERMIT AND CERTIFICATION REQUIREMENTS.

- (1) **Application Requirements.** Application for a Floodplain Development Permit shall be made to the Floodplain Administrator prior to any development activities located within Special Flood Hazard Areas. The following items shall be presented to the Floodplain Administrator to apply for a floodplain development permit:
 - (a) A plot plan drawn to scale which shall include, but shall not be limited to, the following specific details of the proposed floodplain development:

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- i). the nature, location, dimensions, and elevations of the area of development/disturbance; existing and proposed structures, utility systems, grading/pavement areas, fill materials, storage areas, drainage facilities, and other development;
 - ii). the boundary of the Special Flood Hazard Area as delineated on the FIRM or other flood map as determined in Article 3, Section B, or a statement that the entire lot is within the Special Flood Hazard Area;
 - iii). flood zone(s) designation of the proposed development area as determined on the FIRM or other flood map as determined in Article 3, Section B;
 - iv). the boundary of the floodway(s) or non-encroachment area(s) as determined in Article 3, Section B;
 - v). the Base Flood Elevation (BFE) where provided as set forth in Article 3, Section B; Article 4, Section C; or Article 5, Section D;
 - vi). the old and new location of any watercourse that will be altered or relocated as a result of proposed development;
 - vii). the boundary and designation date of the Coastal Barrier Resource System (CBRS) area or Otherwise Protected Areas (OPA), if applicable; and
 - viii). *the certification of the plot plan by a registered land surveyor or professional engineer.*
(OPTIONAL)
- (b) Proposed elevation, and method thereof, of all development within a Special Flood Hazard Area including but not limited to:
- i). Elevation in relation to mean sea level of the proposed reference level (including basement) of all structures;
 - ii). Elevation in relation to mean sea level to which any non-residential structure in Zone AE, A or AO will be flood-proofed; and
 - iii). Elevation in relation to mean sea level to which any proposed utility systems will be elevated or floodproofed;
- (c) If floodproofing, a Floodproofing Certificate (FEMA Form 81-65) with supporting data and an operational plan that includes, but is not limited to, installation, exercise, and maintenance of floodproofing measures.
- (d) A Foundation Plan, drawn to scale, which shall include details of the proposed foundation system to ensure all provisions of this ordinance are met. These details include but are not limited to:
- i). The proposed method of elevation, if applicable (i.e., fill, solid foundation perimeter wall, solid backfilled foundation, open foundation on columns/posts/piers/piles/shear walls);
 - ii). Openings to facilitate automatic equalization of hydrostatic flood forces on walls in accordance with Article 5, Section B(4)(c) when solid foundation perimeter walls are used in Zones A, AO, AE, and A1-30;

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- iii). The following, in Coastal High Hazard Areas, in accordance with the provisions of Article 5, Section B(4)(d) and Article 5, Section G:
 - 1) V-Zone Certification with accompanying plans and specifications verifying the engineered structure and any breakaway wall designs;
 - 2) Plans for open wood latticework or insect screening, if applicable; and
 - 3) Plans for non-structural fill, if applicable. If non-structural fill is proposed, it must be demonstrated through coastal engineering analysis that the proposed fill would not result in any increase in the Base Flood Elevation or otherwise cause adverse impacts by wave ramping and deflection on to the subject structure or adjacent properties.
 - (e) Usage details of any enclosed areas below the lowest floor.
 - (f) Plans and/or details for the protection of public utilities and facilities such as sewer, gas, electrical, and water systems to be located and constructed to minimize flood damage;
 - (g) Certification that all other Local, State and Federal permits required prior to floodplain development permit issuance have been received.
 - (h) Documentation for placement of Recreational Vehicles and/or Temporary Structures, when applicable, to ensure that the provisions of Article 5, Section B (6 & 7) of this ordinance are met.
 - (i) A description of proposed watercourse alteration or relocation, when applicable, including an engineering report on the effects of the proposed project on the flood-carrying capacity of the watercourse and the effects to properties located both upstream and downstream; and a map (if not shown on plot plan) showing the location of the proposed watercourse alteration or relocation.
- (2) **Permit Requirements.** The Floodplain Development Permit shall include, but not be limited to:
- (a) A description of the development to be permitted under the floodplain development permit.
 - (b) The Special Flood Hazard Area determination for the proposed development in accordance with the available data specified in Article 3, Section B.
 - (c) The regulatory flood protection elevation required for the reference level and all attendant utilities.
 - (d) The regulatory flood protection elevation required for the protection of all public utilities.
 - (e) All certification submittal requirements with timelines.
 - (f) A statement that no fill material or other development shall encroach into the floodway or non-encroachment area of any watercourse, as applicable.
 - (g) The flood openings requirements, if in Zones A, AO, AE or A1-30.
 - (h) *Limitations of use of the enclosures below the lowest floor (if applicable). (i.e., parking, building access and limited storage only).* **(OPTIONAL)**

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- (i) *A statement, if in Zone VE, that there shall be no alteration of sand dunes which would increase potential flood damage. (OPTIONAL)*
- (j) *A statement, if in Zone VE, that there shall be no fill used for structural support. (OPTIONAL)*

(3) **Certification Requirements.**

(a) Elevation Certificates

- i). *An Elevation Certificate (FEMA Form 81-31) is required prior to the actual start of any new construction. It shall be the duty of the permit holder to submit to the Floodplain Administrator a certification of the elevation of the reference level, in relation to mean sea level. The Floodplain Administrator shall review the certificate data submitted. Deficiencies detected by such review shall be corrected by the permit holder prior to the beginning of construction. Failure to submit the certification or failure to make required corrections shall be cause to deny a floodplain development permit. (STATE RECOMMENDED BUT OPTIONAL)*
- ii). *An Elevation Certificate (FEMA Form 81-31) is required after the reference level is established. Within seven (7) calendar days of establishment of the reference level elevation, it shall be the duty of the permit holder to submit to the Floodplain Administrator a certification of the elevation of the reference level, in relation to mean sea level. Any work done within the seven (7) day calendar period and prior to submission of the certification shall be at the permit holder's risk. The Floodplain Administrator shall review the certificate data submitted. Deficiencies detected by such review shall be corrected by the permit holder immediately and prior to further work being permitted to proceed. Failure to submit the certification or failure to make required corrections shall be cause to issue a stop-work order for the project. (STATE RECOMMENDED BUT OPTIONAL)*
- iii). *A final as-built Elevation Certificate (FEMA Form 81-31) is required after construction is completed and prior to Certificate of Compliance/Occupancy issuance. It shall be the duty of the permit holder to submit to the Floodplain Administrator a certification of final as-built construction of the elevation of the reference level and all attendant utilities. The Floodplain Administrator shall review the certificate data submitted. Deficiencies detected by such review shall be corrected by the permit holder immediately and prior to Certificate of Compliance/Occupancy issuance. In some instances, another certification may be required to certify corrected as-built construction. Failure to submit the certification or failure to make required corrections shall be cause to withhold the issuance of a Certificate of Compliance/Occupancy. (THE FEMA ELEVATION CERTIFICATE IS OPTIONAL FOR FLOODPLAIN MANAGEMENT ELEVATION DATA, BUT RECOMMENDED. THE USE OF THE FEMA ELEVATION CERTIFICATE IS REQUIRED FOR THE PURCHASE OF FLOOD INSURANCE, AND MANDATORY FOR CRS PARTICIPATION)*

(b) Floodproofing Certificate

If non-residential floodproofing is used to meet the regulatory flood protection elevation requirements, a Floodproofing Certificate (FEMA Form 81-65), with supporting data, an operational plan, and an inspection and maintenance plan are required prior to the actual start of any new construction. It shall be the duty of the permit holder to submit to the Floodplain Administrator a certification of the floodproofed design elevation of the reference level and all attendant utilities, in relation to mean sea level. Floodproofing certification shall be prepared by or under the direct supervision of a professional engineer or architect and certified by same. The Floodplain Administrator shall review the certificate data, the operational plan, and the inspection and maintenance plan. Deficiencies detected by such review shall be corrected by the applicant prior to permit approval. Failure to submit the certification or failure to make required corrections shall be cause to deny a floodplain development permit. Failure

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to construct in accordance with the certified design shall be cause to withhold the issuance of a Certificate of Compliance/Occupancy.

- (c) If a manufactured home is placed within Zone A, AO, AE, or A1-30 and the elevation of the chassis is more than 36 inches in height above grade, an engineered foundation certification is required in accordance with the provisions of Article 5, Section B(3)(b).
- (d) If a watercourse is to be altered or relocated, a description of the extent of watercourse alteration or relocation; a professional engineer's certified report on the effects of the proposed project on the flood-carrying capacity of the watercourse and the effects to properties located both upstream and downstream; and a map showing the location of the proposed watercourse alteration or relocation shall all be submitted by the permit applicant prior to issuance of a floodplain development permit.
- (e) Certification Exemptions. The following structures, if located within Zone A, AO, AE or A1-30, are exempt from the elevation/floodproofing certification requirements specified in items (a) and (b) of this subsection:
 - i). Recreational Vehicles meeting requirements of Article 5, Section B(6)(a);
 - ii). Temporary Structures meeting requirements of Article 5, Section B(7); and
 - iii). Accessory Structures less than 150 square feet meeting requirements of Article 5, Section B(8).
- (f) A V-Zone Certification with accompanying design plans and specifications is required prior to issuance of a Floodplain Development permit within coastal high hazard areas. It shall be the duty of the permit applicant to submit to the Floodplain Administrator said certification to ensure the design standards of this ordinance are met. A registered professional engineer or architect shall develop or review the structural design, plans, and specifications for construction and certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of this ordinance. This certification is not a substitute for an Elevation Certificate.

SECTION C. DUTIES AND RESPONSIBILITIES OF THE FLOODPLAIN ADMINISTRATOR.

The Floodplain Administrator shall perform, but not be limited to, the following duties:

- (1) Review all floodplain development applications and issue permits for all proposed development within Special Flood Hazard Areas to assure that the requirements of this ordinance have been satisfied.
- (2) Review all proposed development within Special Flood Hazard Areas to assure that all necessary Local, State and Federal permits have been received.

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- (3) Notify adjacent communities and the North Carolina Department of Crime Control and Public Safety, Division of Emergency Management, State Coordinator for the National Flood Insurance Program prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Emergency Management Agency (FEMA).
- (4) Assure that maintenance is provided within the altered or relocated portion of said watercourse so that the flood-carrying capacity is maintained.
- (5) Prevent encroachments into floodways and non-encroachment areas unless the certification and flood hazard reduction provisions of Article 5, Section F are met.
- (6) Obtain actual elevation (in relation to mean sea level) of the reference level (including basement) and all attendant utilities of all new and substantially improved structures, in accordance with Article 4, Section B(3).
- (7) Obtain actual elevation (in relation to mean sea level) to which all new and substantially improved structures and utilities have been floodproofed, in accordance with the provisions of Article 4, Section B(3).
- (8) Obtain actual elevation (in relation to mean sea level) of all public utilities in accordance with the provisions of Article 4, Section B(3).
- (9) When floodproofing is utilized for a particular structure, obtain certifications from a registered professional engineer or architect in accordance with the provisions of Article 4, Section B(3) and Article 5, Section B(2).
- (10) Where interpretation is needed as to the exact location of boundaries of the Special Flood Hazard Areas, floodways, or non-encroachment areas (for example, where there appears to be a conflict between a mapped boundary and actual field conditions), make the necessary interpretation. The person contesting the location of the boundary shall be given a reasonable opportunity to appeal the interpretation as provided in this article.
- (11) When Base Flood Elevation (BFE) data has not been provided in accordance with Article 3, Section B, obtain, review, and reasonably utilize any Base Flood Elevation (BFE) data, along with floodway data or non-encroachment area data available from a Federal, State, or other source, including data developed pursuant to Article 5, Section D(2)(b), in order to administer the provisions of this ordinance.
- (12) When Base Flood Elevation (BFE) data is provided but no floodway or non-encroachment area data has been provided in accordance with Article 3, Section B, obtain, review, and reasonably utilize any floodway data or non-encroachment area data available from a Federal, State, or other source in order to administer the provisions of this ordinance.
- (13) When the lowest floor and the lowest adjacent grade of a structure or the lowest ground elevation of a parcel in a Special Flood Hazard Area is above the Base Flood Elevation, advise the property owner of the option to apply for a Letter of Map Amendment (LOMA) from FEMA. Maintain a copy of the Letter of Map Amendment (LOMA) issued by FEMA in the floodplain development permit file. (OPTIONAL)
- (14) Permanently maintain all records that pertain to the administration of this ordinance and make these records available for public inspection, recognizing that such information may be subject to the Privacy Act of 1974, as amended.
- (15) Make on-site inspections of work in progress. As the work pursuant to a floodplain development permit progresses, the floodplain administrator shall make as many inspections of the work as may be necessary to ensure that the work is being done according to the provisions of the local ordinance and the terms of the permit. In exercising this power, the floodplain administrator has a right, upon presentation of proper credentials, to enter on any premises within the jurisdiction of the community at any reasonable hour for the purposes of inspection or other enforcement action.

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- (16) Issue stop-work orders as required. Whenever a building or part thereof is being constructed, reconstructed, altered, or repaired in violation of this ordinance, the Floodplain Administrator may order the work to be immediately stopped. The stop-work order shall be in writing and directed to the person doing or in charge of the work. The stop-work order shall state the specific work to be stopped, the specific reason(s) for the stoppage, and the condition(s) under which the work may be resumed. Violation of a stop-work order constitutes a misdemeanor.
- (17) Revoke floodplain development permits as required. The Floodplain Administrator may revoke and require the return of the floodplain development permit by notifying the permit holder in writing stating the reason(s) for the revocation. Permits shall be revoked for any substantial departure from the approved application, plans, and specifications; for refusal or failure to comply with the requirements of State or local laws; or for false statements or misrepresentations made in securing the permit. Any floodplain development permit mistakenly issued in violation of an applicable State or local law may also be revoked.
- (18) Make periodic inspections throughout the special flood hazard areas within the jurisdiction of the community. The Floodplain Administrator and each member of his or her inspections department shall have a right, upon presentation of proper credentials, to enter on any premises within the territorial jurisdiction of the department at any reasonable hour for the purposes of inspection or other enforcement action.
- (19) Follow through with corrective procedures of Article 4, Section D.
- (20) Review, provide input, and make recommendations for variance requests.
- (21) Maintain a current map repository to include, but not limited to, the FIS Report, FIRM and other official flood maps and studies adopted in accordance with Article 3, Section B of this ordinance, including any revisions thereto including Letters of Map Change, issued by FEMA. Notify State and FEMA of mapping needs.
- (22) Coordinate revisions to FIS reports and FIRMs, including Letters of Map Revision Based on Fill (LOMR-F) and Letters of Map Revision (LOMR).

SECTION D. CORRECTIVE PROCEDURES.

- (1) Violations to be Corrected: When the Floodplain Administrator finds violations of applicable State and local laws, it shall be his or her duty to notify the owner or occupant of the building of the violation. The owner or occupant shall immediately remedy each of the violations of law cited in such notification.
- (2) Actions in Event of Failure to Take Corrective Action: If the owner of a building or property shall fail to take prompt corrective action, the Floodplain Administrator shall give the owner written notice, by certified or registered mail to the owner's last known address or by personal service, stating:
 - (a) that the building or property is in violation of the floodplain management regulations;
 - (b) that a hearing will be held before the floodplain administrator at a designated place and time, not later than ten (10) days after the date of the notice, at which time the owner shall be entitled to be heard in person or by counsel and to present arguments and evidence pertaining to the matter; and
 - (c) that following the hearing, the Floodplain Administrator may issue an order to alter, vacate, or demolish the building; or to remove fill as applicable.
- (3) Order to Take Corrective Action: If, upon a hearing held pursuant to the notice prescribed above, the Floodplain Administrator shall find that the building or development is in violation of the Flood Damage Prevention Ordinance, they shall issue an order in writing to the owner, requiring the owner to remedy the violation within a specified time period, not less than sixty (60) calendar days, nor more than (____) calendar days. (*One-hundred-eighty (180) calendar days or less is recommended*) Where the Floodplain Administrator finds that

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there is imminent danger to life or other property, they may order that corrective action be taken in such lesser period as may be feasible.

- (4) Appeal: Any owner who has received an order to take corrective action may appeal the order to the local elected governing body by giving notice of appeal in writing to the Floodplain Administrator and the clerk within ten (10) days following issuance of the final order. In the absence of an appeal, the order of the Floodplain Administrator shall be final. The local governing body shall hear an appeal within a reasonable time and may affirm, modify and affirm, or revoke the order.
- (5) Failure to Comply with Order: If the owner of a building or property fails to comply with an order to take corrective action for which no appeal has been made or fails to comply with an order of the governing body following an appeal, the owner shall be guilty of a misdemeanor and shall be punished at the discretion of the court.

SECTION E. VARIANCE PROCEDURES.

- (1) The _____ (*appeal board*) as established by _____ (community), hereinafter referred to as the “appeal board”, shall hear and decide requests for variances from the requirements of this ordinance.
- (2) Any person aggrieved by the decision of the appeal board may appeal such decision to the Court, as provided in Chapter 7A of the North Carolina General Statutes.
- (3) Variances may be issued for:
 - (a) the repair or rehabilitation of historic structures upon the determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and that the variance is the minimum necessary to preserve the historic character and design of the structure.
 - (b) functionally dependent facilities if determined to meet the definition as stated in Article 2 of this ordinance, provided provisions of Article 4, Section E(9)(b), (c), and (e) have been satisfied, and such facilities are protected by methods that minimize flood damages during the base flood and create no additional threats to public safety.
 - (c) any other type of development, provided it meets the requirements of this Section.
- (4) In passing upon variances, the appeal board shall consider all technical evaluations, all relevant factors, all standards specified in other sections of this ordinance, and:
 - (a) the danger that materials may be swept onto other lands to the injury of others;
 - (b) the danger to life and property due to flooding or erosion damage;
 - (c) the susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;
 - (d) the importance of the services provided by the proposed facility to the community;
 - (e) the necessity to the facility of a waterfront location as defined under Article 2 of this ordinance as a functionally dependent facility, where applicable;
 - (f) the availability of alternative locations, not subject to flooding or erosion damage, for the proposed use;

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- (g) the compatibility of the proposed use with existing and anticipated development;
 - (h) the relationship of the proposed use to the comprehensive plan and floodplain management program for that area;
 - (i) the safety of access to the property in times of flood for ordinary and emergency vehicles;
 - (j) the expected heights, velocity, duration, rate of rise, and sediment transport of the floodwaters and the effects of wave action, if applicable, expected at the site; and
 - (k) the costs of providing governmental services during and after flood conditions including maintenance and repair of public utilities and facilities such as sewer, gas, electrical and water systems, and streets and bridges.
- (5) A written report addressing each of the above factors shall be submitted with the application for a variance.
- (6) Upon consideration of the factors listed above and the purposes of this ordinance, the appeal board may attach such conditions to the granting of variances as it deems necessary to further the purposes and objectives of this ordinance.
- (7) Any applicant to whom a variance is granted shall be given written notice specifying the difference between the Base Flood Elevation (BFE) and the elevation to which the structure is to be built and that such construction below the Base Flood Elevation increases risks to life and property, and that the issuance of a variance to construct a structure below the Base Flood Elevation will result in increased premium rates for flood insurance up to \$25 per \$100 of insurance coverage. Such notification shall be maintained with a record of all variance actions, including justification for their issuance.
- (8) The Floodplain Administrator shall maintain the records of all appeal actions and report any variances to the Federal Emergency Management Agency and the State of North Carolina upon request.
- (9) Conditions for Variances:
- (a) Variances shall not be issued when the variance will make the structure in violation of other Federal, State, or local laws, regulations, or ordinances.
 - (b) Variances shall not be issued within any designated floodway or non-encroachment area if the variance would result in any increase in flood levels during the base flood discharge.
 - (c) Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.
 - (d) Variances shall only be issued prior to development permit approval.
 - (e) Variances shall only be issued upon:
 - i). a showing of good and sufficient cause;
 - ii). a determination that failure to grant the variance would result in exceptional hardship; and
 - iii). a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, or extraordinary public expense, create nuisance, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances.

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- (10) A variance may be issued for solid waste disposal facilities, hazardous waste management facilities, salvage yards, and chemical storage facilities that are located in Special Flood Hazard Areas provided that all of the following conditions are met.
- (a) The use serves a critical need in the community.
 - (b) No feasible location exists for the use outside the Special Flood Hazard Area.
 - (c) The reference level of any structure is elevated or floodproofed to at least the regulatory flood protection elevation.
 - (d) The use complies with all other applicable Federal, State and local laws.
 - (e) The _____ (*community*) has notified the Secretary of the North Carolina Department of Crime Control and Public Safety of its intention to grant a variance at least thirty (30) calendar days prior to granting the variance.

ARTICLE 5. PROVISIONS FOR FLOOD HAZARD REDUCTION.

SECTION A. GENERAL STANDARDS.

In all Special Flood Hazard Areas the following provisions are required:

- (1) All new construction and substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse, and lateral movement of the structure.
- (2) All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.
- (3) All new construction and substantial improvements shall be constructed by methods and practices that minimize flood damages.
- (4) Electrical, heating, ventilation, plumbing, air conditioning equipment, and other service facilities shall be designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding to the Regulatory Flood Protection Elevation. These include, but are not limited to, HVAC equipment, water softener units, bath/kitchen fixtures, ductwork, electric/gas meter panels/boxes, utility/cable boxes, hot water heaters, and electric outlets/switches.
- (5) All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of floodwaters into the system.
- (6) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into the systems and discharges from the systems into flood waters.
- (7) On-site waste disposal systems shall be located and constructed to avoid impairment to them or contamination from them during flooding.
- (8) Any alteration, repair, reconstruction, or improvements to a structure, which is in compliance with the provisions of this ordinance, shall meet the requirements of “new construction” as contained in this ordinance.
- (9) Nothing in this ordinance shall prevent the repair, reconstruction, or replacement of a building or structure existing on the effective date of this ordinance and located totally or partially within the floodway, non-encroachment area, or stream setback, provided there is no additional encroachment below the regulatory flood

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protection elevation in the floodway, non-encroachment area, or stream setback, and provided that such repair, reconstruction, or replacement meets all of the other requirements of this ordinance.

- (10) New solid waste disposal facilities and sites, hazardous waste management facilities, salvage yards, and chemical storage facilities shall not be permitted, except by variance as specified in Article 4, Section E(10). A structure or tank for chemical or fuel storage incidental to an allowed use or to the operation of a water treatment plant or wastewater treatment facility may be located in a Special Flood Hazard Area only if the structure or tank is either elevated or floodproofed to at least the regulatory flood protection elevation and certified in accordance with the provisions of Article 4, Section B(3).
- (11) All subdivision proposals and other development proposals shall be consistent with the need to minimize flood damage.
- (12) All subdivision proposals and other development proposals shall have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize flood damage.
- (13) All subdivision proposals and other development proposals shall have adequate drainage provided to reduce exposure to flood hazards.
- (14) All subdivision proposals and other development proposals shall have received all necessary permits from those governmental agencies for which approval is required by Federal or State law, including Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334.
- (15) When a structure is partially located in a special flood hazard area, the entire structure shall meet the requirements for new construction and substantial improvements.
- (16) When a structure is located in multiple flood hazard zones or in a flood hazard risk zone with multiple base flood elevations, the provisions for the more restrictive flood hazard risk zone and the highest base flood elevation shall apply.

SECTION B. SPECIFIC STANDARDS.

In all Special Flood Hazard Areas where Base Flood Elevation (BFE) data has been provided, as set forth in Article 3, Section B, or Article 5, Section D, the following provisions, in addition to the provisions of Article 5, Section A, are required:

- (1) Residential Construction. New construction and substantial improvement of any residential structure (including manufactured homes) shall have the reference level, including basement, elevated no lower than the regulatory flood protection elevation, as defined in Article 2 of this ordinance.
- (2) Non-Residential Construction. New construction and substantial improvement of any commercial, industrial, or other non-residential structure shall have the reference level, including basement, elevated no lower than the regulatory flood protection elevation, as defined in Article 2 of this ordinance. Structures located in A, AE, AO, and A1-30 Zones may be floodproofed to the regulatory flood protection elevation in lieu of elevation provided that all areas of the structure, together with attendant utility and sanitary facilities, below the regulatory flood protection elevation are watertight with walls substantially impermeable to the passage of water, using structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effect of buoyancy. For AO Zones, the floodproofing elevation shall be in accordance with Article 5, Section H(2). A registered professional engineer or architect shall certify that the standards of this subsection are satisfied. Such certification shall be provided to the Floodplain Administrator as set forth in Article 4, Section B(3), along with the operational and maintenance plans.
- (3) Manufactured Homes.

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- (a) New and replacement manufactured homes shall be elevated so that the reference level of the manufactured home is no lower than the regulatory flood protection elevation, as defined in Article 2 of this ordinance.
 - (b) Manufactured homes shall be securely anchored to an adequately anchored foundation to resist flotation, collapse, and lateral movement, either by certified engineered foundation system, or in accordance with the most current edition of the State of North Carolina Regulations for Manufactured Homes, adopted by the Commissioner of Insurance pursuant to NCGS 143-143.15. Additionally, when the elevation would be met by an elevation of the chassis thirty-six (36) inches or less above the grade at the site, the chassis shall be supported by reinforced piers or engineered foundation. When the elevation of the chassis is above thirty-six (36) inches in height, an engineering certification is required.
 - (c) All enclosures or skirting below the lowest floor shall meet the requirements of Article 5, Section B(4)
 - (d) An evacuation plan must be developed for evacuation of all residents of all new, substantially improved or substantially damaged manufactured home parks or subdivisions located within flood prone areas. This plan shall be filed with and approved by the Floodplain Administrator and the local Emergency Management coordinator.
- (4) Elevated Buildings. Fully enclosed areas of new construction and substantially improved structures, which are below the lowest floor:
- (a) shall not be designed or used for human habitation, but shall only be used for parking of vehicles, building access, or limited storage of maintenance equipment used in connection with the premises. Access to the enclosed area shall be the minimum necessary to allow for parking of vehicles (garage door) or limited storage of maintenance equipment (standard exterior door), or entry to the living area (stairway or elevator). The interior portion of such enclosed area shall not be finished or partitioned into separate rooms, except to enclose storage areas;
 - (b) shall be constructed entirely of flood resistant materials, at least to the regulatory flood protection elevation;
 - (c) shall include, in Zones A, AO, AE, and A1-30, flood openings to automatically equalize hydrostatic flood forces on walls by allowing for the entry and exit of floodwaters. To meet this requirement, the openings must either be certified by a professional engineer or architect or meet or exceed the following minimum design criteria:
 - i). A minimum of two flood openings on different sides of each enclosed area subject to flooding;

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- ii). The total net area of all flood openings must be at least one (1) square inch for each square foot of enclosed area subject to flooding;
 - iii). If a building has more than one enclosed area, each enclosed area must have flood openings to allow floodwaters to automatically enter and exit;
 - iv). The bottom of all required flood openings shall be no higher than one (1) foot above the adjacent grade;
 - v). Flood openings may be equipped with screens, louvers, or other coverings or devices, provided they permit the automatic flow of floodwaters in both directions; and
 - vi). Enclosures made of flexible skirting are not considered enclosures for regulatory purposes, and, therefore, do not require flood openings. Masonry or wood underpinning, regardless of structural status, is considered an enclosure and requires flood openings as outlined above.
- (d) shall, in Coastal High Hazard Areas (Zone VE), either be free of obstruction or constructed with breakaway walls, open wood latticework or insect screening, provided they are not part of the structural support of the building and are designed so as to breakaway, under abnormally high tides or wave action without causing damage to the elevated portion of the building or supporting foundation system or otherwise jeopardizing the structural integrity of the building. The following design specifications shall be met:
- i). Material shall consist of open wood latticework or insect screening; or
 - ii). Breakaway walls shall meet the following design specifications:
 - 1) Design safe loading resistance shall be not less than 10 nor more than 20 pounds per square foot; or
 - 2) Breakaway walls that exceed a design safe loading resistance of 20 pounds per square foot (either by design or when so required by State or local codes) shall be certified by a registered professional engineer or architect that the breakaway wall will collapse from a water load less than that which would occur during the base flood event, and the elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects of wind and water loads acting simultaneously on all building components (structural and non-structural). The water loading values used shall be those associated with the base flood. The wind loading values used shall be those required by the North Carolina State Building Code.

(5) Additions/Improvements.

- (a) Additions and/or improvements to pre-FIRM structures when the addition and/or improvements in combination with any interior modifications to the existing structure are:
 - i). not a substantial improvement, the addition and/or improvements must be designed to minimize flood damages and must not be any more non-conforming than the existing structure.
 - ii). a substantial improvement, both the existing structure and the addition and/or improvements must comply with the standards for new construction.
- (b) Additions to post-FIRM structures with no modifications to the existing structure other than a standard door in the common wall shall require only the addition to comply with the standards for new construction.

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- (c) Additions and/or improvements to post-FIRM structures when the addition and/or improvements in combination with any interior modifications to the existing structure are:
 - i). not a substantial improvement, the addition and/or improvements only must comply with the standards for new construction.
 - ii). a substantial improvement, both the existing structure and the addition and/or improvements must comply with the standards for new construction.
- (6) Recreational Vehicles. Recreational vehicles shall either:
 - (a) be on site for fewer than 180 consecutive days and be fully licensed and ready for highway use (a recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities, and has no permanently attached additions); or
 - (b) meet all the requirements for new construction.
- (7) Temporary Non-Residential Structures. Prior to the issuance of a floodplain development permit for a temporary structure, the applicant must submit to the Floodplain Administrator a plan for the removal of such structure(s) in the event of a hurricane, flash flood or other type of flood warning notification. The following information shall be submitted in writing to the Floodplain Administrator for review and written approval:
 - (a) a specified time period for which the temporary use will be permitted. Time specified should not exceed three (3) months, renewable up to one (1) year;
 - (b) the name, address, and phone number of the individual responsible for the removal of the temporary structure;
 - (c) the time frame prior to the event at which a structure will be removed (i.e., minimum of seventy-two (72) hours before landfall of a hurricane or immediately upon flood warning notification);
 - (d) a copy of the contract or other suitable instrument with the entity responsible for physical removal of the structure; and
 - (e) designation, accompanied by documentation, of a location outside the Special Flood Hazard Area, to which the temporary structure will be moved.
- (8) Accessory Structures. When accessory structures (sheds, detached garages, etc.) are to be placed within a Special Flood Hazard Area, the following criteria shall be met:

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- (a) Accessory structures shall not be used for human habitation (including working, sleeping, living, cooking or restroom areas);
- (b) Accessory structures shall not be temperature-controlled;
- (c) Accessory structures shall be designed to have low flood damage potential;
- (d) Accessory structures shall be constructed and placed on the building site so as to offer the minimum resistance to the flow of floodwaters;
- (e) Accessory structures shall be firmly anchored in accordance with the provisions of Article 5, Section A(1);
- (f) All service facilities such as electrical shall be installed in accordance with the provisions of Article 5, Section A(4); and
- (g) Flood openings to facilitate automatic equalization of hydrostatic flood forces shall be provided below regulatory flood protection elevation in conformance with the provisions of Article 5, Section B(4)(c).

An accessory structure with a footprint less than 150 square feet that satisfies the criteria outlined above does not require an elevation or floodproofing certificate. Elevation or floodproofing certifications are required for all other accessory structures in accordance with Article 4, Section B(3).

SECTION C. RESERVED.

SECTION D. STANDARDS FOR FLOODPLAINS WITHOUT ESTABLISHED BASE FLOOD ELEVATIONS.

Within the Special Flood Hazard Areas designated as Approximate Zone A and established in Article 3, Section B, where no Base Flood Elevation (BFE) data is available, the following provisions, in addition to the provisions of Article 5, Section A, shall apply:

- (1) No encroachments, including fill, new construction, substantial improvements or new development shall be permitted within a distance of twenty (20) feet each side from top of bank or five times the width of the stream, whichever is greater, unless certification with supporting technical data by a registered professional engineer is provided demonstrating that such encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.
- (2) The BFE used in determining the regulatory flood protection elevation shall be determined based on the following criteria:

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- (a) When Base Flood Elevation (BFE) data is available from other sources, all new construction and substantial improvements within such areas shall also comply with all applicable provisions of this ordinance and shall be elevated or floodproofed in accordance with standards in Article 5, Sections A & B.
- (b) When floodway data is available from a Federal, State, or other source, all new construction and substantial improvements within floodway areas shall also comply with the requirements of Article 5, Sections B and F.
- (c) All subdivision, manufactured home park and other development proposals shall provide Base Flood Elevation (BFE) data if development is greater than five (5) acres or has more than fifty (50) lots/manufactured home sites. Such Base Flood Elevation (BFE) data shall be adopted by reference in accordance with Article 3, Section B and utilized in implementing this ordinance.
- (d) When Base Flood Elevation (BFE) data is not available from a Federal, State, or other source as outlined above, the reference level shall be elevated or floodproofed (nonresidential) to or above the Regulatory Flood Protection Elevation, as defined in Article 2. All other applicable provisions of Article 5, Section B shall also apply.

SECTION E. STANDARDS FOR RIVERINE FLOODPLAINS WITH BFE BUT WITHOUT ESTABLISHED FLOODWAYS OR NON-ENCROACHMENT AREAS.

Along rivers and streams where BFE data is provided by FEMA or is available from another source but neither floodway nor non-encroachment areas are identified for a Special Flood Hazard Area on the FIRM or in the FIS report, the following requirements shall apply to all development within such areas:

- (1) Standards of Article 5, Sections A and B; and
- (2) Until a regulatory floodway or non-encroachment area is designated, no encroachments, including fill, new construction, substantial improvements, or other development, shall be permitted unless certification with supporting technical data by a registered professional engineer is provided demonstrating that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

SECTION F. FLOODWAYS AND NON-ENCROACHMENT AREAS.

Areas designated as floodways or non-encroachment areas are located within the Special Flood Hazard Areas established in Article 3, Section B. The floodways and non-encroachment areas are extremely hazardous areas due to the velocity of floodwaters that have erosion potential and carry debris and potential projectiles. The following provisions, in addition to standards outlined in Article 5, Sections A and B, shall apply to all development within such areas:

- (1) No encroachments, including fill, new construction, substantial improvements and other developments shall be permitted unless:
 - (a) it is demonstrated that the proposed encroachment would not result in any increase in the flood levels during the occurrence of the base flood, based on hydrologic and hydraulic analyses performed in accordance with standard engineering practice and presented to the Floodplain Administrator prior to issuance of floodplain development permit, or
 - (b) a Conditional Letter of Map Revision (CLOMR) has been approved by FEMA. A Letter of Map Revision (LOMR) must also be obtained upon completion of the proposed encroachment.

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- (2) If Article 5, Section F(1) is satisfied, all development shall comply with all applicable flood hazard reduction provisions of this ordinance.
- (3) No manufactured homes shall be permitted, except replacement manufactured homes in an existing manufactured home park or subdivision, provided the following provisions are met:
 - (a) the anchoring and the elevation standards of Article 5, Section B(3); and
 - (b) the no encroachment standard of Article 5, Section F(1).

SECTION G. COASTAL HIGH HAZARD AREAS (ZONES VE).

Coastal High Hazard Areas are Special Flood Hazard Areas established in Article 3, Section B, and designated as Zones VE. These areas have special flood hazards associated with high velocity waters from storm surges or seismic activity and, therefore, all new construction and substantial improvements shall meet the following provisions in addition to the provisions of Article 5, Sections A and B:

- (1) All new construction and substantial improvements shall:
 - (a) be located landward of the reach of mean high tide;
 - (b) be located landward of the first line of stable natural vegetation; and
 - (c) comply with all applicable CAMA setback requirements.
- (2) All new construction and substantial improvements shall be elevated so that the bottom of the lowest horizontal structural member of the lowest floor (excluding pilings or columns) is no lower than the regulatory flood protection elevation. Floodproofing shall not be utilized on any structures in Coastal High Hazard Areas to satisfy the regulatory flood protection elevation requirements.
- (3) All new construction and substantial improvements shall have the space below the lowest floor free of obstruction so as not to impede the flow of flood waters, with the following exceptions:
 - (a) Open wood latticework or insect screening may be permitted below the lowest floor for aesthetic purposes only and must be designed to wash away in the event of abnormal wave action and in accordance with the provisions of Article 5, Section B(4)(d)(i). Design plans shall be submitted in accordance with the provisions of Article 4, Section B(1)(d)(iii)(2); or
 - (b) Breakaway walls may be permitted provided they meet the criteria set forth in Article 5, Section B(4)(b)&(d). Design plans shall be submitted in accordance with the provisions of Article 4, Section B(1)(d)(iii)(1).
- (4) All new construction and substantial improvements shall be securely anchored to pile or column foundations. All pilings and columns and the structure attached thereto shall be anchored to resist flotation, collapse, and lateral movement due to the effect of wind and water loads acting simultaneously on all building components.
 - (a) Water loading values used shall be those associated with the base flood.
 - (b) Wind loading values used shall be those required by the current edition of the North Carolina State Building Code.

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- (5) A registered professional engineer or architect shall certify that the design, specifications and plans for construction are in compliance with the provisions of Article 4, Section B, Article 5, Section G(3), (4), and (6) on the current version of the North Carolina V-Zone Certification form.
- (6) Fill shall not be used for structural support. Limited non-compacted and non-stabilized fill may be used outside the perimeter of a building provided it is demonstrated through coastal engineering analysis that the proposed fill would not result in any increase in the Base Flood Elevation and not cause any adverse impacts by wave ramping or deflection to the subject structure or adjacent properties.
- (7) There shall be no alteration of sand dunes which would increase potential flood damage.
- (8) No manufactured homes shall be permitted except in an existing manufactured home park or subdivision. A replacement manufactured home may be placed on a lot in an existing manufactured home park or subdivision provided the anchoring and elevation standards of this Section have been satisfied.
- (9) Recreational vehicles may be permitted in Coastal High Hazard Areas provided that they meet the Recreational Vehicle criteria of Article 5, Section B(6)(a).

SECTION H. STANDARDS FOR AREAS OF SHALLOW FLOODING (ZONE AO).

Located within the Special Flood Hazard Areas established in Article 3, Section B, are areas designated as shallow flooding areas. These areas have special flood hazards associated with base flood depths of one (1) to three (3) feet where a clearly defined channel does not exist and where the path of flooding is unpredictable and indeterminate. In addition to Article 5, Sections A and B, all new construction and substantial improvements shall meet the following requirements:

- (1) The reference level shall be elevated at least as high as the depth number specified on the Flood Insurance Rate Map (FIRM), in feet, plus a freeboard of ____ () feet, above the highest adjacent grade; or at least ____ () feet above the highest adjacent grade if no depth number is specified. *A minimum of four (4) feet is recommended where a depth is not provided.*
- (2) Non-residential structures may, in lieu of elevation, be floodproofed to the same level as required in Article 5, Section H(1) so that the structure, together with attendant utility and sanitary facilities, below that level shall be watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. Certification is required in accordance with Article 4, Section B(3) and Article 5, Section B(2).
- (3) Adequate drainage paths shall be provided around structures on slopes, to guide floodwaters around and away from proposed structures.

ARTICLE 6. LEGAL STATUS PROVISIONS.

SECTION A. EFFECT ON RIGHTS AND LIABILITIES UNDER THE EXISTING FLOOD DAMAGE PREVENTION ORDINANCE.

This ordinance in part comes forward by re-enactment of some of the provisions of the flood damage prevention ordinance enacted _____ (*adoption date of the community's initial flood damage prevention ordinance*) as amended, and it is not the intention to repeal but rather to re-enact and continue to enforce without interruption of such existing provisions, so that all rights and liabilities that have accrued thereunder are reserved and may be enforced. The enactment of this ordinance shall not affect any action, suit or proceeding instituted or pending. All provisions of the flood damage prevention ordinance of _____ (*community*) enacted on _____ (*adoption date of the community's initial flood damage prevention ordinance*), as amended, which are not reenacted herein are repealed.

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The date of the initial flood damage prevention ordinance for each municipal jurisdiction within _____ County is as follows:

List each municipality within the County with its initial ordinance date.

SECTION B. EFFECT UPON OUTSTANDING FLOODPLAIN DEVELOPMENT PERMITS.

Nothing herein contained shall require any change in the plans, construction, size, or designated use of any development or any part thereof for which a floodplain development permit has been granted by the Floodplain Administrator or his or her authorized agents before the time of passage of this ordinance; provided, however, that when construction is not begun under such outstanding permit within a period of six (6) months subsequent to the date of issuance of the outstanding permit, construction or use shall be in conformity with the provisions of this ordinance.

SECTION C. EFFECTIVE DATE.

This ordinance shall become effective _____ (*upon adoption or specific date*).

SECTION D. ADOPTION CERTIFICATION.

I hereby certify that this is a true and correct copy of the flood damage prevention ordinance as adopted by the _____ (*governing body*) of _____ (*community*), North Carolina, on the _____ day of _____, 200__.

WITNESS my hand and the official seal of _____, this the _____ day of _____, 200__.

(signature)

FLOOD DAMAGE PREVENTION ORDINANCE

Non-Coastal Regular Phase

ARTICLE 1. STATUTORY AUTHORIZATION, FINDINGS OF FACT, PURPOSE AND OBJECTIVES.

SECTION A. STATUTORY AUTHORIZATION.

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

County: The Legislature of the State of North Carolina has in Part 6, Article 21 of Chapter 143; Parts 3 and 4 of Article 18 of Chapter 153A; and Part 121, Article 6 of Chapter 153A of the North Carolina General Statutes, delegated to local governmental units the responsibility to adopt regulations designed to promote the public health, safety, and general welfare.

Therefore, the _____ (*governing body*) of _____ (*community*), North Carolina, does ordain as follows:

SECTION B. FINDINGS OF FACT.

- (1) The flood prone areas within the jurisdiction of _____ (*community*) are subject to periodic inundation which results in loss of life, property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures of flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety, and general welfare.
- (2) These flood losses are caused by the cumulative effect of obstructions in floodplains causing increases in flood heights and velocities and by the occupancy in flood prone areas of uses vulnerable to floods or other hazards.

SECTION C. STATEMENT OF PURPOSE.

It is the purpose of this ordinance to promote public health, safety, and general welfare and to minimize public and private losses due to flood conditions within flood prone areas by provisions designed to:

- (1) restrict or prohibit uses that are dangerous to health, safety, and property due to water or erosion hazards or that result in damaging increases in erosion, flood heights or velocities;
- (2) require that uses vulnerable to floods, including facilities that serve such uses, be protected against flood damage at the time of initial construction;
- (3) control the alteration of natural floodplains, stream channels, and natural protective barriers, which are involved in the accommodation of floodwaters;
- (4) control filling, grading, dredging, and all other development that may increase erosion or flood damage; and

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- (5) prevent or regulate the construction of flood barriers that will unnaturally divert flood waters or which may increase flood hazards to other lands.

SECTION D. OBJECTIVES.

The objectives of this ordinance are to:

- (1) protect human life, safety, and health;
- (2) minimize expenditure of public money for costly flood control projects;
- (3) minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- (4) minimize prolonged business losses and interruptions;
- (5) minimize damage to public facilities and utilities (i.e. water and gas mains, electric, telephone, cable and sewer lines, streets, and bridges) that are located in flood prone areas;
- (6) help maintain a stable tax base by providing for the sound use and development of flood prone areas; and
- (7) ensure that potential buyers are aware that property is in a Special Flood Hazard Area.

ARTICLE 2. DEFINITIONS.

Unless specifically defined below, words or phrases used in this ordinance shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application.

“Accessory Structure (Appurtenant Structure)” means a structure located on the same parcel of property as the principal structure and the use of which is incidental to the use of the principal structure. Garages, carports and storage sheds are common urban accessory structures. Pole barns, hay sheds and the like qualify as accessory structures on farms, and may or may not be located on the same parcel as the farm dwelling or shop building.

“Addition (to an existing building)” means an extension or increase in the floor area or height of a building or structure.

“Appeal” means a request for a review of the Floodplain Administrator's interpretation of any provision of this ordinance.

“Area of Shallow Flooding” means a designated Zone AO on a community's Flood Insurance Rate Map (FIRM) with base flood depths determined to be from one (1) to three (3) feet. These areas are located where a clearly defined channel does not exist, where the path of flooding is unpredictable and indeterminate, and where velocity flow may be evident.

“Area of Special Flood Hazard” see “Special Flood Hazard Area (SFHA)”.

“Base Flood” means the flood having a one (1) percent chance of being equaled or exceeded in any given year.

“Base Flood Elevation (BFE)” means a determination of the water surface elevations of the base flood as published in the Flood Insurance Study. When the BFE has not been provided in a “Special Flood Hazard Area”, it may be obtained from engineering studies available from a Federal, State, or other source using FEMA approved engineering methodologies. This elevation, when combined with the “Freeboard”, establishes the “Regulatory Flood Protection Elevation”.

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“Basement” means any area of the building having its floor subgrade (below ground level) on all sides.

“Building” see “Structure”.

“Chemical Storage Facility” means a building, portion of a building, or exterior area adjacent to a building used for the storage of any chemical or chemically reactive products.

“Development” means any man-made change to improved or unimproved real estate, including, but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, or storage of equipment or materials.

“Disposal” means, as defined in NCGS 130A-290(a)(6), the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste into or on any land or water so that the solid waste or any constituent part of the solid waste may enter the environment or be emitted into the air or discharged into any waters, including groundwaters.

“Elevated Building” means a non-basement building which has its lowest elevated floor raised above ground level by foundation walls, shear walls, posts, piers, pilings, or columns.

“Encroachment” means the advance or infringement of uses, fill, excavation, buildings, structures or development into a floodplain, which may impede or alter the flow capacity of a floodplain.

“Existing Manufactured Home Park or Manufactured Home Subdivision” means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) was completed before the initial effective date of the floodplain management regulations adopted by the community.

“Flood” or “Flooding” means a general and temporary condition of partial or complete inundation of normally dry land areas from:

- (1) the overflow of inland or tidal waters; and/or
- (2) the unusual and rapid accumulation or runoff of surface waters from any source.

“Flood Boundary and Floodway Map (FBFM)” means an official map of a community, issued by the Federal Emergency Management Agency, on which the Special Flood Hazard Areas and the floodways are delineated. This official map is a supplement to and shall be used in conjunction with the Flood Insurance Rate Map (FIRM).

“Flood Hazard Boundary Map (FHBM)” means an official map of a community, issued by the Federal Emergency Management Agency, where the boundaries of the Special Flood Hazard Areas have been defined as Zone A.

“Flood Insurance” means the insurance coverage provided under the National Flood Insurance Program.

“Flood Insurance Rate Map (FIRM)” means an official map of a community, issued by the Federal Emergency Management Agency, on which both the Special Flood Hazard Areas and the risk premium zones applicable to the community are delineated.

“Flood Insurance Study (FIS)” means an examination, evaluation, and determination of flood hazards, corresponding water surface elevations (if appropriate), flood hazard risk zones, and other flood data in a community issued by the Federal Emergency Management Agency. The Flood Insurance Study report includes Flood Insurance Rate Maps (FIRMs) and Flood Boundary and Floodway Maps (FBFMs), if published.

“Flood Prone Area” see “Floodplain”

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“Flood Zone” means a geographical area shown on a Flood Hazard Boundary Map or Flood Insurance Rate Map that reflects the severity or type of flooding in the area.

“Floodplain” means any land area susceptible to being inundated by water from any source.

“Floodplain Administrator” is the individual appointed to administer and enforce the floodplain management regulations.

“Floodplain Development Permit” means any type of permit that is required in conformance with the provisions of this ordinance, prior to the commencement of any development activity.

“Floodplain Management” means the operation of an overall program of corrective and preventive measures for reducing flood damage and preserving and enhancing, where possible, natural resources in the floodplain, including, but not limited to, emergency preparedness plans, flood control works, floodplain management regulations, and open space plans.

“Floodplain Management Regulations” means this ordinance and other zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances, and other applications of police power. This term describes Federal, State or local regulations, in any combination thereof, which provide standards for preventing and reducing flood loss and damage.

“Floodproofing” means any combination of structural and nonstructural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitation facilities, structures, and their contents.

“Floodway” means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one (1) foot.

“Freeboard” means the height added to the Base Flood Elevation (BFE) to account for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, blockage of bridge openings, and the hydrological effect of urbanization of the watershed. The Base Flood Elevation (BFE) plus the freeboard establishes the “Regulatory Flood Protection Elevation”.

“Functionally Dependent Facility” means a facility which cannot be used for its intended purpose unless it is located in close proximity to water, limited to a docking or port facility necessary for the loading and unloading of cargo or passengers, shipbuilding, or ship repair. The term does not include long-term storage, manufacture, sales, or service facilities.

“Hazardous Waste Management Facility” means, as defined in NCGS 130A, Article 9, a facility for the collection, storage, processing, treatment, recycling, recovery, or disposal of hazardous waste.

“Highest Adjacent Grade (HAG)” means the highest natural elevation of the ground surface, prior to construction, immediately next to the proposed walls of the structure.

“Historic Structure” means any structure that is:

- (a) listed individually in the National Register of Historic Places (a listing maintained by the US Department of Interior) or preliminarily determined by the Secretary of Interior as meeting the requirements for individual listing on the National Register;
- (b) certified or preliminarily determined by the Secretary of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;

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- (c) individually listed on a local inventory of historic landmarks in communities with a “Certified Local Government (CLG) Program”; or
- (d) certified as contributing to the historical significance of a historic district designated by a community with a “Certified Local Government (CLG) Program”.

Certified Local Government (CLG) Programs are approved by the US Department of the Interior in cooperation with the North Carolina Department of Cultural Resources through the State Historic Preservation Officer as having met the requirements of the National Historic Preservation Act of 1966 as amended in 1980.

“Lowest Adjacent Grade (LAG)” means the elevation of the ground, sidewalk or patio slab immediately next to the building, or deck support, after completion of the building.

“Lowest Floor” means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access, or limited storage in an area other than a basement area is not considered a building's lowest floor, provided that such an enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of this ordinance.

“Manufactured Home” means a structure, transportable in one or more sections, which is built on a permanent chassis and designed to be used with or without a permanent foundation when connected to the required utilities. The term “manufactured home” does not include a “recreational vehicle”.

“Manufactured Home Park or Subdivision” means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

“Market Value” means the building value, not including the land value and that of any accessory structures or other improvements on the lot. Market value may be established by independent certified appraisal; replacement cost depreciated for age of building and quality of construction (Actual Cash Value); or adjusted tax assessed values.

“Mean Sea Level” means, for purposes of this ordinance, the National Geodetic Vertical Datum (NGVD) as corrected in 1929, the North American Vertical Datum (NAVD) as corrected in 1988, or other vertical control datum used as a reference for establishing varying elevations within the floodplain, to which Base Flood Elevations (BFEs) shown on a FIRM are referenced. Refer to each FIRM panel to determine datum used.

“New Construction” means structures for which the “start of construction” commenced on or after the effective date of the initial floodplain management regulations and includes any subsequent improvements to such structures.

“Non-Encroachment Area” means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one (1) foot as designated in the Flood Insurance Study report.

“Post-FIRM” means construction or other development for which the “start of construction” occurred on or after the effective date of the initial Flood Insurance Rate Map.

“Pre-FIRM” means construction or other development for which the “start of construction” occurred before the effective date of the initial Flood Insurance Rate Map.

“Principally Above Ground” means that at least 51% of the actual cash value of the structure is above ground.

“Public Safety” and/or “Nuisance” means anything which is injurious to the safety or health of an entire community or neighborhood, or any considerable number of persons, or unlawfully obstructs the free passage or use, in the customary manner, of any navigable lake, or river, bay, stream, canal, or basin.

“Recreational Vehicle (RV)” means a vehicle, which is:

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- (a) built on a single chassis;
- (b) 400 square feet or less when measured at the largest horizontal projection;
- (c) designed to be self-propelled or permanently towable by a light duty truck; and
- (d) designed primarily not for use as a permanent dwelling, but as temporary living quarters for recreational, camping, travel, or seasonal use.

“Reference Level” is the top of the lowest floor for structures within Special Flood Hazard Areas designated as Zone A1-A30, AE, A, A99 or AO.

“Regulatory Flood Protection Elevation” means the “Base Flood Elevation” plus the “Freeboard”. In “Special Flood Hazard Areas” where Base Flood Elevations (BFEs) have been determined, this elevation shall be the BFE *plus* ____ () *feet of freeboard*. In “Special Flood Hazard Areas” where no BFE has been established, this elevation shall be at least () feet above the highest adjacent grade. (*Two (2) feet is a State-recommended minimum, greater than two (2) feet is OPTIONAL.*)

“Remedy a Violation” means to bring the structure or other development into compliance with State and community floodplain management regulations, or, if this is not possible, to reduce the impacts of its noncompliance. Ways that impacts may be reduced include protecting the structure or other affected development from flood damages, implementing the enforcement provisions of the ordinance or otherwise deterring future similar violations, or reducing Federal financial exposure with regard to the structure or other development.

“Riverine” means relating to, formed by, or resembling a river (including tributaries), stream, brook, etc.

“Salvage Yard” means any non-residential property used for the storage, collection, and/or recycling of any type of equipment, and including but not limited to vehicles, appliances and related machinery.

“Solid Waste Disposal Facility” means any facility involved in the disposal of solid waste, as defined in NCGS 130A-290(a)(35).

“Solid Waste Disposal Site” means, as defined in NCGS 130A-290(a)(36), any place at which solid wastes are disposed of by incineration, sanitary landfill, or any other method.

“Special Flood Hazard Area (SFHA)” means the land in the floodplain subject to a one percent (1%) or greater chance of being flooded in any given year, as determined in Article 3, Section B of this ordinance.

“Start of Construction” includes substantial improvement, and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition placement, or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading, and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of the building, whether or not that alteration affects the external dimensions of the building.

“Structure” means a walled and roofed building, a manufactured home, or a gas, liquid, or liquefied gas storage tank that is principally above ground.

“Substantial Damage” means damage of any origin sustained by a structure during any one-year period whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. See definition of “substantial improvement”. *Substantial damage also means flood-related damage sustained by a structure on two separate occasions during a 10-year period for which*

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*the cost of repairs at the time of each such flood event, on the average, equals or exceeds 25 percent of the market value of the structure before the damage occurred. (The last sentence is **OPTIONAL** but required for eligibility for Increased Cost of Compliance (ICC) benefits for repetitive losses.)*

“**Substantial Improvement**” means any combination of repairs, reconstruction, rehabilitation, addition, or other improvement of a structure, taking place during any one-year period for which the cost equals or exceeds 50 percent of the market value of the structure before the “start of construction” of the improvement. This term includes structures which have incurred “substantial damage”, regardless of the actual repair work performed. The term does not, however, include either:

- (a) any correction of existing violations of State or community health, sanitary, or safety code specifications which have been identified by the community code enforcement official and which are the minimum necessary to assure safe living conditions; or
- (b) any alteration of a historic structure, provided that the alteration will not preclude the structure's continued designation as a historic structure.

“**Variance**” is a grant of relief from the requirements of this ordinance.

“**Violation**” means the failure of a structure or other development to be fully compliant with the community's floodplain management regulations. A structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in Articles 4 and 5 is presumed to be in violation until such time as that documentation is provided.

“**Water Surface Elevation (WSE)**” means the height, in relation to mean sea level, of floods of various magnitudes and frequencies in the floodplains of riverine areas.

“**Watercourse**” means a lake, river, creek, stream, wash, channel or other topographic feature on or over which waters flow at least periodically. Watercourse includes specifically designated areas in which substantial flood damage may occur.

ARTICLE 3. GENERAL PROVISIONS.

SECTION A. LANDS TO WHICH THIS ORDINANCE APPLIES.

This ordinance shall apply to all Special Flood Hazard Areas within the jurisdiction, *including Extra-Territorial Jurisdictions (ETJs)*, of _____ (*community*) and within the jurisdiction of any other community whose governing body agrees, by resolution, to such applicability.

SECTION B. BASIS FOR ESTABLISHING THE SPECIAL FLOOD HAZARD AREAS.

The Special Flood Hazard Areas are those identified under the Cooperating Technical State (CTS) agreement between the State of North Carolina and FEMA in its Flood Insurance Study (FIS) and its accompanying Flood Insurance Rate Maps (FIRM), for _____ (*county*) dated _____, which are adopted by reference and declared to be a part of this ordinance. (*NOTE - If your community is adopting maps which precede the Cooperating Technical State agreement, or has never been mapped, please see the instructions for guidance in revising this Section.*)

For county ordinances, also list each municipality in the county and that community's initial FIRM date. See FIS-Map History, Community Status Book, or municipal FIRM for initial FIRM date.

The initial Flood Insurance Rate Maps are as follows for the jurisdictional areas at the initial date:

_____ County Unincorporated Area, dated _____ (*Initial FIRM date*)
_____ (Municipal jurisdiction name), dated _____ (*Initial FIRM date*)

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(etc., list each municipality and provide its initial FIRM date)

For municipal ordinances, also list the County's name and its initial FIRM date. See FIS-Map History, Community Status Book, or municipal FIRM for initial FIRM date. (as noted immediately above in directions for Counties)

Special Flood Hazard Areas also include those identified by _____ (county/municipality) in its _____, dated _____, which with accompanying data are adopted by reference and declared to be part of this ordinance. (OPTIONAL – If adopting additional Special Flood Hazard Area, list the names and dates of all referenced engineering studies and maps.)

(The following paragraph only applies to municipalities adopting non-countywide maps. Any community adopting maps produced under the Cooperating Technical State agreement should delete this paragraph.)

Municipality: In addition, upon annexation to _____ (municipality) or inclusion in the Extra-Territorial Jurisdiction (ETJ), the Special Flood Hazard Areas identified by the Federal Emergency Management Agency (FEMA) and/or produced under the Cooperating Technical State agreement between the State of North Carolina and FEMA as stated above, for the Unincorporated Areas of _____ County, with accompanying maps and other supporting data are adopted by reference and declared to be a part of this ordinance.

SECTION C. ESTABLISHMENT OF FLOODPLAIN DEVELOPMENT PERMIT.

A Floodplain Development Permit shall be required in conformance with the provisions of this ordinance prior to the commencement of any development activities within Special Flood Hazard Areas determined in accordance with the provisions of Article 3, Section B of this ordinance.

SECTION D. COMPLIANCE.

No structure or land shall hereafter be located, extended, converted, altered, or developed in any way without full compliance with the terms of this ordinance and other applicable regulations.

SECTION E. ABROGATION AND GREATER RESTRICTIONS.

This ordinance is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this ordinance and another conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

SECTION F. INTERPRETATION.

In the interpretation and application of this ordinance, all provisions shall be:

- (a) considered as minimum requirements;
- (b) liberally construed in favor of the governing body; and
- (c) deemed neither to limit nor repeal any other powers granted under State statutes.

SECTION G. WARNING AND DISCLAIMER OF LIABILITY.

The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering consideration. Larger floods can and will occur. Actual flood heights may be increased by man-made or natural causes. This ordinance does not imply that land outside the Special Flood Hazard Areas or uses permitted within such areas will be free from flooding or flood damages. This ordinance shall not create liability on the part of _____ (community) or by any officer or employee thereof for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made hereunder.

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SECTION H. PENALTIES FOR VIOLATION.

Violation of the provisions of this ordinance or failure to comply with any of its requirements, including violation of conditions and safeguards established in connection with grants of variance or special exceptions, shall constitute a misdemeanor. Any person who violates this ordinance or fails to comply with any of its requirements shall, upon conviction thereof, be fined not more than \$50.00 or imprisoned for not more than thirty (30) days, or both. Each day such violation continues shall be considered a separate offense. Nothing herein contained shall prevent _____ (community) from taking such other lawful action as is necessary to prevent or remedy any violation.

ARTICLE 4. ADMINISTRATION.

SECTION A. DESIGNATION OF FLOODPLAIN ADMINISTRATOR.

The _____, hereinafter referred to as the "Floodplain Administrator", is hereby appointed to administer and implement the provisions of this ordinance.

SECTION B. FLOODPLAIN DEVELOPMENT APPLICATION, PERMIT AND CERTIFICATION REQUIREMENTS.

- (1) **Application Requirements.** Application for a Floodplain Development Permit shall be made to the Floodplain Administrator prior to any development activities located within Special Flood Hazard Areas. The following items shall be presented to the Floodplain Administrator to apply for a floodplain development permit:
 - (a) A plot plan drawn to scale which shall include, but shall not be limited to, the following specific details of the proposed floodplain development:
 - (i) the nature, location, dimensions, and elevations of the area of development/disturbance; existing and proposed structures, utility systems, grading/pavement areas, fill materials, storage areas, drainage facilities, and other development;
 - (ii) the boundary of the Special Flood Hazard Area as delineated on the FIRM or other flood map as determined in Article 3, Section B, or a statement that the entire lot is within the Special Flood Hazard Area;
 - (iii) flood zone(s) designation of the proposed development area as determined on the FIRM or other flood map as determined in Article 3, Section B;
 - (iv) the boundary of the floodway(s) or non-encroachment area(s) as determined in Article 3, Section B;
 - (v) the Base Flood Elevation (BFE) where provided as set forth in Article 3, Section B; Article 4, Section C; or Article 5, Section D;
 - (vi) the old and new location of any watercourse that will be altered or relocated as a result of proposed development; and
 - (vii) *the certification of the plot plan by a registered land surveyor or professional engineer.*
(OPTIONAL)

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- (b) Proposed elevation, and method thereof, of all development within a Special Flood Hazard Area including but not limited to:
 - (i) Elevation in relation to mean sea level of the proposed reference level (including basement) of all structures;
 - (ii) Elevation in relation to mean sea level to which any non-residential structure in Zone AE, A or AO will be floodproofed; and
 - (iii) Elevation in relation to mean sea level to which any proposed utility systems will be elevated or floodproofed.
 - (c) If floodproofing, a Floodproofing Certificate (FEMA Form 81-65) with supporting data, an operational plan, and an inspection and maintenance plan that include, but are not limited to, installation, exercise, and maintenance of floodproofing measures.
 - (d) A Foundation Plan, drawn to scale, which shall include details of the proposed foundation system to ensure all provisions of this ordinance are met. These details include but are not limited to:
 - (i) The proposed method of elevation, if applicable (i.e., fill, solid foundation perimeter wall, solid backfilled foundation, open foundation on columns/posts/piers/piles/shear walls); and
 - (ii) Openings to facilitate automatic equalization of hydrostatic flood forces on walls in accordance with Article 5, Section B(4)(c) when solid foundation perimeter walls are used in Zones A, AO, AE, and A1-30.
 - (e) Usage details of any enclosed areas below the lowest floor.
 - (f) Plans and/or details for the protection of public utilities and facilities such as sewer, gas, electrical, and water systems to be located and constructed to minimize flood damage.
 - (g) Certification that all other Local, State and Federal permits required prior to floodplain development permit issuance have been received.
 - (h) Documentation for placement of Recreational Vehicles and/or Temporary Structures, when applicable, to ensure that the provisions of Article 5, Section B, subsections (6) and (7) of this ordinance are met.
 - (i) A description of proposed watercourse alteration or relocation, when applicable, including an engineering report on the effects of the proposed project on the flood-carrying capacity of the watercourse and the effects to properties located both upstream and downstream; and a map (if not shown on plot plan) showing the location of the proposed watercourse alteration or relocation.
- (2) **Permit Requirements.** The Floodplain Development Permit shall include, but not be limited to:
- (a) A description of the development to be permitted under the floodplain development permit.
 - (b) The Special Flood Hazard Area determination for the proposed development in accordance with available data specified in Article 3, Section B.
 - (c) The Regulatory Flood Protection Elevation required for the reference level and all attendant utilities.
 - (d) The Regulatory Flood Protection Elevation required for the protection of all public utilities.

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- (e) All certification submittal requirements with timelines.
- (f) A statement that no fill material or other development shall encroach into the floodway or non-encroachment area of any watercourse, as applicable.
- (g) The flood openings requirements, if in Zones A, AO, AE or A1-30.
- (h) *Limitations of below BFE enclosure uses (if applicable). (I.e., parking, building access and limited storage only). (OPTIONAL)*

(3) Certification Requirements.

(a) Elevation Certificates

- (i) *An Elevation Certificate (FEMA Form 81-31) is required prior to the actual start of any new construction. It shall be the duty of the permit holder to submit to the Floodplain Administrator a certification of the elevation of the reference level, in relation to mean sea level. The Floodplain Administrator shall review the certificate data submitted. Deficiencies detected by such review shall be corrected by the permit holder prior to the beginning of construction. Failure to submit the certification or failure to make required corrections shall be cause to deny a floodplain development permit. (STATE RECOMMENDED BUT OPTIONAL)*
- (ii) *An Elevation Certificate (FEMA Form 81-31) is required after the reference level is established. Within seven (7) calendar days of establishment of the reference level elevation, it shall be the duty of the permit holder to submit to the Floodplain Administrator a certification of the elevation of the reference level, in relation to mean sea level. Any work done within the seven (7) day calendar period and prior to submission of the certification shall be at the permit holder's risk. The Floodplain Administrator shall review the certificate data submitted. Deficiencies detected by such review shall be corrected by the permit holder immediately and prior to further work being permitted to proceed. Failure to submit the certification or failure to make required corrections shall be cause to issue a stop-work order for the project. (STATE RECOMMENDED BUT OPTIONAL)*
- (iii) A final as-built Elevation Certificate (FEMA Form 81-31) is required after construction is completed and prior to Certificate of Compliance/Occupancy issuance. It shall be the duty of the permit holder to submit to the Floodplain Administrator a certification of final as-built construction of the elevation of the reference level and all attendant utilities. The Floodplain Administrator shall review the certificate data submitted. Deficiencies detected by such review shall be corrected by the permit holder immediately and prior to Certificate of Compliance/Occupancy issuance. In some instances, another certification may be required to certify corrected as-built construction. Failure to submit the certification or failure to make required corrections shall be cause to withhold the issuance of a Certificate of Compliance/Occupancy. **(THE FEMA ELEVATION CERTIFICATE IS OPTIONAL FOR FLOODPLAIN MANAGEMENT ELEVATION DATA, BUT RECOMMENDED. THE USE OF THE FEMA ELEVATION CERTIFICATE IS REQUIRED FOR THE PURCHASE OF FLOOD INSURANCE, AND MANDATORY FOR CRS PARTICIPATION.)**

(b) Floodproofing Certificate

If non-residential floodproofing is used to meet the Regulatory Flood Protection Elevation requirements, a Floodproofing Certificate (FEMA Form 81-65), with supporting data, an operational plan, and an inspection and maintenance plan are required prior to the actual start of any new construction. It shall be the duty of the permit holder to submit to the Floodplain Administrator a certification of the floodproofed design elevation of the reference level and all attendant utilities, in

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relation to mean sea level. Floodproofing certification shall be prepared by or under the direct supervision of a professional engineer or architect and certified by same. The Floodplain Administrator shall review the certificate data, the operational plan, and the inspection and maintenance plan. Deficiencies detected by such review shall be corrected by the applicant prior to permit approval. Failure to submit the certification or failure to make required corrections shall be cause to deny a Floodplain Development Permit. Failure to construct in accordance with the certified design shall be cause to withhold the issuance of a Certificate of Compliance/Occupancy.

- (c) If a manufactured home is placed within Zone A, AO, AE, or A1-30 and the elevation of the chassis is more than 36 inches in height above grade, an engineered foundation certification is required in accordance with the provisions of Article 5, Section B(3)(b).
- (d) If a watercourse is to be altered or relocated, a description of the extent of watercourse alteration or relocation; a professional engineer's certified report on the effects of the proposed project on the flood-carrying capacity of the watercourse and the effects to properties located both upstream and downstream; and a map showing the location of the proposed watercourse alteration or relocation shall all be submitted by the permit applicant prior to issuance of a floodplain development permit.
- (e) Certification Exemptions. The following structures, if located within Zone A, AO, AE or A1-30, are exempt from the elevation/floodproofing certification requirements specified in items (a) and (b) of this subsection:
 - (i) Recreational Vehicles meeting requirements of Article 5, Section B(6)(a);
 - (ii) Temporary Structures meeting requirements of Article 5, Section B(7); and
 - (iii) Accessory Structures less than 150 square feet meeting requirements of Article 5, Section B(8).

SECTION C. DUTIES AND RESPONSIBILITIES OF THE FLOODPLAIN ADMINISTRATOR.

The Floodplain Administrator shall perform, but not be limited to, the following duties:

- (1) Review all floodplain development applications and issue permits for all proposed development within Special Flood Hazard Areas to assure that the requirements of this ordinance have been satisfied.
- (2) Review all proposed development within Special Flood Hazard Areas to assure that all necessary Local, State and Federal permits have been received.
- (3) Notify adjacent communities and the North Carolina Department of Crime Control and Public Safety, Division of Emergency Management, State Coordinator for the National Flood Insurance Program prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Emergency Management Agency (FEMA).
- (4) Assure that maintenance is provided within the altered or relocated portion of said watercourse so that the flood-carrying capacity is maintained.
- (5) Prevent encroachments into floodways and non-encroachment areas unless the certification and flood hazard reduction provisions of Article 5, Section F are met.
- (6) Obtain actual elevation (in relation to mean sea level) of the reference level (including basement) and all attendant utilities of all new and substantially improved structures, in accordance with the provisions of Article 4, Section B(3).

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- (7) Obtain actual elevation (in relation to mean sea level) to which all new and substantially improved structures and utilities have been floodproofed, in accordance with the provisions of Article 4, Section B(3).
- (8) Obtain actual elevation (in relation to mean sea level) of all public utilities in accordance with the provisions of Article 4, Section B(3).
- (9) When floodproofing is utilized for a particular structure, obtain certifications from a registered professional engineer or architect in accordance with the provisions of Article 4, Section B(3) and Article 5, Section B(2).
- (10) Where interpretation is needed as to the exact location of boundaries of the Special Flood Hazard Areas, floodways, or non-encroachment areas (for example, where there appears to be a conflict between a mapped boundary and actual field conditions), make the necessary interpretation. The person contesting the location of the boundary shall be given a reasonable opportunity to appeal the interpretation as provided in this article.
- (11) When Base Flood Elevation (BFE) data has not been provided in accordance with the provisions of Article 3, Section B, obtain, review, and reasonably utilize any BFE data, along with floodway data or non-encroachment area data available from a Federal, State, or other source, including data developed pursuant to Article 5, Section D(2)(b), in order to administer the provisions of this ordinance.
- (12) When Base Flood Elevation (BFE) data is provided but no floodway or non-encroachment area data has been provided in accordance with the provisions of Article 3, Section B, obtain, review, and reasonably utilize any floodway data or non-encroachment area data available from a Federal, State, or other source in order to administer the provisions of this ordinance.
- (13) *When the lowest floor and the lowest adjacent grade of a structure or the lowest ground elevation of a parcel in a Special Flood Hazard Area is above the Base Flood Elevation (BFE), advise the property owner of the option to apply for a Letter of Map Amendment (LOMA) from FEMA. Maintain a copy of the LOMA issued by FEMA in the floodplain development permit file. (OPTIONAL)*
- (14) Permanently maintain all records that pertain to the administration of this ordinance and make these records available for public inspection, recognizing that such information may be subject to the Privacy Act of 1974, as amended.
- (15) Make on-site inspections of work in progress. As the work pursuant to a floodplain development permit progresses, the Floodplain Administrator shall make as many inspections of the work as may be necessary to ensure that the work is being done according to the provisions of the local ordinance and the terms of the permit. In exercising this power, the Floodplain Administrator has a right, upon presentation of proper credentials, to enter on any premises within the jurisdiction of the community at any reasonable hour for the purposes of inspection or other enforcement action.
- (16) Issue stop-work orders as required. Whenever a building or part thereof is being constructed, reconstructed, altered, or repaired in violation of this ordinance, the Floodplain Administrator may order the work to be immediately stopped. The stop-work order shall be in writing and directed to the person doing or in charge of the work. The stop-work order shall state the specific work to be stopped, the specific reason(s) for the stoppage, and the condition(s) under which the work may be resumed. Violation of a stop-work order constitutes a misdemeanor.
- (17) Revoke floodplain development permits as required. The Floodplain Administrator may revoke and require the return of the floodplain development permit by notifying the permit holder in writing stating the reason(s) for the revocation. Permits shall be revoked for any substantial departure from the approved application, plans, and specifications; for refusal or failure to comply with the requirements of State or local laws; or for false statements or misrepresentations made in securing the permit. Any floodplain development permit mistakenly issued in violation of an applicable State or local law may also be revoked.

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- (18) Make periodic inspections throughout the Special Flood Hazard Areas within the jurisdiction of the community. The Floodplain Administrator and each member of his or her inspections department shall have a right, upon presentation of proper credentials, to enter on any premises within the territorial jurisdiction of the department at any reasonable hour for the purposes of inspection or other enforcement action.
- (19) Follow through with corrective procedures of Article 4, Section D.
- (20) Review, provide input, and make recommendations for variance requests.
- (21) Maintain a current map repository to include, but not limited to, the FIS Report, FIRM and other official flood maps and studies adopted in accordance with the provisions of Article 3, Section B of this ordinance, including any revisions thereto including Letters of Map Change, issued by FEMA. Notify State and FEMA of mapping needs.
- (22) Coordinate revisions to FIS reports and FIRMs, including Letters of Map Revision Based on Fill (LOMR-Fs) and Letters of Map Revision (LOMRs).

SECTION D. CORRECTIVE PROCEDURES.

- (1) **Violations to be Corrected:** When the Floodplain Administrator finds violations of applicable State and local laws, it shall be his or her duty to notify the owner or occupant of the building of the violation. The owner or occupant shall immediately remedy each of the violations of law cited in such notification.
- (2) **Actions in Event of Failure to Take Corrective Action:** If the owner of a building or property shall fail to take prompt corrective action, the Floodplain Administrator shall give the owner written notice, by certified or registered mail to the owner's last known address or by personal service, stating:
 - (a) that the building or property is in violation of the floodplain management regulations;
 - (b) that a hearing will be held before the Floodplain Administrator at a designated place and time, not later than ten (10) days after the date of the notice, at which time the owner shall be entitled to be heard in person or by counsel and to present arguments and evidence pertaining to the matter; and
 - (c) that following the hearing, the Floodplain Administrator may issue an order to alter, vacate, or demolish the building; or to remove fill as applicable.
- (3) **Order to Take Corrective Action:** If, upon a hearing held pursuant to the notice prescribed above, the Floodplain Administrator shall find that the building or development is in violation of the Flood Damage Prevention Ordinance, he or she shall issue an order in writing to the owner, requiring the owner to remedy the violation within a specified time period, not less than sixty (60) calendar days, nor more than (___) calendar days. (*One-hundred-eighty (180) calendar days or less is recommended*) Where the Floodplain Administrator finds that there is imminent danger to life or other property, he or she may order that corrective action be taken in such lesser period as may be feasible.
- (4) **Appeal:** Any owner who has received an order to take corrective action may appeal the order to the local elected governing body by giving notice of appeal in writing to the Floodplain Administrator and the clerk within ten (10) days following issuance of the final order. In the absence of an appeal, the order of the Floodplain Administrator shall be final. The local governing body shall hear an appeal within a reasonable time and may affirm, modify and affirm, or revoke the order.

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- (5) Failure to Comply with Order: If the owner of a building or property fails to comply with an order to take corrective action for which no appeal has been made or fails to comply with an order of the governing body following an appeal, the owner shall be guilty of a misdemeanor and shall be punished at the discretion of the court.

SECTION E. VARIANCE PROCEDURES.

- (1) The _____ (*appeal board*) as established by _____ (*community*), hereinafter referred to as the “appeal board”, shall hear and decide requests for variances from the requirements of this ordinance.
- (2) Any person aggrieved by the decision of the appeal board may appeal such decision to the Court, as provided in Chapter 7A of the North Carolina General Statutes.
- (3) Variances may be issued for:
- (a) the repair or rehabilitation of historic structures upon the determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and that the variance is the minimum necessary to preserve the historic character and design of the structure;
 - (b) functionally dependent facilities if determined to meet the definition as stated in Article 2 of this ordinance, provided provisions of Article 4, Section E(9)(b), (c), and (e) have been satisfied, and such facilities are protected by methods that minimize flood damages during the base flood and create no additional threats to public safety; or
 - (c) any other type of development, provided it meets the requirements of this Section.
- (4) In passing upon variances, the appeal board shall consider all technical evaluations, all relevant factors, all standards specified in other sections of this ordinance, and:
- (a) the danger that materials may be swept onto other lands to the injury of others;
 - (b) the danger to life and property due to flooding or erosion damage;
 - (c) the susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;
 - (d) the importance of the services provided by the proposed facility to the community;
 - (e) the necessity to the facility of a waterfront location as defined under Article 2 of this ordinance as a functionally dependent facility, where applicable;
 - (f) the availability of alternative locations, not subject to flooding or erosion damage, for the proposed use;
 - (g) the compatibility of the proposed use with existing and anticipated development;
 - (h) the relationship of the proposed use to the comprehensive plan and floodplain management program for that area;
 - (i) the safety of access to the property in times of flood for ordinary and emergency vehicles;

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- (j) the expected heights, velocity, duration, rate of rise, and sediment transport of the floodwaters and the effects of wave action, if applicable, expected at the site; and
 - (k) the costs of providing governmental services during and after flood conditions including maintenance and repair of public utilities and facilities such as sewer, gas, electrical and water systems, and streets and bridges.
- (5) A written report addressing each of the above factors shall be submitted with the application for a variance.
- (6) Upon consideration of the factors listed above and the purposes of this ordinance, the appeal board may attach such conditions to the granting of variances as it deems necessary to further the purposes and objectives of this ordinance.
- (7) Any applicant to whom a variance is granted shall be given written notice specifying the difference between the Base Flood Elevation (BFE) and the elevation to which the structure is to be built and that such construction below the BFE increases risks to life and property, and that the issuance of a variance to construct a structure below the BFE will result in increased premium rates for flood insurance up to \$25 per \$100 of insurance coverage. Such notification shall be maintained with a record of all variance actions, including justification for their issuance.
- (8) The Floodplain Administrator shall maintain the records of all appeal actions and report any variances to the Federal Emergency Management Agency and the State of North Carolina upon request.
- (9) Conditions for Variances:
- (a) Variances shall not be issued when the variance will make the structure in violation of other Federal, State, or local laws, regulations, or ordinances.
 - (b) Variances shall not be issued within any designated floodway or non-encroachment area if the variance would result in any increase in flood levels during the base flood discharge.
 - (c) Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.
 - (d) Variances shall only be issued prior to development permit approval.
 - (e) Variances shall only be issued upon:
 - (i) a showing of good and sufficient cause;
 - (ii) a determination that failure to grant the variance would result in exceptional hardship; and
 - (iii) a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, or extraordinary public expense, create nuisance, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances.
- (10) A variance may be issued for solid waste disposal facilities or sites, hazardous waste management facilities, salvage yards, and chemical storage facilities that are located in Special Flood Hazard Areas provided that all of the following conditions are met.

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- (a) The use serves a critical need in the community.
- (b) No feasible location exists for the use outside the Special Flood Hazard Area.
- (c) The reference level of any structure is elevated or floodproofed to at least the Regulatory Flood Protection Elevation.
- (d) The use complies with all other applicable Federal, State and local laws.
- (e) The _____ (*community*) has notified the Secretary of the North Carolina Department of Crime Control and Public Safety of its intention to grant a variance at least thirty (30) calendar days prior to granting the variance.

ARTICLE 5. PROVISIONS FOR FLOOD HAZARD REDUCTION.

SECTION A. GENERAL STANDARDS.

In all Special Flood Hazard Areas the following provisions are required:

- (1) All new construction and substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse, and lateral movement of the structure.
- (2) All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.
- (3) All new construction and substantial improvements shall be constructed by methods and practices that minimize flood damages.
- (4) Electrical, heating, ventilation, plumbing, air conditioning equipment, and other service facilities shall be designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding to the Regulatory Flood Protection Elevation. These include, but are not limited to, HVAC equipment, water softener units, bath/kitchen fixtures, ductwork, electric/gas meter panels/boxes, utility/cable boxes, hot water heaters, and electric outlets/switches.
- (5) All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of floodwaters into the system.
- (6) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into the systems and discharges from the systems into flood waters.
- (7) On-site waste disposal systems shall be located and constructed to avoid impairment to them or contamination from them during flooding.
- (8) Any alteration, repair, reconstruction, or improvements to a structure, which is in compliance with the provisions of this ordinance, shall meet the requirements of “new construction” as contained in this ordinance.
- (9) Nothing in this ordinance shall prevent the repair, reconstruction, or replacement of a building or structure existing on the effective date of this ordinance and located totally or partially within the floodway, non-encroachment area, or stream setback, provided there is no additional encroachment below the Regulatory Flood Protection Elevation in the floodway, non-encroachment area, or stream setback, and provided that such repair, reconstruction, or replacement meets all of the other requirements of this ordinance.

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- (10) New solid waste disposal facilities and sites, hazardous waste management facilities, salvage yards, and chemical storage facilities shall not be permitted, except by variance as specified in Article 4, Section E(10). A structure or tank for chemical or fuel storage incidental to an allowed use or to the operation of a water treatment plant or wastewater treatment facility may be located in a Special Flood Hazard Area only if the structure or tank is either elevated or floodproofed to at least the Regulatory Flood Protection Elevation and certified in accordance with the provisions of Article 4, Section B(3).
- (11) All subdivision proposals and other development proposals shall be consistent with the need to minimize flood damage.
- (12) All subdivision proposals and other development proposals shall have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize flood damage.
- (13) All subdivision proposals and other development proposals shall have adequate drainage provided to reduce exposure to flood hazards.
- (14) All subdivision proposals and other development proposals shall have received all necessary permits from those governmental agencies for which approval is required by Federal or State law, including Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334.
- (15) When a structure is partially located in a Special Flood Hazard Area, the entire structure shall meet the requirements for new construction and substantial improvements.
- (16) When a structure is located in multiple flood hazard zones or in a flood hazard risk zone with multiple base flood elevations, the provisions for the more restrictive flood hazard risk zone and the highest Base Flood Elevation (BFE) shall apply.

SECTION B. SPECIFIC STANDARDS.

In all Special Flood Hazard Areas where Base Flood Elevation (BFE) data has been provided, as set forth in Article 3, Section B, or Article 5, Section D, the following provisions, in addition to the provisions of Article 5, Section A, are required:

- (1) Residential Construction. New construction and substantial improvement of any residential structure (including manufactured homes) shall have the reference level, including basement, elevated no lower than the Regulatory Flood Protection Elevation, as defined in Article 2 of this ordinance.
- (2) Non-Residential Construction. New construction and substantial improvement of any commercial, industrial, or other non-residential structure shall have the reference level, including basement, elevated no lower than the Regulatory Flood Protection Elevation, as defined in Article 2 of this ordinance. Structures located in A, AE, AO, and A1-30 Zones may be floodproofed to the Regulatory Flood Protection Elevation in lieu of elevation provided that all areas of the structure, together with attendant utility and sanitary facilities, below the Regulatory Flood Protection Elevation are watertight with walls substantially impermeable to the passage of water, using structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effect of buoyancy. For AO Zones, the floodproofing elevation shall be in accordance with Article 5, Section G(2). A registered professional engineer or architect shall certify that the floodproofing standards of this subsection are satisfied. Such certification shall be provided to the Floodplain Administrator as set forth in Article 4, Section B(3), along with the operational plan and the inspection and maintenance plan.
- (3) Manufactured Homes.

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- (a) New and replacement manufactured homes shall be elevated so that the reference level of the manufactured home is no lower than the Regulatory Flood Protection Elevation, as defined in Article 2 of this ordinance.
 - (b) Manufactured homes shall be securely anchored to an adequately anchored foundation to resist flotation, collapse, and lateral movement, either by certified engineered foundation system, or in accordance with the most current edition of the State of North Carolina Regulations for Manufactured Homes adopted by the Commissioner of Insurance pursuant to NCGS 143-143.15. Additionally, when the elevation would be met by an elevation of the chassis thirty-six (36) inches or less above the grade at the site, the chassis shall be supported by reinforced piers or engineered foundation. When the elevation of the chassis is above thirty-six (36) inches in height, an engineering certification is required.
 - (c) All enclosures or skirting below the lowest floor shall meet the requirements of Article 5, Section B(4).
 - (d) An evacuation plan must be developed for evacuation of all residents of all new, substantially improved or substantially damaged manufactured home parks or subdivisions located within flood prone areas. This plan shall be filed with and approved by the Floodplain Administrator and the local Emergency Management Coordinator.
- (4) Elevated Buildings. Fully enclosed area, of new construction and substantially improved structures, which is below the lowest floor:
- (a) shall not be designed or used for human habitation, but shall only be used for parking of vehicles, building access, or limited storage of maintenance equipment used in connection with the premises. Access to the enclosed area shall be the minimum necessary to allow for parking of vehicles (garage door) or limited storage of maintenance equipment (standard exterior door), or entry to the living area (stairway or elevator). The interior portion of such enclosed area shall not be finished or partitioned into separate rooms, except to enclose storage areas;
 - (b) shall be constructed entirely of flood resistant materials at least to the Regulatory Flood Protection Elevation; and
 - (c) shall include, in Zones A, AO, AE, and A1-30, flood openings to automatically equalize hydrostatic flood forces on walls by allowing for the entry and exit of floodwaters. To meet this requirement, the openings must either be certified by a professional engineer or architect or meet or exceed the following minimum design criteria:

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- (i) A minimum of two flood openings on different sides of each enclosed area subject to flooding;
 - (ii) The total net area of all flood openings must be at least one (1) square inch for each square foot of enclosed area subject to flooding;
 - (iii) If a building has more than one enclosed area, each enclosed area must have flood openings to allow floodwaters to automatically enter and exit;
 - (iv) The bottom of all required flood openings shall be no higher than one (1) foot above the adjacent grade;
 - (v) Flood openings may be equipped with screens, louvers, or other coverings or devices, provided they permit the automatic flow of floodwaters in both directions; and
 - (vi) Enclosures made of flexible skirting are not considered enclosures for regulatory purposes, and, therefore, do not require flood openings. Masonry or wood underpinning, regardless of structural status, is considered an enclosure and requires flood openings as outlined above.
- (5) Additions/Improvements.
- (a) Additions and/or improvements to pre-FIRM structures when the addition and/or improvements in combination with any interior modifications to the existing structure are:
 - (i) not a substantial improvement, the addition and/or improvements must be designed to minimize flood damages and must not be any more non-conforming than the existing structure.
 - (ii) a substantial improvement, both the existing structure and the addition and/or improvements must comply with the standards for new construction.
 - (b) Additions to post-FIRM structures with no modifications to the existing structure other than a standard door in the common wall shall require only the addition to comply with the standards for new construction.
 - (c) Additions and/or improvements to post-FIRM structures when the addition and/or improvements in combination with any interior modifications to the existing structure are:
 - (i) not a substantial improvement, the addition and/or improvements only must comply with the standards for new construction.
 - (ii) a substantial improvement, both the existing structure and the addition and/or improvements must comply with the standards for new construction.
- (6) Recreational Vehicles. Recreational vehicles shall either:
- (a) be on site for fewer than 180 consecutive days and be fully licensed and ready for highway use (a recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities, and has no permanently attached additions); or
 - (b) meet all the requirements for new construction.

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- (7) Temporary Non-Residential Structures. Prior to the issuance of a floodplain development permit for a temporary structure, the applicant must submit to the Floodplain Administrator a plan for the removal of such structure(s) in the event of a hurricane, flash flood or other type of flood warning notification. The following information shall be submitted in writing to the Floodplain Administrator for review and written approval:
- (a) a specified time period for which the temporary use will be permitted. Time specified may not exceed three (3) months, renewable up to one (1) year;
 - (b) the name, address, and phone number of the individual responsible for the removal of the temporary structure;
 - (c) the time frame prior to the event at which a structure will be removed (i.e., minimum of 72 hours before landfall of a hurricane or immediately upon flood warning notification);
 - (d) a copy of the contract or other suitable instrument with the entity responsible for physical removal of the structure; and
 - (e) designation, accompanied by documentation, of a location outside the Special Flood Hazard Area, to which the temporary structure will be moved.
- (8) Accessory Structures. When accessory structures (sheds, detached garages, etc.) are to be placed within a Special Flood Hazard Area, the following criteria shall be met:
- (a) Accessory structures shall not be used for human habitation (including working, sleeping, living, cooking or restroom areas);
 - (b) Accessory structures shall not be temperature-controlled;
 - (c) Accessory structures shall be designed to have low flood damage potential;
 - (d) Accessory structures shall be constructed and placed on the building site so as to offer the minimum resistance to the flow of floodwaters;
 - (e) Accessory structures shall be firmly anchored in accordance with the provisions of Article 5, Section A(1);
 - (f) All service facilities such as electrical shall be installed in accordance with the provisions of Article 5, Section A(4); and
 - (g) Flood openings to facilitate automatic equalization of hydrostatic flood forces shall be provided below Regulatory Flood Protection Elevation in conformance with the provisions of Article 5, Section B(4)(c).

An accessory structure with a footprint less than 150 square feet that satisfies the criteria outlined above does not require an elevation or floodproofing certificate. Elevation or floodproofing certifications are required for all other accessory structures in accordance with Article 4, Section B(3).

SECTION C. RESERVED.

SECTION D. STANDARDS FOR FLOODPLAINS WITHOUT ESTABLISHED BASE FLOOD ELEVATIONS.

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Within the Special Flood Hazard Areas designated as Approximate Zone A and established in Article 3, Section B, where no Base Flood Elevation (BFE) data has been provided by FEMA, the following provisions, in addition to the provisions of Article 5, Section A, shall apply:

- (1) No encroachments, including fill, new construction, substantial improvements or new development shall be permitted within a distance of twenty (20) feet each side from top of bank or five times the width of the stream, whichever is greater, unless certification with supporting technical data by a registered professional engineer is provided demonstrating that such encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.
- (2) The BFE used in determining the Regulatory Flood Protection Elevation shall be determined based on the following criteria:
 - (a) When Base Flood Elevation (BFE) data is available from other sources, all new construction and substantial improvements within such areas shall also comply with all applicable provisions of this ordinance and shall be elevated or floodproofed in accordance with standards in Article 5, Sections A and B.
 - (b) When floodway or non-encroachment data is available from a Federal, State, or other source, all new construction and substantial improvements within floodway and non-encroachment areas shall also comply with the requirements of Article 5, Sections B and F.
 - (c) All subdivision, manufactured home park and other development proposals shall provide Base Flood Elevation (BFE) data if development is greater than five (5) acres or has more than fifty (50) lots/manufactured home sites. Such Base Flood Elevation (BFE) data shall be adopted by reference in accordance with Article 3, Section B and utilized in implementing this ordinance.
 - (d) When Base Flood Elevation (BFE) data is not available from a Federal, State, or other source as outlined above, the reference level shall be elevated or floodproofed (nonresidential) to or above the Regulatory Flood Protection Elevation, as defined in Article 2. All other applicable provisions of Article 5, Section B shall also apply.

SECTION E. STANDARDS FOR RIVERINE FLOODPLAINS WITH BASE FLOOD ELEVATIONS BUT WITHOUT ESTABLISHED FLOODWAYS OR NON-ENCROACHMENT AREAS.

Along rivers and streams where Base Flood Elevation (BFE) data is provided by FEMA or is available from another source but neither floodway nor non-encroachment areas are identified for a Special Flood Hazard Area on the FIRM or in the FIS report, the following requirements shall apply to all development within such areas:

- (1) Standards of Article 5, Sections A and B; and
- (2) Until a regulatory floodway or non-encroachment area is designated, no encroachments, including fill, new construction, substantial improvements, or other development, shall be permitted unless certification with supporting technical data by a registered professional engineer is provided demonstrating that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one (1) foot at any point within the community.

SECTION F. FLOODWAYS AND NON-ENCROACHMENT AREAS.

Areas designated as floodways or non-encroachment areas are located within the Special Flood Hazard Areas established in Article 3, Section B. The floodways and non-encroachment areas are extremely hazardous areas due to the velocity of floodwaters that have erosion potential and carry debris and potential projectiles. The following

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provisions, in addition to standards outlined in Article 5, Sections A and B, shall apply to all development within such areas:

- (1) No encroachments, including fill, new construction, substantial improvements and other developments shall be permitted unless:
 - (a) it is demonstrated that the proposed encroachment would not result in any increase in the flood levels during the occurrence of the base flood, based on hydrologic and hydraulic analyses performed in accordance with standard engineering practice and presented to the Floodplain Administrator prior to issuance of floodplain development permit, or
 - (b) a Conditional Letter of Map Revision (CLOMR) has been approved by FEMA. A Letter of Map Revision (LOMR) must also be obtained upon completion of the proposed encroachment.
- (2) If Article 5, Section F(1) is satisfied, all development shall comply with all applicable flood hazard reduction provisions of this ordinance.
- (3) No manufactured homes shall be permitted, except replacement manufactured homes in an existing manufactured home park or subdivision, provided the following provisions are met:
 - (a) the anchoring and the elevation standards of Article 5, Section B(3); and
 - (b) the no encroachment standard of Article 5, Section F(1).

SECTION G. STANDARDS FOR AREAS OF SHALLOW FLOODING (ZONE AO).

Located within the Special Flood Hazard Areas established in Article 3, Section B, are areas designated as shallow flooding areas. These areas have special flood hazards associated with base flood depths of one (1) to three (3) feet where a clearly defined channel does not exist and where the path of flooding is unpredictable and indeterminate. In addition to Article 5, Sections A and B, all new construction and substantial improvements shall meet the following requirements:

- (1) The reference level shall be elevated at least as high as the depth number specified on the Flood Insurance Rate Map (FIRM), in feet, plus a freeboard of _____ () feet, above the highest adjacent grade; or at least ____ (__) feet above the highest adjacent grade if no depth number is specified. ***A minimum of four (4) feet is recommended where a depth is not provided.***
- (2) Non-residential structures may, in lieu of elevation, be floodproofed to the same level as required in Article 5, Section G(1) so that the structure, together with attendant utility and sanitary facilities, below that level shall be watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. Certification is required in accordance with Article 4, Section B(3) and Article 5, Section B(2).
- (3) Adequate drainage paths shall be provided around structures on slopes, to guide floodwaters around and away from proposed structures.

ARTICLE 6. LEGAL STATUS PROVISIONS.

SECTION A. EFFECT ON RIGHTS AND LIABILITIES UNDER THE EXISTING FLOOD DAMAGE PREVENTION ORDINANCE.

This ordinance in part comes forward by re-enactment of some of the provisions of the Flood Damage Prevention Ordinance enacted _____ (*adoption date of the community's initial Flood Damage Prevention Ordinance*) as amended, and it is not the intention to repeal but rather to re-enact and continue to enforce without interruption of such existing provisions, so that all rights and liabilities that have accrued thereunder are reserved and may be

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enforced. The enactment of this ordinance shall not affect any action, suit or proceeding instituted or pending. All provisions of the Flood Damage Prevention Ordinance of _____ (community) enacted on _____ (adoption date of the community's initial Flood Damage Prevention Ordinance), as amended, which are not reenacted herein are repealed.

Municipal: The date of the initial Flood Damage Prevention Ordinance for _____ County is _____.

County: The date of the initial Flood Damage Prevention Ordinance for each municipal jurisdiction within _____ County is as follows:

List each municipality within the County with its initial ordinance date.

SECTION B. EFFECT UPON OUTSTANDING FLOODPLAIN DEVELOPMENT PERMITS.

Nothing herein contained shall require any change in the plans, construction, size, or designated use of any development or any part thereof for which a floodplain development permit has been granted by the Floodplain Administrator or his or her authorized agents before the time of passage of this ordinance; provided, however, that when construction is not begun under such outstanding permit within a period of six (6) months subsequent to the date of issuance of the outstanding permit, construction or use shall be in conformity with the provisions of this ordinance.

SECTION C. SEVERABILITY.

If any section, clause, sentence, or phrase of the Ordinance is held to be invalid or unconstitutional by any court of competent jurisdiction, then said holding shall in no way effect the validity of the remaining portions of this Ordinance.

SECTION D. EFFECTIVE DATE.

This ordinance shall become effective _____ (upon adoption or specific date).

SECTION E. ADOPTION CERTIFICATION.

I hereby certify that this is a true and correct copy of the Flood Damage Prevention Ordinance as adopted by the _____ (governing body) of _____ (community), North Carolina, on the _____ day of _____, 200__.

WITNESS my hand and the official seal of _____, this the _____ day of _____, 200__.

(signature)

APPENDIX E

44 Code of Federal Regulations, Section 60.3

Revised November 19, 2007

The Administrator will provide the data upon which flood plain management regulations shall be based. If the Administrator has not provided sufficient data to furnish a basis for these regulations in a particular community, the community shall obtain, review and reasonably utilize data available from other Federal, State or other sources pending receipt of data from the Administrator. However, when special flood hazard area designations and water surface elevations have been furnished by the Administrator, they shall apply. The symbols defining such special flood hazard designations are set forth in Sec. 64.3 of this subchapter. In all cases the minimum requirements governing the adequacy of the flood plain management regulations for flood-prone areas adopted by a particular community depend on the amount of technical data formally provided to the community by the Administrator.

Minimum standards for communities are as follows:

(a) When the Administrator has not defined the special flood hazard areas within a community, has not provided water surface elevation data, and has not provided sufficient data to identify the floodway or coastal high hazard area, but the community has indicated the presence of such hazards by submitting an application to participate in the Program, the community shall:

(1) Require permits for all proposed construction or other development in the community, including the placement of manufactured homes, so that it may determine whether such construction or other development is proposed within flood-prone areas;

(2) Review proposed development to assure that all necessary permits have been received from those governmental agencies from which approval is required by Federal or State law, including section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334;

(3) Review all permit applications to determine whether proposed building sites will be reasonably safe from flooding. If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall (i) be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy, (ii) be constructed with materials resistant to flood damage, (iii) be constructed by methods and practices that minimize flood damages, and (iv) be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

(4) Review subdivision proposals and other proposed new development, including manufactured home parks or subdivisions, to determine whether such proposals will be reasonably safe from flooding. If a subdivision proposal or other proposed new development is in a flood-prone area, any such

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proposals shall be reviewed to assure that (i) all such proposals are consistent with the need to minimize flood damage within the flood-prone area, (ii) all public utilities and facilities, such as sewer, gas, electrical, and water systems are located and constructed to minimize or eliminate flood damage, and (iii) adequate drainage is provided to reduce exposure to flood hazards;

(5) Require within flood-prone areas new and replacement water supply systems to be designed to minimize or eliminate infiltration of flood waters into the systems; and

(6) Require within flood-prone areas (i) new and replacement sanitary sewage systems to be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters and (ii) onsite waste disposal systems to be located to avoid impairment to them or contamination from them during flooding.

(b) When the Administrator has designated areas of special flood hazards (A zones) by the publication of a community's FHBM or FIRM, but has neither produced water surface elevation data nor identified a floodway or coastal high hazard area, the community shall:

(1) Require permits for all proposed construction and other developments including the placement of manufactured homes, within Zone A on the community's FHBM or FIRM;

(2) Require the application of the standards in paragraphs (a) (2), (3), (4), (5) and (6) of this section to development within Zone A on the community's FHBM or FIRM;

(3) Require that all new subdivision proposals and other proposed developments (including proposals for manufactured home parks and subdivisions) greater than 50 lots or 5 acres, whichever is the lesser, include within such proposals base flood elevation data;

(4) Obtain, review and reasonably utilize any base flood elevation and floodway data available from a Federal, State, or other source, including data developed pursuant to paragraph (b)(3) of this section, as criteria for requiring that new construction, substantial improvements, or other development in Zone A on the community's FHBM or FIRM meet the standards in paragraphs (c)(2), (c)(3), (c)(5), (c)(6), (c)(12), (c)(14), (d)(2) and (d)(3) of this section;

(5) Where base flood elevation data are utilized, within Zone A on the community's FHBM or FIRM:

(i) Obtain the elevation (in relation to mean sea level) of the lowest floor (including basement) of all new and substantially improved structures, and

(ii) Obtain, if the structure has been floodproofed in accordance with paragraph (c)(3)(ii) of this section, the elevation (in relation to mean sea level) to which the structure was floodproofed, and

(iii) Maintain a record of all such information with the official designated by the community under Sec. 59.22 (a)(9)(iii);

(6) Notify, in riverine situations, adjacent communities and the State Coordinating Office prior to any alteration or relocation of a watercourse, and submit copies of such notifications to the Administrator;

(7) Assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained;

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(8) Require that all manufactured homes to be placed within Zone A on a community's FHBM or FIRM shall be installed using methods and practices which minimize flood damage. For the purposes of this requirement, manufactured homes must be elevated and anchored to resist flotation, collapse, or lateral movement. Methods of anchoring may include, but are not to be limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable State and local anchoring requirements for resisting wind forces.

(c) When the Administrator has provided a notice of final flood elevations for one or more special flood hazard areas on the community's FIRM and, if appropriate, has designated other special flood hazard areas without base flood elevations on the community's FIRM, but has not identified a regulatory floodway or coastal high hazard area, the community shall:

(1) Require the standards of paragraph (b) of this section within all A1-30 zones, AE zones, A zones, AH zones, and AO zones, on the community's FIRM;

(2) Require that all new construction and substantial improvements of residential structures within Zones A1-30, AE and AH zones on the community's FIRM have the lowest floor (including basement) elevated to or above the base flood level, unless the community is granted an exception by the Administrator for the allowance of basements in accordance with Sec. 60.6 (b) or (c);

(3) Require that all new construction and substantial improvements of non-residential structures within Zones A1-30, AE and AH zones on the community's FIRM (i) have the lowest floor (including basement) elevated to or above the base flood level or, (ii) together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;

(4) Provide that where a non-residential structure is intended to be made watertight below the base flood level, (i) a registered professional engineer or architect shall develop and/or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the applicable provisions of paragraph (c)(3)(ii) or (c)(8)(ii) of this section, and (ii) a record of such certificates which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained with the official designated by the community under Sec. 59.22(a)(9)(iii);

(5) Require, for all new construction and substantial improvements, that fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria: A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. The bottom of all openings shall be no higher than one foot above grade. Openings may be

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equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.

(6) Require that manufactured homes that are placed or substantially improved within Zones A1-30, AH, and AE on the community's FIRM on sites

(i) Outside of a manufactured home park or subdivision,

(ii) In a new manufactured home park or subdivision,

(iii) In an expansion to an existing manufactured home park or subdivision, or

(iv) In an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood, be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely anchored to an adequately anchored foundation system to resist floatation collapse and lateral movement.

(7) Require within any AO zone on the community's FIRM that all new construction and substantial improvements of residential structures have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified);

(8) Require within any AO zone on the community's FIRM that all new construction and substantial improvements of nonresidential structures (i) have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified), or (ii) together with attendant utility and sanitary facilities be completely floodproofed to that level to meet the floodproofing standard specified in Sec. 60.3(c)(3)(ii);

(9) Require within any A99 zones on a community's FIRM the standards of paragraphs (a)(1) through (a)(4)(i) and (b)(5) through (b)(9) of this section;

(10) Require until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

(11) Require within Zones AH and AO, adequate drainage paths around structures on slopes, to guide floodwaters around and away from proposed structures.

(12) Require that manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision within Zones A-1-30, AH, and AE on the community's FIRM that are not subject to the provisions of paragraph (c)(6) of this section be elevated so that either

(i) The lowest floor of the manufactured home is at or above the base flood elevation, or

(ii) The manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade

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and be securely anchored to an adequately anchored foundation system to resist floatation, collapse, and lateral movement.

(13) Notwithstanding any other provisions of Sec. 60.3, a community may approve certain development in Zones A1-30, AE, and AH, on the community's FIRM which increase the water surface elevation of the base flood by more than one foot, provided that the community first applies for a conditional FIRM revision, fulfills the requirements for such a revision as established under the provisions of Sec. 65.12, and receives the approval of the Administrator.

(14) Require that recreational vehicles placed on sites within Zones A1-30, AH, and AE on the community's FIRM either

(i) Be on the site for fewer than 180 consecutive days,

(ii) Be fully licensed and ready for highway use, or

(iii) Meet the permit requirements of paragraph (b)(1) of this section and the elevation and anchoring requirements for "manufactured homes" in paragraph (c)(6) of this section. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.

(d) When the Administrator has provided a notice of final base flood elevations within Zones A1-30 and/or AE on the community's FIRM and, if appropriate, has designated AO zones, AH zones, A99 zones, and A zones on the community's FIRM, and has provided data from which the community shall designate its regulatory floodway, the community shall:

(1) Meet the requirements of paragraphs (c) (1) through (14) of this section;

(2) Select and adopt a regulatory floodway based on the principle that the area chosen for the regulatory floodway must be designed to carry the waters of the base flood, without increasing the water surface elevation of that flood more than one foot at any point;

(3) Prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge;

(4) Notwithstanding any other provisions of Sec. 60.3, a community may permit encroachments within the adopted regulatory floodway that would result in an increase in base flood elevations, provided that the community first applies for a conditional FIRM and floodway revision, fulfills the requirements for such revisions as established under the provisions of Sec. 65.12, and receives the approval of the Administrator.

(e) When the Administrator has provided a notice of final base flood elevations within Zones A1-30 and/or AE on the community's FIRM and, if appropriate, has designated AH zones, AO zones, A99 zones, and A zones on the community's FIRM, and has identified on the community's FIRM coastal high hazard areas by designating Zones V1-30, VE, and/or V, the community shall:

(1) Meet the requirements of paragraphs (c)(1) through (14) of this section;

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(2) Within Zones V1-30, VE, and V on a community's FIRM, (i) obtain the elevation (in relation to mean sea level) of the bottom of the lowest structural member of the lowest floor (excluding pilings and columns) of all new and substantially improved structures, and whether or not such structures contain a basement, and (ii) maintain a record of all such information with the official designated by the community under Sec. 59.22(a)(9)(iii);

(3) Provide that all new construction within Zones V1-30, VE, and V on the community's FIRM is located landward of the reach of mean high tide;

(4) Provide that all new construction and substantial improvements in Zones V1-30 and VE, and also Zone V if base flood elevation data is available, on the community's FIRM, are elevated on pilings and columns so that (i) the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to or above the base flood level; and (ii) the pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. Water loading values used shall be those associated with the base flood. Wind loading values used shall be those required by applicable State or local building standards. A registered professional engineer or architect shall develop or review the structural design, specifications and plans for the construction, and shall certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of paragraphs (e)(4) (i) and (ii) of this section.

(5) Provide that all new construction and substantial improvements within Zones V1-30, VE, and V on the community's FIRM have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls, open wood lattice-work, or insect screening intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system. For the purposes of this section, a breakway wall shall have a design safe loading resistance of not less than 10 and no more than 20 pounds per square foot. Use of breakway walls which exceed a design safe loading resistance of 20 pounds per square foot (either by design or when so required by local or State codes) may be permitted only if a registered professional engineer or architect certifies that the designs proposed meet the following conditions:

(i) Breakaway wall collapse shall result from a water load less than that which would occur during the base flood; and,

(ii) The elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects of wind and water loads acting simultaneously on all building components (structural and non-structural). Water loading values used shall be those associated with the base flood. Wind loading values used shall be those required by applicable State or local building standards. Such enclosed space shall be useable solely for parking of vehicles, building access, or storage.

(6) Prohibit the use of fill for structural support of buildings within Zones V1-30, VE, and V on the community's FIRM;

(7) Prohibit man-made alteration of sand dunes and mangrove stands within Zones V1-30, VE, and V on the community's FIRM which would increase potential flood damage.

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(8) Require that manufactured homes placed or substantially improved within Zones V1-30, V, and VE on the community's FIRM on sites

(i) Outside of a manufactured home park or subdivision,

(ii) In a new manufactured home park or subdivision,

(iii) In an expansion to an existing manufactured home park or subdivision, or

(iv) In an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood, meet the standards of paragraphs (e)(2) through (7) of this section and that manufactured homes placed or substantially improved on other sites in an existing manufactured home park or subdivision within Zones V1-30, V, and VE on the community's FIRM meet the requirements of paragraph (c)(12) of this section.

(9) Require that recreational vehicles placed on sites within Zones V1-30, V, and VE on the community's FIRM either

(i) Be on the site for fewer than 180 consecutive days,

(ii) Be fully licensed and ready for highway use, or

(iii) Meet the requirements in paragraphs (b)(1) and (e) (2) through (7) of this section. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.

(f) When the Administrator has provided a notice of final base flood elevations within Zones A1-30 or AE on the community's FIRM, and, if appropriate, has designated AH zones, AO zones, A99 zones, and A zones on the community's FIRM, and has identified flood protection restoration areas by designating Zones AR, AR/A1-30, AR/AE, AR/AH, AR/AO, or AR/A, the community shall:

(1) Meet the requirements of paragraphs (c)(1) through (14) and (d)(1) through (4) of this section.

(2) Adopt the official map or legal description of those areas within Zones AR, AR/A1-30, AR/AE, AR/AH, AR/A, or AR/AO that are designated developed areas as defined in Sec. 59.1 in accordance with the eligibility procedures under Sec. 65.14.

(3) For all new construction of structures in areas within Zone AR that are designated as developed areas and in other areas within Zone AR where the AR flood depth is 5 feet or less:

(i) Determine the lower of either the AR base flood elevation or the elevation that is 3 feet above highest adjacent grade; and

(ii) Using this elevation, require the standards of paragraphs (c)(1) through (14) of this section.

(4) For all new construction of structures in those areas within Zone AR that are not designated as developed areas where the AR flood depth is greater than 5 feet:

(i) Determine the AR base flood elevation; and

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(ii) Using that elevation require the standards of paragraphs (c)(1) through (14) of this section.

(5) For all new construction of structures in areas within Zone AR/A1-30, AR/AE, AR/AH, AR/AO, and AR/A:

(i) Determine the applicable elevation for Zone AR from paragraphs (a)(3) and (4) of this section;

(ii) Determine the base flood elevation or flood depth for the underlying A1-30, AE, AH, AO and A Zone; and

(iii) Using the higher elevation from paragraphs (a)(5)(i) and (ii) of this section require the standards of paragraphs (c)(1) through (14) of this section.

(6) For all substantial improvements to existing construction within Zones AR/A1-30, AR/AE, AR/AH, AR/AO, and AR/A:

(i) Determine the A1-30 or AE, AH, AO, or A Zone base flood elevation; and

(ii) Using this elevation apply the requirements of paragraphs (c)(1) through (14) of this section.

(7) Notify the permit applicant that the area has been designated as an AR, AR/A1-30, AR/AE, AR/AH, AR/AO, or AR/A Zone and whether the structure will be elevated or protected to or above the AR base flood elevation.