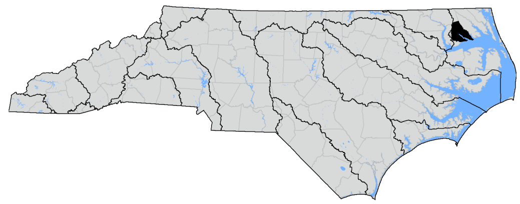
PRELIMINARY FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

A Report of Flood Hazards in

PERQUIMANS COUNTY, NORTH CAROLINA AND INCORPORATED AREAS



Community Name	Community Number
PERQUIMANS COUNTY	370315
TOWN OF HERTFORD	370188
TOWN OF WINFALL	370345

NORTH CAROLINA
Cooperating Technical State
FEMA'S COOPERATING TECHNICAL PARTNER

PRELIMINARY: 11/30/2015

REVISED: 9/9/9999

Federal Emergency Management Agency

State of North Carolina

Flood Insurance Study Number

37143CV000

www.fema.gov and www.ncfloodmaps.com

FOREWORD

This countywide Flood Insurance Study (FIS) Report was produced through a unique cooperative partnership between the State of North Carolina and the Federal Emergency Management Agency (FEMA). The State of North Carolina has implemented a long-term approach to floodplain management to decrease the costs associated with flooding. This is demonstrated by the State's commitment to map floodplain areas at the state level. As a part of this effort, the State of North Carolina has joined with FEMA in a Cooperating Technical State (CTS) agreement to produce and maintain this FIS Report and the accompanying digital Flood Insurance Rate Map (FIRM) for North Carolina.

NOTICE TO FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

The following is a list of the publication dates of this Countywide FIS Report starting with the initial Report accompanying the North Carolina Statewide FIRM:

Date	Reason
10/5/2004	Initial Countywide FIS Report Effective Date

This FIS has been produced as part of the North Carolina Floodplain Mapping Program. Perquimans County, North Carolina, falls under the administrative jurisdiction of Region IV of the Federal Emergency Management Agency (FEMA). Questions concerning this FIS may be directed to the North Carolina Floodplain Mapping Program at www.ncfloodmaps.com, the FEMA Map Assistance Center by calling the toll-free information line at 1-877-FEMA MAP (1-877-336-2627), or by contacting the FEMA Regional Office at the following address:

FEMA, Federal Insurance and Mitigation Administration
Koger Center - Rutgers Building
3003 Chamblee Tucker Road
Atlanta, Georgia 30341
(770) 220-5400

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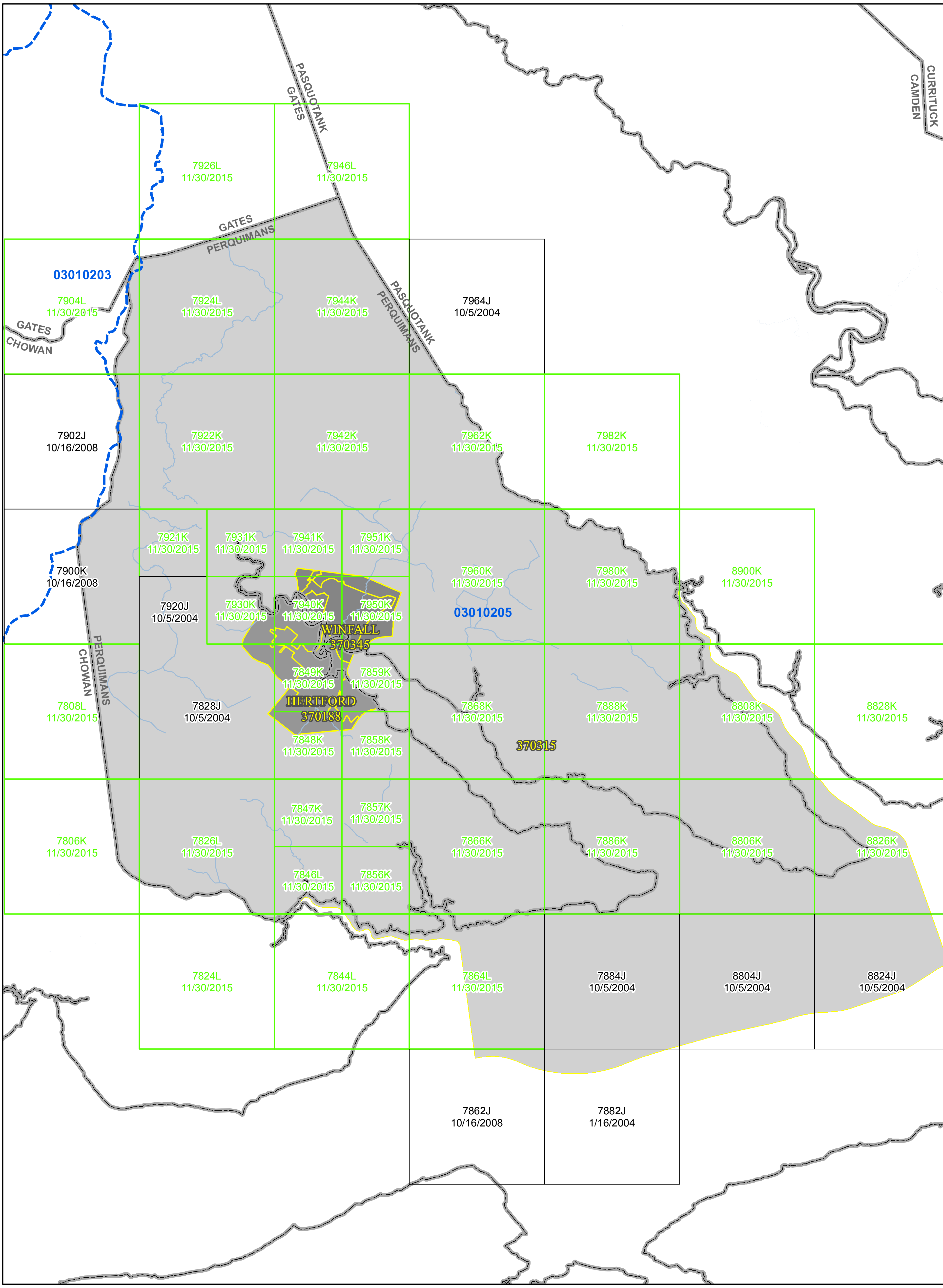

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1 in = 3 miles

0 0.5 1 2 3 Miles

Map Projection:
Lambert Conformal Conic
North American Datum 1983

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

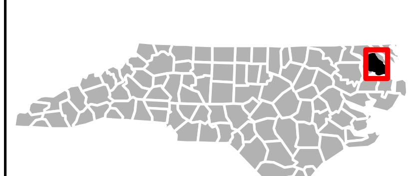
HTTP://FRIS.NC.GOV/FRIS

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

PRELIMINARY

11/30/2015

COUNTY LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

PERQUIMANS COUNTY, NORTH CAROLINA And Incorporated Areas

PANELS PRINTED:
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FEMA

MAP NUMBER
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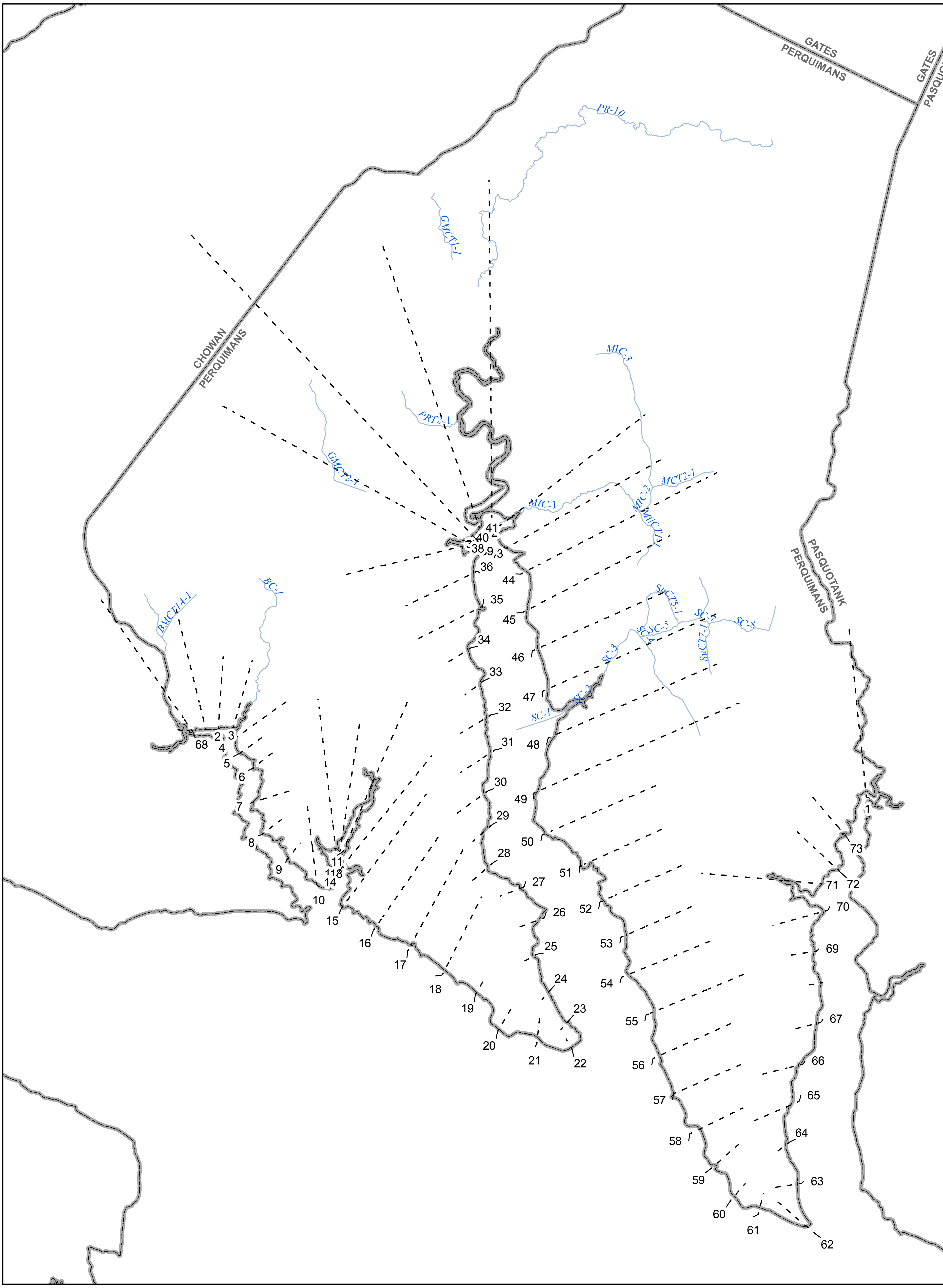

1 in = 2 miles

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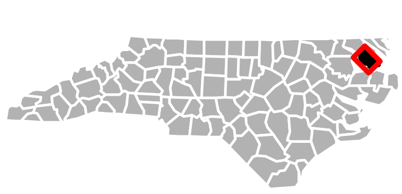
Map Projection:
Lambert Conformal Conic
North American Datum 1983

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTP://FRIS.NC.GOV/FRIS

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

COUNTY LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

TRANSECT LOCATOR MAP

PERQUIMANS COUNTY, NORTH CAROLINA

PANELS WITH TRANSECTS:

7808, 7828, 7849, 7859, 7868, 7888, 8808, 8828, 7922, 7942, 7962, 7900, 7921, 7931, 7951, 7960, 7980, 8900, 7920, 7930, 7940, 7950, 7848, 7858, 7806, 7826, 7847, 7857, 7866, 7886, 8806, 8826, 7846, 7856, 7824, 7844, 7864

FEMA

1.0 Introduction

1.1 The National Flood Insurance Program

In 1968, Congress created the National Flood Insurance Program (NFIP) in response to the rising cost of taxpayer-funded disaster relief for flood victims and the increasing amount of damage caused by floods. The NFIP makes federally backed flood insurance available in communities that agree to adopt and enforce floodplain management ordinances to reduce future flood damage. Federally backed flood insurance is available in more than 19,000 communities across the United States and its territories.

The NFIP is managed by the Federal Insurance and Mitigation Administration of the Federal Emergency Management Agency (FEMA). The Federal Insurance and Mitigation Administration manages the insurance component of the NFIP and oversees the flood hazard mapping and the floodplain management aspects of the program.

The NFIP, through involvement with communities, the insurance industry, and the lending industry, helps reduce flood damage by nearly $800 million a year. Further, buildings constructed in compliance with NFIP building standards suffer approximately 80% less damage annually than those not built in compliance. In addition, every $3 paid in flood insurance claims saves $1 in disaster assistance payments. The NFIP is self-supporting for the average historical loss year, which means that operating expenses and flood insurance claims are not paid by the taxpayer, but through premiums collected for flood insurance policies.

Additional information of interest to homeowners, community officials, insurance companies, lenders, and study contractors is available in Section 9.0 of this FIS Report and on the NFIP Internet homepage at http://www.fema.gov/business/nfip/.

1.2 Purpose of this Flood Insurance Study

Flood Insurance Studies (FISs) are one of the primary means by which the NFIP administers the National Flood Insurance Act of 1968, the Flood Disaster Protection Act of 1973, and the National Flood Insurance Reform Act of 1994. FISs develop flood risk data that are used to establish actuarial flood insurance rates. The information in this FIS Report will also be used by Perquimans County and the jurisdictions therein (hereinafter referred to collectively as Perquimans County) to facilitate the adoption and maintenance of floodplain management ordinances, which form the basis of communities' continued participation in the NFIP. Minimum requirements for participation in the NFIP are set forth in Title 44, Part 60, Section 3 of the Code of Federal Regulations (44 CFR 60.3). In some States and/or communities, floodplain management criteria or regulations may exist that are more restrictive than the minimum Federal requirements. In such cases, the more restrictive criteria will take precedence, and the State and/or community (or other jurisdictional agency) will be able to explain them.

This FIS investigates the existence and severity of flood hazards in, or revises and updates previous FISs for, the geographic area of Perquimans County, North Carolina, including the jurisdictions listed in Table 1.

Table 1 - Jurisdictions in Perquimans County

Community	Included in this FIS	If Not Included, Location of Flood Hazard/Flood Insurance Rate Data
PERQUIMANS COUNTY	Yes	*
TOWN OF HERTFORD	Yes	*
TOWN OF WINFALL	Yes	*

1.3 FIS Components

A Flood Insurance Study (FIS) is an analysis of flood hazards, typically presented as a set of Flood Insurance Rate Map (FIRM) panels and the FIS Report, which includes a set of Flood Profiles and/or Water-surface elevation rasters.

Flood Insurance Study Report

The FIS Report provides a context for the information shown on the FIRM, as well as a summary of the data upon which the analyses are based. It also includes an index of sources of additional information on the NFIP.

1.4 Considerations for Using this Flood Insurance Study Report

The NFIP encourages State and local governments to implement sound floodplain management programs. To assist in this endeavor, each FIS Report provides floodplain data, which may include a combination of the following: 10-, 4-, 2-, 1-, and 0.2-percent annual chance flood elevations (the 1% annual chance flood elevation is also referred to as the Base Flood Elevation (BFE)); delineations of the 1% annual chance and 0.2% annual chance floodplains; and 1% annual chance floodway. This information is presented on the FIRM and/or in many components of the FIS Report, including Flood Profiles, Floodway Data tables, Summary of Non-Coastal Stillwater Elevations tables, and Coastal Transect Parameters tables (not all components may be provided for a specific FIS).

It is, therefore, the responsibility of the user to consult with community officials by contacting the community repository to obtain the most current FIS Report components. Communities participating in the NFIP have established repositories of flood hazard data for floodplain management and flood insurance purposes. Community map repository addresses are provided in Table 27, “Map Repositories,” within this FIS Report.

New FIS Reports are frequently developed for multiple communities, such as entire counties. A countywide FIS Report incorporates previous FIS Reports for individual communities and the unincorporated area of the county (if not jurisdictional) into a single document and supersedes those documents for the purposes of the NFIP.

The Initial Countywide FIS Report for Perquimans became Effective on 10/5/2004. Refer to Table XX for information about subsequent revisions to FIRMs.

Selected FIRM panels for the community may contain information (such as floodways and cross sections) that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels. In addition, former flood hazard zone designations have been changed as follows:

Old Zone	New Zone
A1 through A30	AE
V1 through V30	VE
B	X (shaded)
C	X (unshaded)

FEMA does not impose floodplain management requirements or special insurance ratings based on Limit of Moderate Wave Action (LiMWA) delineations at this time. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. If the LiMWA is shown on the FIRM, it is being provided by FEMA as information only. For communities that do adopt Zone VE building standards in the area defined by the LiMWA, additional Community Rating System (CRS) credits are available. Refer to Section 2.5.4 for additional information about the LiMWA.

The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Visit the FEMA Web site at http://www.fema.gov or contact your appropriate FEMA Regional Office for more information about this program.

Previous FIS Reports and FIRMs may have included levees that were accredited as reducing the risk associated with the 1% annual chance flood based on the information available and the mapping standards of the NFIP at that time. For FEMA to continue to accredit the identified levees, the levees must meet the criteria of the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10), titled “Mapping of Areas Protected by Levee Systems.

Since the status of levees is subject to change at any time, the user should contact the appropriate agency for the latest information regarding levees presented in Table 9 of this FIS Report. For levees owned or operated by the U.S. Army Corps of Engineers (USACE), information may be obtained from the USACE national levee database. For all other levees, the user is encouraged to contact the appropriate local community.

FEMA has developed a Guide to Flood Maps (FEMA 258) and online tutorials to assist users in accessing the information contained on the FIRM. These include how to read panels and step-by-step instructions to obtain specific information. To obtain this guide and other assistance in using the FIRM, visit the FEMA Web site at http://www.fema.gov.

2.0 Floodplain Management Applications

Flood events of a magnitude expected to occur with a 10%, 2%, 1%, or 0.2% annual chance have been selected as having special significance for developing sound floodplain management programs. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10%, 2%, 1%, and 0.2% chance, respectively, of being equaled in any given year. Therefore, FIS Reports typically determine water-surface elevations for floods with these probabilities. The FIRM delineates 1% and 0.2% annual chance floodplains and 1% annual chance floodway boundaries, and depicts 1% annual chance flood elevations, rounded to the nearest foot, to assist in developing floodplain management measures.

2.1 Floodplains

To provide a national standard without regional discrimination, the 1% annual chance flood has been adopted by FEMA as the base flood for floodplain management purposes. A 1% annual chance flood, or base flood, is defined as that having a 1% chance of being equaled or exceeded in any given year. The 1% annual chance floodplains shown on the FIRM identify areas that are expected to be inundated by the 1% annual chance flood. This 1% annual chance floodplain is also called a Special Flood Hazard Area (SFHA), where the NFIP's floodplain management regulations must be enforced by the community as a condition of participation in the NFIP. The 0.2% annual chance floodplain is employed to indicate additional areas of flood risk associated with exceptionally severe floods.

2.2 Floodways

Encroachment on floodplains such as that caused by placement of structures and fill reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, floodways are provided as a tool to assist local communities in this aspect of floodplain management. Under this concept, the 1% annual chance riverine floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights. Figure 1, "Floodway Schematic," illustrates this principle. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this FIS are presented to local agencies as a minimum standard that can be adopted directly or that can be used as a basis for additional encroachment studies.

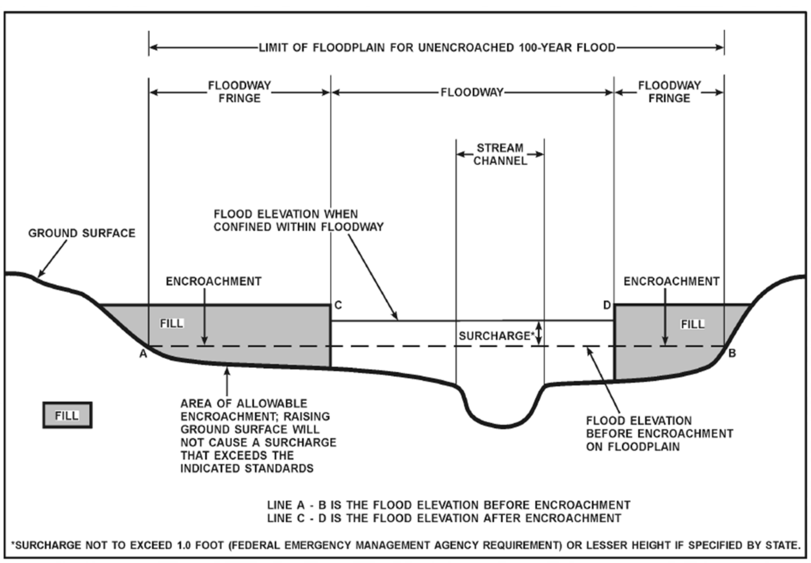


Figure 1- Floodway Schematic

2.3 Base Flood Elevations

The hydraulic characteristics of flooding sources were analyzed to provide estimates of the elevations of floods of the selected recurrence intervals. The Base Flood Elevation (BFE) is the elevation of the 1% annual chance flood. These BFEs are most commonly rounded to the whole foot, as shown on the FIRM, but in certain circumstances or locations they may be rounded to 0.1 foot. Cross section lines shown on the FIRM may also be labeled with the BFE rounded to 0.1 foot. Whole-foot BFEs derived from engineering analyses that apply to coastal areas, areas of ponding, or other static areas with little elevation change may also be shown at selected intervals on the FIRM. Cross sections with BFEs shown on the FIRM correspond to the cross sections shown in the Floodway Data table and Flood Profiles in this FIS Report. BFEs are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM.

Coastal flood elevations are provided in the Summary of Coastal Stillwater Elevations table in this report. If the elevation on the FIRM is higher than the elevation shown in this table, a wave height, wave runup and/or wave setup component likely exists, in which case, the higher elevation should be used for construction and/or floodplain management purposes.

2.4 Watershed Characteristics

Because a FIS is a probability analysis that may not account for some of the factors listed below, communities are strongly encouraged to consider adopting more restrictive or higher floodplain management criteria or ordinances than the minimum Federal requirements. Communities may also increase the validity of their flood hazard data by investing in continuous maintenance of river gages (see the Data Validity and Reliability paragraph below). If the U.S. Geological Survey (USGS) or other agencies do not maintain gages on the flooding sources of interest, partnerships with the USGS may be pursued, or local gages may be installed. For more information, see Section 9.0 of this report.

This flood hazard study represents an analysis of certain watershed characteristics, some of which are summarized as follows:

Drainage Area
In general, streams that drain larger areas have greater flood hazards. FISs, in North Carolina, do not typically analyze flood hazards in places with rural drainage areas of less than one square mile and within urban drainage areas of less than ½ square mile.

Soil Permeability and Infiltration
Differences in the types of soil and the amount of vegetation in a watershed have a significant effect on the amount of water that the soil can absorb; soils with a high sand content absorb much more water than soils with a high clay content. The presence of vegetation increases infiltration; the presence of pavement decreases infiltration and also speeds runoff to receiving waters. As soil permeability and infiltration decrease, the volume and rate of overland flow increases.

Soil Moisture Conditions
In addition to soil permeability and infiltration, the level of the water table helps determine the saturation point, beyond which no water is absorbed. As rainfall duration increases, the height of the water table increases.

Channel and Floodplain Geometry
The geometric contour of a streambed, termed channel geometry, and the geometric contour of a floodplain determine the volume of water that a channel can hold and partially determine the rate at which water flows through it.

Channel and Floodplain Roughness
The roughness of a surface affects the characteristics of runoff whether the water is on the surface of the watershed or in the channel.

FIS Reports include analyses of how these factors will combine to produce overland flow patterns during floods that have a certain probability of occurring in any given year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at shorter intervals or even within the same year. The risk of experiencing a rare flood increases when longer periods are considered. For example, the risk of having a flood which equals or exceeds the 1% annual chance flood (1% chance of annual exceedence) in any 50-year period is approximately 40% (4 in 10), but for any 90-year period, the risk increases to approximately 60% (6 in 10).

It is important to note that the 1% annual chance flood is used as the national standard to allow a consistent approach to floodplain management, flood hazard assessment, and flood hazard mapping. In any given community, a number of factors may result in flooding characteristics that do not conform to predicted conditions. Therefore, the determination that an area is not shown on the FIRM as being within a Special Flood Hazard Area is no guarantee that it will not flood during a 1% annual chance flood. Examples of these factors include Data Validity and Reliability; Developmental and Topographic Changes Over Time; Erosion, Deposition, and Debris Flow; and Meandering and Lateral Migration.

Data Validity and Reliability

Certain types of analysis methods yield more justifiable characterizations of flood hazards. For example, a gage analysis, to determine peak discharges, is based on actual measurements of watershed conditions over time and, therefore, is typically considered the most accurate method of hydrologic analysis. However, it is not feasible to install enough gages to gather data on every stream. In addition, for many of the gage sites that do exist, there are interruptions in the period of record. The usefulness of gage data for the purpose of predicting flooding behavior decreases with interruptions in the period of record; predicted flooding conditions over a 100-year period based on 20 years of measurements spread over a 35-year period are less valid than those based on 30 years of continuous measurements. A regression analysis is typically considered the best method in the absence of gage data, as it uses gage data from watersheds with similar characteristics to estimate flood frequency and magnitude in an ungaged watershed. Regression equations reflect average conditions for a region; therefore, the results will not exactly match the results of a gage analysis at a particular location. The standard errors of the North Carolina rural regression equations range from 44 to 51 percent for estimates of the 1% annual chance flood. That means the difference between the results of the regression equation and the gage analysis for approximately two-thirds of the locations that gage data exists are within 44 to 51 percent of the gage analysis results. A rainfall-runoff hydrologic analysis may be used for gaged or ungaged watersheds, and can estimate the effects of storage areas and flood control structures and measures. This method is most valid when calibrated against historical data.

Developmental and Topographic Changes Over Time

A FIRM is based on the best topographic and planimetric information available to FEMA and the State of North Carolina at the time the study is produced. In time, however, development and/or natural phenomena can alter the physical characteristics of a watershed and its drainage channels, resulting in changes in the flood hazards in those areas. For example, constructing a housing subdivision reduces the amount of soil that is available to absorb water; this in turn causes an increase in the volume of surface water that flows into the channel.

Erosion, Deposition, and Debris Flow

The flood hazards shown on a FIRM are based on the assumption of unobstructed flow. The FIRM does not reflect an analysis of areas that are subject to erosion caused by the increased water-surface elevations and velocities that occur during flooding. In addition to the risks of landslides or a weakening of the ground underneath roads or structures, any sediment that is removed from one location will be deposited in another; accumulated deposits may have a pronounced effect on flood hazards in those areas. Similarly, debris such as fallen trees or branches, litter, or other items may obstruct stream channels or hydraulic structures, increasing water-surface elevations, velocities, and floodplain width.

Meandering and Lateral Migration

FISs are based on the assumption that channel geometry will remain stable during normal drainage and during flood events. This assumption is valid for most streams, which flow over bedrock or between bedrock outcroppings that form non-alluvial channels. However, alluvial streams change the channel geometry with time, significantly so during flood events. Alluvial streams are subject to erosion and deposition, which may result in braided or meandering channels. Streams of this type may be characterized by lateral migration, or channel shifting, in which the stream may change course entirely during a flood. Whenever clear evidence is available, a FIRM will identify the alluvial nature of a studied flooding source and designate wider floodways to allow for potential migration. However, these floodways are based on qualitative assessments and not on quantitative geomorphic and engineering analyses.

2.5 Coastal Flood Hazard Areas

For most areas along rivers, streams, and small lakes, BFEs and floodplain boundaries are based on the amount of water expected to enter the area during a 1% annual chance flood and the geometry of the floodplain. Floods in these areas are typically caused by storm events. However, for areas on or near ocean coasts, large rivers, or large bodies of water, BFE and floodplain boundaries may need to be based on additional components, including storm surges and waves. Communities on or near ocean coasts face flood hazards caused by offshore seismic events as well as storm events.

Coastal flooding sources that are included in this Flood Risk Project are shown in Table XX.

2.5.1 Water Elevations and the Effects of Waves

Specific terminology is used in coastal analyses to indicate which components have been included in evaluating flood hazards.

The stillwater elevation (SWEL or still water level) is the surface of the water resulting from astronomical tides, storm surge, and freshwater inputs, but excluding wave setup contribution or the effects of waves.

- *Astronomical tides* are periodic rises and falls in large bodies of water caused by the rotation of the earth and by the gravitational forces exerted by the earth, moon and sun.
- *Storm surge* is the additional water depth that occurs during large storm events. These events can bring air pressure changes and strong winds that force water up against the shore.
- *Freshwater inputs* include rainfall that falls directly on the body of water, runoff from surfaces and overland flow, and inputs from rivers.

The 1% annual chance stillwater elevation is the stillwater elevation that has been calculated for a storm surge from a 1% annual chance storm. The 1% annual chance storm surge can be determined from analyses of tidal gage records, statistical study of regional historical storms, or other modeling approaches. Stillwater elevations for storms of other frequencies can be developed using similar approaches.

The total stillwater elevation (also referred to as the mean water level) is the stillwater elevation plus wave setup contribution but excluding the effects of waves.

- *Wave setup* is the increase in stillwater elevation at the shoreline caused by the reduction of waves in shallow water. It occurs as breaking wave momentum is transferred to the water column.

Like the stillwater elevation, the total stillwater elevation is based on a storm of a particular frequency, such as the 1% annual chance storm. Wave setup is typically estimated using standard engineering practices or calculated using models, since tidal gages are often sited in areas sheltered from wave action and do not capture this information.

Coastal analyses may examine the effects of overland waves by analyzing storm-induced erosion, overland wave propagation, wave runup, and/or wave overtopping.

- *Storm-induced erosion* is the modification of existing topography by erosion caused by a specific storm event, as opposed to general erosion that occurs at a more constant rate.
- *Overland wave propagation* describes the combined effects of variation in ground elevation, vegetation, and physical features on wave characteristics as waves move onshore.
- *Wave runup* is the uprush of water from wave action on a shore barrier. It is a function of the roughness and geometry of the shoreline at the point where the stillwater elevation intersects the land.
- *Wave overtopping* refers to wave runup that occurs when waves pass over the crest of a barrier.

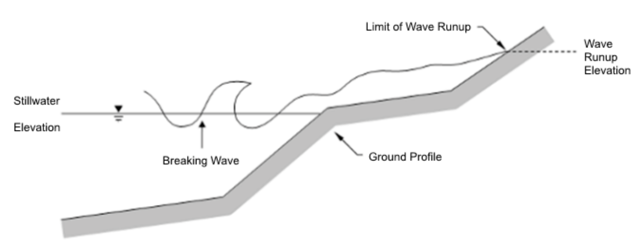


Figure 5: Wave Runup Transect Schematic

2.5.2 Floodplain Boundaries and BFEs for Coastal Areas

For coastal communities along the Atlantic and Pacific Oceans, the Gulf of Mexico, the Great Lakes, and the Caribbean Sea, flood hazards must take into account how storm surges, waves, and extreme tides interact with factors such as topography and vegetation. Storm surge and waves must also be considered in assessing flood risk for certain communities on rivers or large inland bodies of water.

Beyond areas that are affected by waves and tides, coastal communities can also have riverine floodplains with designated floodways, as described in previous sections.

Floodplain Boundaries

In many coastal areas, storm surge is the principle component of flooding. The extent of the 1% annual chance floodplain in these areas is derived from the total stillwater elevation (stillwater elevation including storm surge plus wave setup) for the 1% annual chance storm. The methods that were used for calculation of total stillwater elevations for coastal areas are described in Section 5.3 of this FIS Report. Location of total stillwater elevations for coastal areas are shown in Figure 8, "1% Annual Chance Total Stillwater Levels for Coastal Areas.

In some areas, the 1% annual chance floodplain is determined based on the limit of wave runup or wave overtopping for the 1% annual chance storm surge. The methods that were used for calculation of wave hazards are described in Section 5.3 of this FIS Report.

Table 18 and 18P presents the types of coastal analyses that were used in mapping the 1% annual chance floodplain in coastal areas.

Coastal BFEs

CWhere they apply, coastal BFEs are calculated along transects extending from offshore to the limit of coastal flooding onshore. Results of these analyses are accurate until local topography, vegetation, or development type and density within the community undergoes major changes.

Parameters that were included in calculating coastal BFEs for each transect included in this FIS Report are presented in Table 20, "Coastal Transect Parameters." The locations of transects are shown in Figure 9, "Transect Location Map." More detailed information about the methods used in coastal analyses and the results of intermediate steps in the coastal analyses are presented in Section 5.3 of this FIS Report. Additional information on specific mapping methods is provided in Section 6.4 of this FIS Report.

2.5.3 Coastal High Hazard Areas

Certain areas along the open coast and other areas may have higher risk of experiencing structural damage caused by wave action and/or high-velocity water during the 1% annual chance flood. These areas will be identified on the FIRM as Coastal High Hazard Areas.

- *Coastal High Hazard Area (CHHA)* is a SFHA extending from offshore to the inland limit of the primary frontal dune (PFD) or any other area subject to damages caused by wave action and/or high-velocity water during the 1% annual chance flood.
- *Primary Frontal Dune (PFD)* is a continuous or nearly continuous mound or ridge of sand with relatively steep slopes immediately landward and adjacent to the beach. The PFD is subject to erosion and overtopping from high tides and waves during major coastal storms.

CHHAs are designated as "V" zones (for "velocity wave zones") and are subject to more stringent regulatory requirements and a different flood insurance rate structure. The areas of greatest risk are shown as VE on the FIRM. Zone VE is further subdivided into elevation zones and shown with BFEs on the FIRM.

The landward limit of the PFD occurs at a point where there is a distinct change from a relatively steep slope to a relatively mild slope; this point represents the landward extension of Zone VE. Areas of lower risk in the CHHA are designated with Zone V on the FIRM. More detailed information about the identification and designation of Zone VE is presented in Section 6.4 of this FIS Report.

Areas that are not within the CHHA but are SFHAs may still be impacted by coastal flooding and damaging waves; these areas are shown as "A" zones on the FIRM.

Figure 6, “Coastal Transect Schematic,” illustrates the relationship between the base flood elevation, the 1% annual chance stillwater elevation, and the ground profile as well as the location of the Zone VE and Zone AE areas in an area without a PFD subject to overland wave propagation. This figure also illustrates energy dissipation and regeneration of a wave as it moves inland.

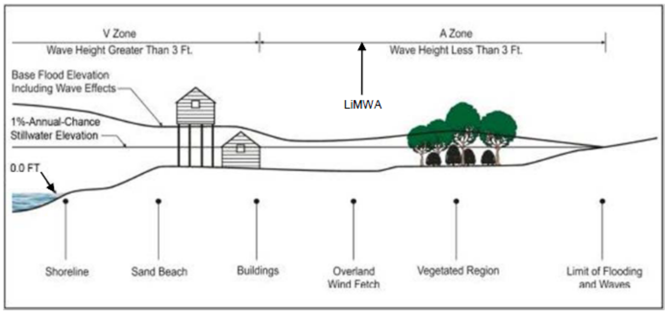


Figure 6: Coastal Transect Schematic

Methods used in coastal analyses in this Flood Risk Project are presented in Section 5.3 and mapping methods are provided in Section 6.4 of this FIS Report.

Coastal floodplains are shown on the FIRM using the symbology described in Figure 3, “Map Legend for FIRM.” In many cases, the BFE on the FIRM is higher than the stillwater elevations shown in Table 17 due to the presence of wave effects. The higher elevation should be used for construction and/or floodplain management purposes.

2.5.4 Limit of Moderate Wave Action

Laboratory tests and field investigations have shown that wave heights as little as 1.5 feet can cause damage to and failure of typical Zone AE building construction. Wood-frame, light gage steel, or masonry walls on shallow footings or slabs are subject to damage when exposed to waves less than 3 feet in height. Other flood hazards associated with coastal waves (floating debris, high velocity flow, erosion, and scour) can also damage Zone AE construction.

Therefore, a LiMWA boundary may be shown on the FIRM as an informational layer to assist coastal communities in safe rebuilding practices. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The location of the LiMWA relative to Zone VE and Zone AE is shown in Figure 6.

The effects of wave hazards in Zone AE between Zone VE (or the shoreline where Zone VE is not identified) and the limit of the LiMWA boundary are similar to, but less severe than, those in Zone VE where 3-foot or greater breaking waves are projected to occur during the 1% annual chance flooding event. Communities are therefore encouraged to adopt and enforce more stringent floodplain management requirements than the minimum NFIP requirements in the LiMWA. The NFIP Community Rating System provides credits for these actions.

Where wave runup elevations dominate over wave heights, there is no evidence to date of significant damage to residential structures by runup depths less than 3 feet. Examples of these areas include areas with steeply sloped beaches, bluffs, or flood protection structures that lie parallel to the shore. In these areas, the FIRM shows the LiMWA immediately landward of the VE/AE boundary. Similarly, in areas where the zone VE designation is based on the presence of a primary frontal dune or wave overtopping, the LiMWA is delineated immediately landward of the Zone VE/AE boundary.

3.0 Insurance Applications

3.1 National Flood Insurance Program Insurance Zones

For flood insurance applications, the FIRM designates flood insurance rate zones and, in 1% annual chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use the zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies. Table 2, “Flood Zone Designations,” includes a description of each type of flood hazard zone.

Table 2 - Flood Designations

Zone	Description
A	Zone A is the flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined in the FIS Report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no Base Flood Elevations or depths are shown within this zone.
AE	Zone AE is the flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined in the FIS Report by detailed methods. In most instances, whole-foot Base Flood Elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.
AH	Zone AH is the flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot Base Flood Elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.
AO	Zone AO is the flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.
AR	Zone AR is the flood insurance rate zone that corresponds to areas that were formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
A99	Zone A99 is the flood insurance rate zone that corresponds to areas of the 1% annual chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No Base Flood Elevations or depths are shown within this zone.
V	Zone V is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no Base Flood Elevations are shown within this zone.
VE	Zone VE is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Whole-foot Base Flood Elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.
X	Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2% annual chance floodplain, areas within the 0.2% annual chance floodplain, and to areas of 1% annual chance flooding where average depths are less than 1 foot, areas of 1% annual chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1% annual chance flood by levees. No Base Flood Elevations or depths are shown within this zone.
X (Future)	Zone X (Future Base Flood) is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined based on future-conditions hydrology. No BFEs or base flood depths are shown within this zone.
D	Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

3.2 Coastal Barrier Resources System

3.2 Coastal Barrier Resources System

The Coastal Barrier Resources Act (CBRA) of 1982 was established by Congress to create areas along the Atlantic and Gulf coasts and the Great Lakes, where restrictions for Federal financial assistance including flood insurance are prohibited. In 1990, Congress passed the Coastal Barrier Improvement Act (CBIA), which increased the extent of areas established by the CBRA and added “Otherwise Protected Areas” (OPA) to the system. These areas are collectively referred to as the John. H Chafee Coastal Barrier Resources System (CBRS). The CBRS boundaries that have been identified in the project area are in Table 4: Coastal Barrier Resource System Information.

Table 4: “Coastal Barrier Resources System Information” is not applicable in Perquimans County.

4.0 Area Studied

Perquimans County is found in the Coastal Plain region of North Carolina. It is surrounded by Gates County to the north, Pasquotank

County to the east, Tyrrell and Washington Counties to the south, and Chowan County to the west.

4.1 Basin Description

Table 3, “Basin Description” contains a description of the characteristics of the HUC-8 sub-basins within which each community falls. The table includes the main flooding sources within each basin, a brief description of the basin, and its area.

Table 3 - Basin Description

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description	HUC Area (square miles)
Albemarle	03010205	Albemarle Sound	The Albemarle Basin covers the Albemarle Sound and surrounding drainage areas along the northeast North Carolina coast and into southeastern Virginia. The Albemarle Sound begins where Roanoke River and Chowan River join in eastern Bertie County.	4,323
Chowan	03010203	Chowan River	The Chowan River Basin begins where the Nottoway River and Blackwater River confluence. From there, the basin drains significant portions of Bertie, Chowan, Gates, and Hertford Counties, ending where the Chowan River enters the Albemarle Sound.	899

4.2 Principal Flood Problems

Table 4, “Principal Flood Problems” is not applicable in Perquimans County.

4.3 Historic Flood Elevations

Hurricane Floyd
(9/16/1999)
Hurricane Floyd made landfall near Wilmington with category two winds of 105 to 110 mph. Rainfall totals from Floyd were as high as 15 to 20 inches over portions of eastern North Carolina; with a record of 23.45 inches of rain falling in the month of September at Wilmington, NC. This breaks the previous record of 21.12 inches set in July 1886. These rains combined with saturated ground from previous rain events, including Hurricane Dennis, to produce an inland flood disaster. There were 74 deaths in the United States, including 52 in North Carolina, due to drowning from flood waters. This makes Floyd the deadliest U.S. hurricane since Agnes in 1972. Data from the USGS indicate that eleven of their stream gage monitoring sites in North Carolina (Ahoskie, Rocky Mount, Hilliardston, White Oak, Enfield, Tarboro, Lucama, Hookerton, Trenton, Chinquapin, and Freeland) exceeded 0.2% annual chance flood levels due to Floyd. Total losses in North Carolina approach $5 billion with an estimated $3.5 billion in damages to North Carolina homes, businesses, roads, and infrastructure. Floyd passed relatively close to the entire U.S. east coast, justifying hurricane warnings from Florida to Massachusetts and requiring an estimated two million people to evacuate. The last hurricane to require warnings for as large a stretch of coastline was Hurricane Donna in 1960.

Hurricane Bonnie
(8/26/1998)
The landfall location of Bonnie was in southern North Carolina near Cape Fear very close to landfall of both Hurricanes Bertha and Fran in 1996. Even though a powerful storm, damage from Bonnie was much less than Fran, which was also Category 3. Winds gusted up to 100 knots and storm tides of 5 to 8 feet above normal were reported mainly in eastern beaches of Brunswick County, while a storm surge of 6 feet was reported at Pasquotank and Camden Counties in the Albemarle Sound.

Hurricane Fran
(9/5/1996)
The landfall location of Fran near the city of Wilmington and its progression into the Raleigh-Durham area caused an estimated $1.275 billion in damage in North Carolina alone. Fran hit with gusts up to 105 mph and a storm surge of approximately 16 feet. Over $1 billion in damage was reported in North Topsail Beach and Surf City and 23 people were killed.

Hurricane Bertha
(7/12/1996)
1996 was a damaging year in the hurricane history of North Carolina. Tropical Storm Arthur, Hurricane Bertha, and Hurricane Fran all made direct landfall on the North Carolina coastline. It was the most active tropical cyclone season in the state since 1955, when

Hurricanes Connie, Diane, and Ione all hit the coast. Bertha entered North Carolina in North Topsail Beach with 105 mph gust and a storm surge of approximately 5 feet.

Hurricane Gloria
(9/26/1985)
The landfall location of Gloria was Cape Hatteras, with 90 knot winds and a storm surge of approximately 6-8 feet.

Hurricane Diana
(9/13/1984)
The landfall location of Diana was 38 miles south of Wilmington with 90 mph winds at its closest approach to Wilmington. Diana had 115 mph sustained winds before landfall. Storm surge was approximately 5-6 feet.

Hurricane Donna
(8/29/1960)
Hurricane Donna crossed the North Carolina coast between Wilmington and Morehead City of September 11, 1960. The center of the storm passed a few miles east of Wrightsville Beach, although Wilmington and Wrightsville Beach were each in the eye for about an hour. The lowest barometric pressure recorded during this storm was 962 mb at Wilmington. High tides, 6 to 8 feet above normal, together with high winds, caused severe damage at many points. Winds of hurricane force, up to 97 mph, were reported from Wilmington. During the night of September 11, the storm center moved northward, parallel, and slightly east of a line drawn between Wilmington and Norfolk. Wind gusts were in excess of 97 mph and tides were 4 to 8 feet above normal. High tides of 10.3 and 8.3 feet NGVD were reported at Atlantic Beach and Wrightsville Beach, respectively. Coastal communities from Wilmington to Nags Head suffered heavy structural damage and considerable beach erosion. Eight deaths and approximately 100 injuries were attributed to the storm. Damages were estimated at millions of dollars.

Hurricane Helene
(9/21/1958)
Hurricane Helene was one of the most powerful storms of recent history. Fortunately for the people of North Carolina, the storm center was well out at sea as it moved north on September 26 and 27. Nevertheless, high winds were recorded at Wilmington, with the highest winds measured at 85 mph and peak gusts recorded at 135 mph. The lowest reported central pressure of the storm was 932 mb; this measurement was recorded south-southeast of Cape Fear early on the morning of September 27. There was some beach erosion due to seas and tides, but this erosion was minimized by the fact that the storm occurred at the time of low astronomical tides. High tides were estimated at 3 to 5 feet above normal; a high tide of 5.1 feet NGVD was reported at Wrightsville Beach. Tides were higher on the southern edge of Pamlico Sound, when the wind shift as the storm center passed brought the tides 7 to 8 feet above normal.

Hurricane Ione
(9/10/1955)
Hurricane Ione moved up from the south and crossed the North Carolina coast near Salter Path, 10 miles west of Morehead City, at about 5 a.m. on September 19. It then slowly curved to the northeast and went out to sea near the Virginia border early on September 20. When Ione entered North Carolina, winds gusted to over 100 mph. Wind speeds of 75 mph with gusts to 107 mph were recorded at Cherry Point. The minimum barometric pressure recorded over North Carolina during this storm was 960 mb. Heavy rains also accompanied Ione. At the same time, prolonged easterly winds drove tidal water onto beaches and into sounds and estuaries to heights of 3 to 10 feet above normal. The result was the largest inundation of eastern North Carolina ever known to have occurred. At New Bern, the depth of the flood was the greatest ever recorded, about 10.5 feet above mean low water; forty city blocks were flooded, several hundred homes were washed away, and thousands more were flooded with up to 4 feet of water. A high tide of 6.9 feet NGVD was reported at Atlantic Beach, North Carolina, and an estimated 5.3 feet NGVD at Wrightsville Beach.

Hurricane Diane
(8/7/1955)
Five days after Hurricane Connie, and before the damage from that storm could be estimated, Hurricane Diane struck the coast near Carolina Beach about 6 a.m. on August 17. The highest wind speed reported during this storm was 74 mph at Wilmington Airport. Storm tides ranged from 5 to 9 feet above mean low water on the beaches (6.8 feet NGVD at Wrightsville Beach), and in some areas of sounds and rivers emptying into sounds, estimated water levels were 5 to 9 feet above normal. Water was 3 feet above flood level in

the business district of Belhaven and "waist deep" in parts of Washington and New Bern. Diane caused severe beach erosion along the North Carolina coast. The total damage caused in North Carolina by both Connie and Diane was estimated to be in excess of $90 million. No deaths or injuries in North Carolina were attributed to either of the storms.

Hurricane Connie
(8/3/1955)
Hurricane Connie entered North Carolina close to Cape Lookout at about 8:30 a.m. on August 12. The prolonged pounding of high waves against the coast caused tremendous beach erosion, probably worse than that caused by Hazel in 1954. Storm tides along the coast from Southport to Nags Head were reported to be about 7 feet NGVD (6.9 feet NGVD at Wrightsville Beach and 7.5 feet NGVD at Kure Beach). Water in sounds and near the mouths of rivers was 5 to 8 feet above normal. At Wilmington, winds were reported at 72 mph, gusting to 83 mph. At Fort Macon, winds of 75 mph, gusts of 100 mph, and barometric pressure of 962 mb were reported. The storm also brought torrential rains with the maximum rainfall, around 12 inches in 48 hours, occurring near Morehead City. Total damage throughout the state was estimated at $50 million.

Hurricane Hazel
(10/5/1954)
Hurricane Hazel was the most destructive storm in the history of North Carolina. The storm crossed the coast just north of Myrtle Beach, South Carolina, as hurricane winds hit the Atlantic coast between Georgetown, South Carolina, and Cape Lookout, North Carolina. Storm tides (i.e., hurricane surge) devastated the immediate ocean front of this stretch of coast. Every fishing pier along 170 miles of coast, from Myrtle Beach to Cedar Island, North Carolina, was destroyed. The waterfront between the South Carolina/North Carolina state boundary and Cape Fear was destroyed. Beach homes, which had been built in a continuous line five miles long behind and along grass-covered dunes (some of which were 20 feet high), simply disappeared – dunes, houses, and all. From Cape Fear to Cape Lookout, the degree of devastation was not as great, but oceanfront property was damaged an average of 50 percent along this entire stretch. To the north of Cape Lookout, the damage was relatively light. Storm surges of 16.6 feet above NGVD were observed at Holden Beach Bridge and Calabash, North Carolina. The highest tide of record was observed during Hurricane Hazel, when ocean tide levels reached approximately 10 feet NGVD at Wrightsville Beach and 11 feet NGVD at Carolina Beach. The lowest recorded barometric pressure of the storm was 938 millibars (mb), reported at Little River Inlet on the North Carolina/South Carolina border. Maximum wind speeds were 83 miles per hour (mph), with gusts recorded at 98 mph at Wilmington, North Carolina, 106 mph at Myrtle Beach, South Carolina, and an estimated 150 mph at Cape Fear. The storm continued inland through North Carolina, causing widespread damage due to high winds and record rainfalls. Nineteen people were killed and 200 injured during this storm.

Table 5, "Historic Flood Elevations" is not applicable in Perquimans County.

4.4 Flood Protection Measures

Flood protection measures may be structural (such as levees, dams, and reservoirs) or non-structural (such as land-use management ordinances, policies, or practices).

Table 6, "Non-Levee Flood Protection Measures" is not applicable in Perquimans County.

Table 7, "Levees" is not applicable in Perquimans County.

4.5 Scope of Study

For this map maintenance revision, a scoping meeting was held in Perquimans County to present the results of initial research to the county and communities within the county and to discuss their floodplain mapping needs. The county and communities were asked to provide input on proposed study priorities and analysis methods. These meetings resulted in the identification of flooding sources having a floodplain mapping need. Map Maintenance Plans were developed based on the results of the scoping meetings and were both mailed to each jurisdiction within Perquimans County and posted to the State's website at www.ncfloodmaps.com.

Draft basin plans were developed based on the results of the initial scoping meetings. Final scoping meetings were held by the State and FEMA to provide counties and communities an overview of the draft basin plans, including the proposed scope and schedule for the project, and to provide an opportunity for additional county and community input. After the final scoping meeting was held, the Final

Basin Plans were produced.

This FIS covers the geographic area of Perquimans County, North Carolina, and all jurisdictions therein. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction. Limits of detailed study are indicated on the Flood Profiles and/or Water-surface elevation rasters and/or the FIRM.

Table 8P, "Scope of Revisions: Revised or New Detailed Study -Preliminary", lists flooding sources that were newly studied by detailed methods or were previously studied by detailed methods and had a change in backwater elevation due to flooding effects from a newly studied flooding source.

Table 8P - Scope of Revisions: Revised or New Detailed Study - Preliminary

Source	Riverine Sources		Affected Communties
	From	To	
Little River	Approximately 2.17 miles downstream from Old US-17	Approximately 1.5 miles upstream of US-17	Perquimans County
Perquimans River	Approximately 2 miles downstream from Belvidere Rd	Approximately 0.75 mile upstream from Perrys Bridge Rd.	Perquimans County

Table 9P, "Scope of Revisions: Redelineated - Preliminary" is not applicable in Perquimans County.

Table 10P, "Scope of Revisions: Limited Detailed - Preliminary", lists flooding sources that were newly studied by limited detailed methods or were previously studied by limited detailed methods and had a change in backwater elevation due to flooding effects from a newly studied flooding source.

Table 10P - Scope of Revisions: Limited Detailed - Preliminary

Source	Riverine Sources		Affected Communties
	From	To	
Bagley Swamp	Approximately 200 feet downstream of Belvidere Rd.	Approximately 0.5 mile upstream from Bagley Swamp Rd.	Perquimans County
Bethel Creek[1]	Approximately 0.20 mile downstream of Burnt Mill Road	Approximately 0.10 mile upstream of Burnt Mill Road	Perquimans County
Burnt Mill Creek[1]	Approximately 0.40 mile upstream of the confluence with the Yeopim River	Approximately 0.60 mile upstream of the confluence with the Yeopim River	Perquimans County
Burnt Mill Creek Tributary 1[1]	Confluence with Burnt Mill Creek	Approximeltey 2000 feet upstream of the confluence with Burn Mill Creek	Perquimans County
Deep Creek	Approximately 340 feet downstream of Woodville Rd.	Approximately 180 feet upstream of Godfreys Ln.	Perquimans County
Goodwin Mill Creek[1]	Approximately 0.40 mile upstream of confluence with Perquimans River	Approximately 1.40 miles upstream of confluence with Perquimans River	Perquimans County
Goodwin Mill Creek Tributary 1[1]	The confluence with Goodwin Mill Creek Tributary 1	Approximately 0.30 mile upstream of the confluence with Goodwin Mill Creek Tributary 1	Perquimans County
Little River	Approximately 1.5 miles upstream of US-17	Approximately 575 feet downstream of Sandy Rd.	Perquimans County
Mill Creek	Approximately 0.20 mile upstream of Wiggins Road	Approximately 1.10 miles upstream of Lake Road	Perquimans County Town Of Winfall
Mill Creek	Approximately 0.3 mile downstream of Four Mile Desert Rd.	Approximately 0.48 miles downstream of Swamp Rd.	Perquimans County
Mill Creek Tributary 1[1]	Confluence with Mill Creek	Approximately 2,200 feet upstream of the confluence with Mill Creek	Perquimans County
Mill Creek Tributary 2[1]	Confluence with Mill Creek	Approximately 2,500 feet upstream of the confluence with Mill Creek	Perquimans County
Perquimans River	Approximately 0.75 mile upstream from Perrys Bridge Rd.	At the Gates/Perquimans border	Perquimans County
Perquimans River	Approximately 2.5 miles downstream of the Gates/Perquimans County Boundary	At the Gates/Perquimans County Boundary	Perquimans County
Perquimans River Tributary 2	Approximately 0.20 mile upstream of the confluence with Perquimans River	Approximately 0.10 mile upstream of Layden Road	Perquimans County Town Of Hertford
Raccoon Creek	Approximately 0.1 mile downstream from Ocean Hwy S.	Approximately 1 mile upstream from Ocean Hwy.	Perquimans County Town Of Hertford
Raccoon Creek Tributary	Approximately 220 feet upstream from confluence with Raccoon Creek	Approximately 0.6 mile upstream from Wynne Fork Rd.	Perquimans County Town Of Hertford
Sutton Creek	Approximately 200 feet downstream from New Hope Rd.	Approximately 0.6 mile upstream from New Hope Rd.	Perquimans County
Tributary to Deep Creek	Approximately 300 feet upstream from confluence with Little River	Approximately 0.8 mile upstream from Woodville Rd.	Perquimans County
Unnamed Tributary to Mill Creek	Approximately 730 feet upstream from confluence with Mill Creek	Approximately 0.9 mile upstream from confluence with Mill Creek	Perquimans County

Table 10P - Scope of Revisions: Limited Detailed - Preliminary

Source	Riverine Sources		Affected Communties
	From	To	
Yeopim Creek	Approximately 0.5 mile upstream from confluence with Yeopim Creek Tributary	Approximately 0.4 mile downstream from Pender Rd.	Perquimans County
Yeopim Creek Tributary 5	Approximately 0.4 miles upstream from confluence with Yeopim Creek	Approximately 1 mile upstream from Holiday Island Rd.	Perquimans County

[1] **Revised to reflect backwater effects from new detailed study**

Table 8, “Flooding Sources Studied by Detailed Methods”, lists all flooding sources within the county that were studied by detailed methods for this FIS and previous FISs.

Table 8 - Flooding Sources Studied by Detailed Methods: Revised or Newly Studied

Source	Riverine Sources		Affected Communties
	From	To	
Little River	Approximately 2.17 miles downstream from Old US-17	Approximately 1.5 miles upstream of US-17	Perquimans County
Perquimans River	Approximately 2 miles downstream from Belvidere Rd	Approximately 0.75 mile upstream from Perrys Bridge Rd.	Perquimans County

Table 9, “Flooding Sources Studied by Detailed Methods: Redelineated” is not applicable in Perquimans County.

Table 10, “Flooding Sources Studied by Detailed Methods: Limited Detailed”, lists all flooding sources within the county that were studied by limited detailed methods for either this FIS or previous FISs.

Table 10 - Flooding Sources Studied by Detailed Methods: Limited Detailed

Source	Riverine Sources		Affected Communties
	From	To	
Bagley Swamp	Approximately 200 feet downstream of Belvidere Rd.	Approximately 0.5 mile upstream from Bagley Swamp Rd.	Perquimans County
Bethel Creek	Approximately 0.20 mile downstream of Burnt Mill Road	Approximately 1.0 mile upstream of US Highway 17	Perquimans County
Burnt Mill Creek	Approximately 0.40 mile upstream of the confluence with the Yeopim River	Approximately 0.30 mile	Perquimans County
Burnt Mill Creek Tributary 1	Confluence with Burnt Mill Creek	Approximately 0.60 mile upstream of US Highway 17	Perquimans County
Burnt Mill Creek Tributary 1A	Confluence with Burnt Mill Creek Tributary 1	Approximately 0.70 mile upstream of US Highway 17	Perquimans County
Deep Creek	Approximately 340 feet downstream of Woodville Rd.	Approximately 180 feet upstream of Godfreys Ln.	Perquimans County
Goodwin Mill Creek	Approximately 0.40 mile upstream of confluence with Perquimans River	Approximately 0.40 mile upstream of North Bear Swamp Road	Perquimans County
Goodwin Mill Creek Tributary 1	Goodwin Mill Creek Tributary 1	Approximately 0.60 mile upstream of Goodwin Mill Road	Perquimans County
Goodwin Mill Creek Tributary 2	Confluence with Goodwin Mill Creek	Approximately 1.20 miles upstream of Brinn Farm Road	Perquimans County
Little River	Approximately 1.5 miles upstream of US-17	Approximately 575 feet downstream of Sandy Rd.	Perquimans County
Mill Creek	Approximately 0.20 mile upstream of Wiggins Road	Approximately 1.10 miles upstream of Lake Road	Perquimans County Town Of Winfall
Mill Creek	Approximately 0.3 mile downstream of Four Mile Desert Rd.	Approximately 0.48 miles downstream of Swamp Rd.	Perquimans County
Mill Creek Tributary 1	Confluence with Mill Creek	Approximately 0.9 mile upstream of Swing Gate Road	Perquimans County
Mill Creek Tributary 2	Confluence with Mill Creek	Approximately 1.00 mile upstream of Swing Gate Road	Perquimans County
Perquimans River	Approximately 0.75 mile upstream from Perrys Bridge Rd.	At the Gates/Perquimans border	Perquimans County
Perquimans River	Approximately 2.5 miles downstream of the Gates/Perquimans County Boundary	At the Gates/Perquimans County Boundary	Perquimans County
Perquimans River Tributary 2	Approximately 0.20 mile upstream of the confluence with Perquimans River	Approximately 0.10 mile upstream of Layden Road	Perquimans County Town Of Hertford
Raccoon Creek	Approximately 0.1 mile downstream from Ocean Hwy S.	Approximately 1 mile upstream from Ocean Hwy.	Perquimans County Town Of Hertford
Raccoon Creek Tributary	Approximately 220 feet upstream from confluence with Raccoon Creek	Approximately 0.6 mile upstream from Wynne Fork Rd.	Perquimans County Town Of Hertford

Table 10 - Flooding Sources Studied by Detailed Methods: Limited Detailed

Source	Riverine Sources		Affected Communties
	From	To	
Sutton Creek	Approximately 0.90 mile upstream of New Hope Road	Approximately 0.20 mile upstream of US Highway 17	Perquimans County
Sutton Creek	Approximately 200 feet downstream from New Hope Rd.	Approximately 0.6 mile upstream from New Hope Rd.	Perquimans County
Sutton Creek Tributary 3	Confluence with Sutton Creek	Approximately 0.30 mile upstream of US Highway 17	Perquimans County
Sutton Creek Tributary 4	Confluence with Sutton Creek	Approximately 2.20 miles upstream of the confluence with Sutton Creek	Perquimans County
Sutton Creek Tributary 5	Confluence with Sutton Creek	Just upstream of US Highway 17	Perquimans County
Sutton Creek Tributary 6	Confluence with Sutton Creek	Approximately 250 feet downstream of Old Hickory Road	Perquimans County
Sutton Creek Tributary 7	Confluence with Sutton Creek	Approximately 500 feet upstream of Woodland Church Road	Perquimans County
Tributary to Deep Creek	Approximately 300 feet upstream from confluence with Little River	Approximately 0.8 mile upstream from Woodville Rd.	Perquimans County
Unnamed Tributary to Mill Creek	Approximately 730 feet upstream from confluence with Mill Creek	Approximately 0.9 mile upstream from confluence with Mill Creek	Perquimans County
Yeopim Creek	Approximately 0.5 mile upstream from confluence with Yeopim Creek Tributary	Approximately 0.4 mile downstream from Pender Rd.	Perquimans County
Yeopim Creek Tributary 5	Approximately 0.4 miles upstream from confluence with Yeopim Creek	Approximately 1 mile upstream from Holiday Island Rd.	Perquimans County

Table 11, “Stream Name Changes” is not applicable in Perquimans County.

Table 12, “Letters of Map Revision” is not applicable in Perquimans County.

5.0 Engineering Methods

For the flooding sources in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded at least once on the average during any 10-, 25-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 25-, 50-, 100-, and 500-year floods, have a 10-, 4-, 2-, 1-, and 0.2% annual chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedance) during the term of a 30-year mortgage is approximately 26 percent (about 3 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

5.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for floods of the selected recurrence intervals for each flooding source studied. Hydrologic analyses are typically performed at the watershed level. Depending on factors such as watershed size and shape, land use and urbanization, and natural or man-made storage, various models or methodologies may be applied. For details on the county’s hydrologic analyses, the hydrologic report is available by request.

A summary of the drainage area-peak discharge relationships for the flooding sources studied by detailed methods is shown in Table 13, “Summary of Discharges”.

Table 13 - Summary of Discharges

Flooding Source		Discharges (cfs)			
Location	Drainage Area (square miles)	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Bagley Swamp					

Table 13 - Summary of Discharges

Flooding Source		Discharges (cfs)			
Location	Drainage Area (square miles)	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Approximately 0.76 mile upstream of the confluence of Perquimans River and Bagely Swamp	3.20	*	*	904	*
Approximately 1.25 miles upstream of the confluence of Perquimans River and Bagely Swamp	2.58	*	*	800	*
Approximately 1.55 miles upstream of the confluence of Perquimans River and Bagely Swamp	2.06	*	*	705	*
Approximately 0.05 mile upstream of the confluence of Perquimans River and Bagely Swamp	1.66	*	*	623	*
Approximately 2.35 miles upstream of the confluence of Perquimans River and Bagely Swamp	1.38	*	*	562	*
Bethel Creek					
Approximately 1.10 miles downstream of Burnt Mill Road	9.98	*	*	1721	*
Approximately 0.20 mile downstream of Burnt Mill Road	9.06	*	*	1630	*
Approximately 0.60 mile upstream of Burnt Mill Road	8.08	*	*	1527	*
Approximately 0.30 mile downstream of US Highway 17	7.08	*	*	1417	*
Approximately 0.30 mile upstream of US Highway 17	6.08	*	*	1301	*
Burnt Mill Creek					
Approximately 0.60 mile downstream of the confluence of Burnt Mill Creek Tributary 1	8.69	*	*	1591	*
Approximately 250 feet upstream of the confluence of Burnt Mill Creek Tributary 1	4.72	*	*	1126	*
Approximately 0.30 mile upstream of the confluence of Burnt Mill Creek Tributary 1	4.46	*	*	1092	*
Approximately 0.20 mile downstream of US Highway 17	2.22	*	*	736	*
Burnt Mill Creek Tributary 1					
At the confluence with Burnt Mill Creek	3.26	*	*	914	*
Approximately 0.30 mile upstream of the mouth	1.85	*	*	663	*
Approximately 0.20 mile upstream of US Highway 17	1.56	*	*	601	*
Burnt Mill Creek Tributary 1A					
At the confluence with Burnt Mill Creek Tributary 1	0.63	*	*	359	*
Deep Creek					
Approximately 2.35 miles upstream of the confluence of Deep Creek and Little River	3.23	*	*	909	*
Approximately 2.8 miles upstream of the confluence of Deep Creek and Little River	2.70	*	*	821	*
Approximately 2.85 miles upstream of the confluence of Deep Creek and Little River	2.30	*	*	750	*
Approximately 3.4 miles upstream of the confluence of Deep Creek and Little River	1.93	*	*	679	*
Approximately 3.75 miles upstream of the confluence of Deep Creek and Little River	1.52	*	*	593	*
Approximately 3.9 miles upstream of the confluence of Deep Creek and Little River	1.09	*	*	491	*
Goodwin Mill Creek					
At the confluence with the Perquimans River	32.46	*	*	3355	*
Just upstream of the confluence of Goodwin Mill Creek Tributary 1	30.14	*	*	3217	*
Approximately 0.70 mile upstream of Beech Springs Road	28.18	*	*	3097	*
Approximately 1.0 mile upstream of Beech Springs Road	24.36	*	*	2851	*
Approximately 2.40 miles upstream of Beech Springs Road	23.28	*	*	2780	*
Approximately 1.40 miles downstream of Great Hope Church Road	22.38	*	*	2718	*
Approximately 0.80 mile downstream of Great Hope Church Road	21.41	*	*	2651	*
Approximately 0.40 mile downstream of Great Hope Church Road	20.51	*	*	2587	*
Approximately 0.30 mile upstream of Great Hope Church Road	19.25	*	*	2496	*
Just upstream of the confluence of Goodwin Mill Creek Tributary 2	13.62	*	*	2052	*

Table 13 - Summary of Discharges

Flooding Source		Discharges (cfs)			
Location	Drainage Area (square miles)	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Approximately 0.30 mile upstream of Center Hill Highway	13.00	*	*	1998	*
Approximately 0.90 mile upstream of Center Hill Highway	5.83	*	*	1269	*
Approximately 1.0 mile upstream of Center Hill Highway	3.77	*	*	993	*
Approximately 0.90 mile downstream of North Bear Swamp Road	2.82	*	*	841	*
Approximately 0.50 mile downstream of North Bear Swamp Road	2.02	*	*	696	*
Approximately 900 feet upstream of North Bear Swamp Road	1.08	*	*	490	*
Goodwin Mill Creek Tributary 1					
At the confluence with Goodwin Mill Creek	1.28	*	*	539	*
Approximately 0.50 mile upstream of the mouth	1.00	*	*	468	*
Goodwin Mill Creek Tributary 2					
At the confluence with Goodwin Mill Creek	4.89	*	*	1150	*
Just upstream on Center Hill Highway	2.92	*	*	859	*
Just upstream of Brinn Farm Road	2.19	*	*	729	*
Little River					
Approximately 1.65 miles upstream of the confluence of Little River and Halls Creek	54.46	2200	3710	4500	6670
Approximately 3.85 miles upstream of the confluence of Little River and Halls Creek	49.60	2070	3520	4260	6340
Approximately 1.40 mile upstream of US Highway 17	46.39	*	*	4106	*
Approximately 1.60 mile upstream of US Highway 17	36.95	*	*	3610	*
Approximately 1.70 mile upstream of US Highway 17	36.28	*	*	3573	*
Approximately 1.80 mile downstream of Foreman Bundy Road	35.71	*	*	3541	*
Approximately 1.10 mile downstream of Foreman Bundy Road	30.89	*	*	3262	*
Approximately 0.80 mile downstream of Foreman Bundy Road	30.70	*	*	3251	*
Approximately 900 feet downstream of Foreman Bundy Road	29.70	*	*	3190	*
Approximately 1.0 mile downstream of Five Bridge Road	27.39	*	*	3047	*
Approximately 0.50 mile downstream of Five Bridge Road	22.93	*	*	2756	*
Approximately 800 feet downstream of Five Bridge Road	22.01	*	*	2693	*
Approximately 0.60 mile upstream of Five Bridge Road	13.89	*	*	2075	*
Approximately 0.70 mile upstream of Five Bridge Road	12.50	*	*	1955	*
Mill Creek					
Approximately 0.30 mile upstream of Wiggins Road	15.68	*	*	2222	*
Approximately 0.30 mile downstream of Lake Road	15.40	*	*	2200	*
Approximately 0.30 mile upstream of Lake Road	14.42	*	*	2119	*
Approximately 0.60 mile upstream of Lake Road	13.74	*	*	2062	*
Just upstream of the confluence of Mill Creek Tributary 1	11.29	*	*	1846	*
Approximately 0.30 mile upstream of the confluence of Mill Creek Tributary 1	11.06	*	*	1824	*
Just upstream of the confluence of Mill Creek Tributary 2	10.22	*	*	1744	*
Approximately 0.60 mile upstream of the second crossing of Lake Road	5.70	*	*	1254	*
Approximately 0.3 mile downstream of Two Mile Desert Rd.	5.41	*	*	1254	*
Approximately 0.5 mile upstream of Four Mile Desert Rd.	4.36	*	*	1150	*
Approximately 0.6 mile upstream of Four Mile Desert Rd.	3.98	*	*	1020	*
Approximately 0.7 mile upstream of four Mile Desert Rd.	3.96	*	*	1020	*
Approximately 0.8 mile upstream of four Mile Desert Rd.	2.67	*	*	816	*
Mill Creek Tributary 1					
At the confluence with Mill Creek	1.93	*	*	678	*

Table 13 - Summary of Discharges

Flooding Source		Discharges (cfs)			
Location	Drainage Area (square miles)	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Approximately 0.40 mile upstream of Swing Gate Road	1.01	*	*	470	*
Mill Creek Tributary 2					
At the confluence with Mill Creek	0.77	*	*	403	*
Perquimans River					
Approximately 1.05 miles upstream of the confluence of Goodwin Mill Creek and Perquimans River	75.08	2680	4470	5390	7930
Approximately 0.6 mile upstream of Perrys Bridge Road.	62.16	2380	4010	4850	7160
Approximately 1.5 miles upstream of Sandy Cross Road	19.25	*	*	2496	*
Approximately 1.7 miles upstream of Sandy Cross Road	19.23	*	*	2494	*
Approximately 2.3 miles upstream of Sandy Cross Road	18.21	*	*	2419	*
Approximately 2.7 miles upstream of Sandy Cross Road	7.44	*	*	1457	*
Approximately 3.3 miles upstream of Sandy Cross Road	6.69	*	*	1372	*
Approximately 100 feet downstream of Ocean Hwy S.	3.79	*	*	995	*
Approximately 0.3 mile upstream of Ocean Highway S.	2.82	*	*	842	*
Approximately 0.7 mile upstream of Ocean Highway S.	2.62	*	*	807	*
Approximately 3.5 miles upstream of Sandy Cross Road	1.78	*	*	649	*
At the Gates/Perquimans County boundary Perquimans County boundary	1.50	*	*	649	*
Approximately 1.05 mile upstream of Ocean Highway S.	1.04	*	*	481	*
Perquimans River Tributary 2					
At the confluence with the Perquimans River	2.95	*	*	863	*
Approximately 0.40 mile upstream of the mouth	2.84	*	*	845	*
Approximately 1.0 mile upstream of the mouth	1.84	*	*	662	*
Approximately 350 feet upstream of Layden Road	1.13	*	*	501	*
Raccoon Creek Tributary					
Approximately 300 feet upstream of confluence with Raccoon Creek.	2.31	*	*	752	*
Approximately 0.5 mile upstream of Ocean Hwy S.	1.93	*	*	679	*
Approximately 0.9 mile upstream of Ocean Hwy S.	1.58	*	*	606	*
Approximately 1.1 miles upstream of Ocean Hwy S.	1.13	*	*	502	*
Sutton Creek					
Approximately 250 feet upstream of New Hope Rd.	9.98	*	*	1720	*
Approximately 0.6 mile upstream of New Hope Rd.	8.73	*	*	1600	*
Approximately 80 feet upstream of the confluence of Sutton Creek Tributary 3	8.16	*	*	1535	*
Just upstream of the confluence of Sutton Creek Tributary 4	6.32	*	*	1328	*
Just upstream of the confluence of Sutton Creek Tributary 5	5.66	*	*	1249	*
Just upstream of the confluence of Sutton Creek Tributary 6	3.88	*	*	1009	*
Just upstream of the confluence of Sutton Creek Tributary 7	1.60	*	*	610	*
Approximately 0.20 mile upstream of the confluence of Sutton Tributary 7	1.54	*	*	597	*
Sutton Creek Tributary 3					
At the confluence with Sutton Creek	0.29	*	*	230	*
Sutton Creek Tributary 4					
At the confluence with Sutton Creek	1.81	*	*	655	*
Approximately 0.20 mile downstream of Woodland Church Road	1.07	*	*	485	*
Sutton Creek Tributary 5					

Table 13 - Summary of Discharges

Flooding Source		Discharges (cfs)			
Location	Drainage Area (square miles)	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
At the confluence with Sutton Creek	0.22	*	*	198	*
Sutton Creek Tributary 6					
At the confluence with Sutton Creek	1.49	*	*	587	*
Approximately 700 feet upstream of US Highway 17	1.00	*	*	469	*
Sutton Creek Tributary 7					
At the confluence with Sutton Creek	2.26	*	*	742	*
Approximately 0.30 mile upstream of the mouth	2.11	*	*	715	*
Tributary to Deep Creek					
Approximately 280 feet upstream of confluence with Deep Creek.	3.49	*	*	949	*
Approximately 0.8 mile upstream of confluence with Deep Creek.	2.85	*	*	847	*
Approximately 1.35 miles upstream of the confluence with Deep Creek	2.53	*	*	791	*
Approximately 1.4 miles upstream of the confluence with Deep Creek	2.22	*	*	735	*
Approximately 1.7 miles upstream of the confluence with Deep Creek	1.88	*	*	669	*
Unnamed Tributary to Mill Creek					
Approximately 1,000 feet downstream from Lowes Lane	3.69	*	*	980	*
Approximately 0.8 mile upstream from Lowes Lane	3.22	*	*	907	*
Yeopim Creek					
At confluence with Yeopim Creek Tributary 6.	2.89	*	*	853	*
Approximately 0.6 mile upstream of confluence with Yeopim Creek Tributary 6.	1.10	*	*	494	*
Yeopim Creek Tributary 5					
At Holiday Island Rd.	3.31	*	*	921	*
Approximately 0.7 mile upstream of Holiday Island Road	1.18	*	*	514	*

Table 14, “Summary of Stillwater Elevations” is not applicable in Perquimans County.

Table 15, “Gage Information” is not applicable in Perquimans County.

5.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the flood elevations for the selected recurrence intervals. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and/or Water-surface elevation rasters. For stream segments for which BFEs were computed, selected cross-section locations are also shown on the FIRM. Flood Profiles and/or Water-surface elevation rasters were developed showing computed water-surface elevations for floods of the selected recurrence intervals.

Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles and/or Water-surface elevation rasters or in the Floodway Data tables in the FIS Report. For construction and/or floodplain management purposes, users are encouraged to use the flood elevation data presented in the FIS in conjunction with the data shown on the FIRM.

The hydraulic analyses for this FIS were based on unobstructed flow. The flood elevations shown on the Flood Profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

For details on the county’s hydraulic analyses, the hydraulic report is available by request.

For the streams studied by detailed methods, water surface elevations of floods of the selected recurrence intervals were computed through use of the Army Corps of Engineers' HEC RAS step backwater computer program . The hydraulic analyses were based on unobstructed flow. The flood elevations shown on the Profiles and/or Water-surface elevation rasters are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail. The computer models were calibrated using historic high water data collected during field investigations.

The cross section geometries were obtained from a combination of digital elevation data obtained by Light Detection and Ranging (LIDAR) and field surveys. All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry. Natural floodplain cross sections were surveyed approximately every 4000 feet along the detail study reaches to obtain the channel geometry between bridges and culverts. Overbank cross section data for the backwater analyses were obtained from recently flown LIDAR data.

Channel roughness factors (Manning's "n") used in the hydraulic computations were made in the field by an engineer where stream access was possible, with orthophotos used to supplement areas that could not be accessed. The channel and overbank "n" values for all of the streams studied by detailed methods are shown in Table 16, "Roughness Coefficients".

Table 16 - Roughness Coefficients

Stream	Channel "n"	Overbank "n"
Bagley Swamp	0.045	0.140
Bethel Creek	0.045	0.140
Burnt Mill Creek	0.045	0.140
Burnt Mill Creek Tributary 1	0.045	0.060 to 0.140
Burnt Mill Creek Tributary 1A	0.045	0.060 to 0.140
Deep Creek	0.045	0.100 to 0.120
Goodwin Mill Creek	0.045	0.140
Goodwin Mill Creek Tributary 1	0.045	0.101
Goodwin Mill Creek Tributary 2	0.045	0.071 to 0.140
Little River	0.040 to 0.070	0.014 to 0.200
Mill Creek	0.045	0.100 to 0.140
Mill Creek Tributary 1	0.045	0.101 to 0.140
Mill Creek Tributary 2	0.045	0.090 to 0.140
Perquimans River	0.040 to 0.070	0.090 to 0.200
Perquimans River Tributary 2	0.045	0.140
Raccoon Creek	0.043 to 0.045	0.090 to 0.110
Raccoon Creek Tributary	0.045	0.100 to 0.140
Sutton Creek	0.045	0.060 to 0.140
Sutton Creek Tributary 3	0.045	0.060 to 0.140
Sutton Creek Tributary 4	0.045	0.060 to 0.140
Sutton Creek Tributary 5	0.045	0.060 to 0.140
Sutton Creek Tributary 6	0.045	0.081
Sutton Creek Tributary 7	0.045	0.140
Tributary to Deep Creek	0.045	0.090 to 0.100
Unnamed Tributary to Mill Creek	0.045	0.100 to 0.110
Yeopim Creek	0.045	0.100
Yeopim Creek Tributary 5	0.045	0.140

For flooding sources studied by limited detailed methods in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this report and the FIRM panels. This method entails developing a HEC-RAS hydraulic model, resulting in the calculation of BFEs and the delineation of the 1% annual chance floodplain (designated as Zone AE). Cross sections for the flooding sources studied by limited detailed methods were obtained using digital elevation data obtained with LIDAR technology developed as part of the North Carolina Statewide Floodplain Mapping Program. The hydraulic model is prepared using this digital elevation data, without surveying bathymetric or structural data. Where bridge or culvert data are readily available, such as from the North Carolina Department of Transportation, these data have been reflected in the hydraulic model. If these structural data are not readily available, field measurements of these structures were made to approximate their geometry in the hydraulic models. In addition, this method does not include field surveys that determine specifics on channel and floodplain characteristics. A limited detailed study is a "buildable" product that can be upgraded to a fully detailed study at a later date by verifying stream channel characteristics, bridge and culvert opening geometry, and by analyzing multiple recurrence intervals.

The results of the HEC-RAS computations are tabulated for all cross sections (Table 17, "Limited Detailed Flood Hazard Data"). Flood

Profiles have not been developed for streams studied by limited detailed methods. Water-surface elevation rasters were developed for steams studied by limited detailed methods. In addition, floodways for streams studied by limited detailed methods are not delineated on the FIRM. However, the 1% annual chance water-surface elevations, flood discharges, and non-encroachment widths from the limited detailed studies for every modeled cross section are given in Table 17. The non-encroachment widths given at modeled cross sections can be used by communities to enforce floodplain management ordinances that meet the requirement defined in 44 CFR 60.3(c)(10).

Between cross sections for streams studied by limited detailed methods, 1% annual chance water-surface elevations can be calculated by mathematical interpolation using the distance along the stream centerline. Non-encroachment widths and, therefore, the location of a non-encroachment area boundary between cross sections should be determined based on either 1) mathematical interpolation, or 2) the non-encroachment width at the upstream or downstream cross section, whichever is larger. If the width determined by this second method is wider than the Special Flood Hazard Area (SFHA) or the 1% annual chance floodplain delineated on the FIRM for this location along the stream, the non-encroachment area shall be considered to be coincident with the SFHA. A full detailed study incorporating field survey data in the HEC-RAS hydraulic model may be submitted for a Letter of Map Revision (LOMR) request to map a regulatory floodway along a section of a stream in lieu of applying the non-encroachment widths listed in Table 17.

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
Bagley Swamp				
041	4,133	904	4.9	33 / 107
044	4,371	904	5.0	100 / 83
046	4,598	904	5.0	100 / 122
048	4,830	904	5.0	52 / 170
053	5,257	904	5.1	73 / 124
055	5,515	904	5.2	202 / 61
060	6,037	904	5.2	121 / 221
065	6,537	904	5.3	175 / 43
070	7,037	800	5.4	159 / 134
074	7,403	800	5.4	112 / 104
078	7,820	800	5.5	69 / 187
081	8,094	705	5.5	31 / 126
083	8,289	705	5.6	91 / 88
084	8,372	705	5.7	45 / 88
085	8,537	705	5.8	52 / 111
090	9,037	705	6.0	133 / 37
095	9,537	705	6.1	55 / 73
098	9,813	705	6.3	53 / 42
103	10,255	705	6.6	36 / 166
105	10,522	623	6.9	40 / 111
106	10,639	623	7.0	19 / 106
107	10,680	623	7.0	19 / 105
107	10,737	623	7.0	8 / 120
109	10,875	623	7.1	75 / 149
110	10,950	623	7.1	38 / 59
110	10,990	623	7.1	38 / 59
111	11,098	623	7.3	16 / 43
113	11,341	623	7.7	24 / 124
115	11,452	623	8.4	29 / 124
117	11,654	623	8.4	33 / 32

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
120	12,037	623	8.5	46 / 32
123	12,345	562	8.6	27 / 70
125	12,475	562	8.7	40 / 13
125	12,516	562	8.7	39 / 12
126	12,594	562	8.8	52 / 17
129	12,892	562	9.0	40 / 24
133	13,277	562	9.1	124 / 36
135	13,537	562	9.2	96 / 77
140	14,037	562	9.4	10 / 8
Bethel Creek				
082	8,192	1,630	4.3	40 / 334
089	8,877	1,630	5.3	173 / 170
093	9,297	1,630	5.5	115 / 226
097	9,727	1,630	5.7	115 / 226
104	10,364	1,630	6.2	209 / 85
109	10,874	1,630	6.5	83 / 292
114	11,384	1,630	6.6	238 / 202
119	11,937	1,527	6.8	172 / 256
124	12,411	1,527	7.0	42 / 301
130	12,960	1,527	7.2	119 / 215
135	13,548	1,527	7.4	542 / 51
140	14,046	1,527	7.5	184 / 87
147	14,680	1,527	7.7	135 / 222
152	15,209	1,527	7.9	73 / 219
157	15,659	1,417	8.0	79 / 243
162	16,183	1,417	8.2	97 / 239
167	16,710	1,417	8.3	168 / 167
177	17,734	1,417	9.8	297 / 100
182	18,242	1,417	9.8	383 / 32
188	18,799	1,301	9.9	132 / 335
193	19,293	1,301	10.0	76 / 308
198	19,808	1,301	10.1	165 / 183
203	20,314	1,301	10.2	184 / 205
209	20,854	1,301	10.4	208 / 234
214	21,397	1,301	10.5	305 / 36
221	22,070	1,301	10.8	108 / 241
226	22,576	1,301	11.0	192 / 161
Burnt Mill Creek				
080	8,020	1,591	4.1	267 / 166
085	8,515	1,591	4.3	197 / 194
090	9,019	1,591	4.6	136 / 276
095	9,524	1,591	4.8	189 / 140
100	10,018	1,591	5.0	300 / 110
105	10,544	1,126	5.2	78 / 103
110	11,028	1,126	5.6	162 / 76

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
115	11,544	1,126	5.9	230 / 18
120	12,043	1,092	6.2	47 / 213
125	12,542	1,092	6.6	167 / 103
130	13,040	1,092	7.0	88 / 18
135	13,542	1,092	7.4	165 / 36
140	14,036	1,092	7.8	105 / 90
145	14,527	1,092	8.2	53 / 212
150	14,981	1,092	8.6	33 / 119
155	15,542	1,092	12.3	253 / 120
160	16,010	1,092	12.4	494 / 120
166	16,581	1,092	12.4	285 / 57
170	17,040	1,092	12.6	297 / 144
175	17,537	736	12.6	120 / 106
180	18,004	736	12.8	100 / 70
192	19,241	736	13.2	24 / 133
197	19,724	736	13.4	144 / 180
Burnt Mill Creek Tributary 1				
005	539	914	5.2[1]	91 / 109
010	971	914	5.2[1]	49 / 166
015	1,543	663	5.2[1]	200 / 45
020	1,982	663	5.6	55 / 130
025	2,468	663	6.3	30 / 20
029	2,910	663	6.7	96 / 76
036	3,615	663	9.0	44 / 115
041	4,082	663	9.2	30 / 82
051	5,054	663	10.5	15 / 125
055	5,479	663	10.8	125 / 31
060	6,006	601	11.1	85 / 251
066	6,600	601	11.6	100 / 65
071	7,076	601	12.5	130 / 40
075	7,543	601	13.1	350 / 195
Burnt Mill Creek Tributary 1A				
005	546	359	6.2	12 / 10
014	1,357	359	10.2	67 / 73
019	1,899	359	11.0	20 / 82
030	3,007	359	15.1	137 / 60
035	3,503	359	15.3	123 / 25
038	3,845	359	15.6	414 / 23
044	4,409	359	16.0	364 / 220
050	5,000	359	16.5	257 / 200
055	5,495	359	16.9	305 / 300
062	6,171	359	17.2	319 / 565
Deep Creek				
000	14	909	4.5	198 / 24
003	338	909	4.9	86 / 30
004	407	909	5.9	93 / 23

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
006	600	909	6.1	63 / 136
008	847	909	6.2	71 / 104
011	1,087	821	6.3	137 / 67
015	1,546	821	6.4	45 / 139
020	1,999	821	6.5	41 / 158
023	2,280	821	6.6	27 / 149
025	2,522	821	6.6	121 / 80
028	2,787	821	6.7	99 / 76
031	3,132	821	6.8	72 / 71
035	3,500	821	7.0	24 / 66
039	3,914	750	7.3	74 / 50
045	4,485	750	7.4	76 / 88
046	4,592	750	7.4	80 / 84
049	4,947	750	7.6	22 / 153
053	5,337	750	7.6	20 / 389
055	5,498	750	7.6	13 / 494
058	5,817	679	7.7	127 / 267
062	6,242	679	7.8	20 / 359
064	6,359	679	7.8	17 / 375
065	6,468	679	7.8	17 / 288
068	6,827	679	7.9	96 / 90
070	7,038	593	8.0	67 / 134
072	7,232	593	8.1	142 / 22
075	7,496	593	8.2	79 / 23
078	7,807	593	8.2	89 / 23
081	8,053	593	8.3	173 / 39
081	8,091	593	8.3	173 / 40
082	8,238	593	8.4	138 / 61
090	8,987	491	8.5	63 / 54
093	9,271	491	8.6	113 / 67
093	9,303	491	8.6	113 / 66
095	9,471	491	8.6	40 / 181
Goodwin Mill Creek				
020	2,006	3,355	4.7	853 / 1,101
030	2,998	3,355	4.8	627 / 720
040	4,004	3,355	4.9	463 / 554
050	5,009	3,355	5.1	266 / 334
060	6,000	3,217	5.5	347 / 152
070	7,000	3,217	5.8	673 / 51
080	7,995	3,217	6.0	340 / 326
090	8,990	3,217	6.2	196 / 390
101	10,138	3,217	6.8	370 / 787
110	11,036	3,217	6.8	848 / 505
120	12,002	3,217	6.8	645 / 295
130	12,993	3,217	6.9	595 / 348

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
140	13,998	3,097	7.0	375 / 506
150	14,997	2,851	7.1	836 / 523
160	16,002	2,851	7.1	479 / 437
170	16,996	2,851	7.2	309 / 719
180	18,010	2,851	7.2	435 / 562
190	18,999	2,851	7.3	627 / 296
200	19,992	2,851	7.4	211 / 406
210	21,000	2,851	7.6	165 / 228
220	21,992	2,851	7.9	78 / 320
230	22,997	2,780	8.1	187 / 285
240	23,999	2,780	8.4	119 / 223
250	25,020	2,718	8.7	236 / 170
260	26,003	2,718	8.8	147 / 362
270	26,993	2,718	9.0	221 / 427
279	27,923	2,651	9.1	158 / 268
290	28,997	2,651	9.3	148 / 295
300	29,995	2,587	9.6	284 / 259
310	30,995	2,587	9.8	224 / 207
320	31,977	2,587	10.2	158 / 282
330	32,992	2,587	10.4	187 / 314
340	34,049	2,496	10.6	110 / 627
351	35,066	2,496	10.8	327 / 100
360	36,008	2,496	11.1	399 / 57
370	37,027	2,496	11.3	286 / 138
380	37,977	2,496	11.6	153 / 286
390	38,981	2,052	11.9	62 / 140
400	40,006	2,052	12.5	89 / 165
430	43,005	2,052	13.2	135 / 134
440	44,015	1,998	13.5	154 / 96
450	44,998	1,998	13.7	189 / 338
460	46,013	1,998	13.8	800 / 700
470	47,006	1,269	13.8	2,800 / 1,200
480	48,008	993	13.8	2,600 / 585
490	48,991	993	13.8	2,400 / 780
500	49,994	993	13.8	2,100 / 790
511	51,105	993	13.9	1,900 / 560
520	52,006	841	13.9	1,020 / 970
530	52,989	841	13.9	610 / 1,230
541	54,087	696	14.0	520 / 630
550	55,018	696	14.1	43 / 818
569	56,871	696	14.6	345 / 410
579	57,896	490	15.2	300 / 500
Goodwin Mill Creek Tributary 1				
026	2,627	539	5.4[1]	20 / 85
030	2,989	468	5.4[1]	67 / 29

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
036	3,615	468	6.8	74 / 11
040	4,008	468	7.2	29 / 20
045	4,512	468	7.9	33 / 39
050	5,013	468	8.6	48 / 20
055	5,465	468	10.2	42 / 6
060	6,010	468	11.6	45 / 64
Goodwin Mill Creek Tributary 2				
005	498	1,150	11.6[1]	160 / 35
010	993	1,150	11.6[1]	68 / 35
014	1,440	1,150	11.6[1]	40 / 40
020	1,994	1,150	11.6[1]	41 / 38
025	2,505	1,150	11.6[1]	47 / 34
030	2,996	1,150	12.1	70 / 30
034	3,407	1,150	12.4	69 / 28
040	3,992	1,150	12.8	59 / 85
044	4,392	1,150	13.0	86 / 63
056	5,562	859	13.8	27 / 100
060	6,001	859	13.9	88 / 62
064	6,386	859	14.1	47 / 62
071	7,062	729	14.4	100 / 132
075	7,545	729	14.5	100 / 132
080	7,997	729	14.6	122 / 109
085	8,495	729	14.7	120 / 153
090	8,994	729	14.8	162 / 203
095	9,466	729	14.8	162 / 250
099	9,940	729	14.9	193 / 140
105	10,499	729	15.0	31 / 130
110	11,011	729	15.1	50 / 130
115	11,476	729	15.2	34 / 200
120	11,999	729	15.3	100 / 200
128	12,783	729	15.4	187 / 275
Little River				
791	79,093	3,610	6.5	1,000 / 1,110
797	79,745	3,573	6.5	599 / 765
805	80,517	3,573	6.6	635 / 2,472
812	81,179	3,573	6.6	793 / 1,185
820	81,956	3,573	6.6	980 / 816
827	82,717	3,573	6.7	877 / 1,106
833	83,339	3,541	6.7	684 / 1,264
838	83,850	3,541	6.7	1,293 / 835
843	84,303	3,541	6.7	471 / 922
849	84,858	3,541	6.8	443 / 879
854	85,358	3,541	6.8	514 / 690
860	85,973	3,541	6.9	921 / 530
864	86,399	3,262	6.9	1,051 / 632

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
874	87,354	3,262	7.0	850 / 1,376
879	87,897	3,251	7.0	703 / 1,430
883	88,328	3,251	7.0	616 / 1,024
889	88,885	3,251	7.1	309 / 1,082
894	89,376	3,251	7.1	539 / 925
899	89,851	3,251	7.2	979 / 421
905	90,465	3,251	7.2	834 / 379
909	90,884	3,251	7.2	894 / 533
914	91,362	3,190	7.3	587 / 980
918	91,787	3,190	7.3	500 / 1,082
926	92,574	3,190	7.5	934 / 638
937	93,747	3,190	7.6	329 / 1,179
943	94,284	3,190	7.6	680 / 634
950	94,962	3,047	7.7	780 / 695
957	95,704	3,047	7.7	696 / 1,033
964	96,447	3,047	7.8	640 / 949
970	97,020	3,047	7.8	640 / 690
974	97,442	2,756	7.8	1,146 / 530
981	98,079	2,756	7.9	747 / 574
987	98,656	2,756	8.0	718 / 424
991	99,057	2,756	8.1	701 / 700
1006	100,572	2,693	8.4	582 / 920
1014	101,353	2,693	8.6	455 / 958
1020	101,972	2,693	8.7	603 / 839
1026	102,575	2,693	8.7	641 / 960
1037	103,747	2,075	8.8	531 / 900
1047	104,687	1,955	8.8	973 / 130
1054	105,357	1,955	8.9	140 / 1,013
1064	106,402	1,955	10.0	1,015 / 291
Mill Creek				
112	11,209	2,222	4.5	49 / 422
116	11,590	2,222	4.7	55 / 306
120	12,000	2,200	5.0	57 / 328
125	12,510	2,200	5.3	137 / 159
130	13,009	2,200	5.5	275 / 155
133	13,281	2,200	5.6	54 / 54
133	13,328	2,200	6.0	54 / 54
138	13,780	2,200	6.4	133 / 321
145	14,497	2,200	6.5	326 / 266
150	15,005	2,119	6.6	181 / 69
155	15,523	2,119	6.8	130 / 224
160	16,003	2,119	7.0	146 / 165
165	16,507	2,119	7.2	95 / 179
170	17,012	2,062	7.4	89 / 229
175	17,498	2,062	7.6	110 / 340

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
180	18,003	2,062	7.7	188 / 139
185	18,502	2,062	7.8	85 / 285
190	18,998	2,062	7.9	148 / 225
195	19,479	2,062	8.0	237 / 152
200	19,999	2,062	8.1	168 / 173
205	20,496	2,062	8.2	204 / 170
210	20,997	2,062	8.3	106 / 232
215	21,485	2,062	8.4	102 / 407
220	21,995	1,846	8.5	180 / 161
225	22,509	1,846	8.6	153 / 157
230	23,007	1,846	8.6	219 / 105
235	23,497	1,824	8.7	138 / 133
240	23,997	1,824	8.9	156 / 111
245	24,485	1,824	9.0	170 / 115
249	24,947	1,824	9.1	265 / 106
250	25,050	1,824	9.0	27 / 27
251	25,079	1,824	9.6	30 / 30
255	25,499	1,744	9.9	112 / 152
260	26,007	1,744	10.0	144 / 178
265	26,502	1,744	10.1	199 / 170
270	27,014	1,744	10.1	255 / 120
272	27,181	1,744	10.1	158 / 99
272	27,226	1,744	10.2	157 / 107
275	27,510	1,744	10.3	228 / 82
280	28,010	1,744	10.3	193 / 131
285	28,505	1,744	10.4	203 / 169
290	28,987	1,744	10.4	64 / 269
295	29,513	1,744	10.4	76 / 372
300	30,022	1,744	10.5	275 / 135
306	30,574	1,254	10.5	210 / 150
310	31,003	1,254	10.6	67 / 98
315	31,509	1,254	10.6	190 / 240
320	31,966	1,254	10.6	106 / 143
325	32,476	1,254	10.7	192 / 183
325	32,476	1,254	10.9	212 / 162
329	32,930	1,150	10.9	55 / 282
334	33,430	1,150	10.9	50 / 343
337	33,738	1,150	11.0	161 / 86
340	34,046	1,150	11.0	217 / 113
341	34,127	1,150	11.0	216 / 114
343	34,343	1,150	11.0	96 / 258
349	34,941	1,150	11.1	64 / 98
352	35,192	1,150	11.1	275 / 123
354	35,373	1,150	11.2	72 / 159
354	35,413	1,150	11.2	72 / 160

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
355	35,526	1,150	11.2	59 / 135
359	35,922	1,150	11.3	66 / 113
366	36,613	1,150	11.4	44 / 161
371	37,070	1,020	11.5	107 / 361
373	37,272	1,020	11.5	99 / 152
377	37,662	1,020	11.6	21 / 146
381	38,072	1,020	11.7	220 / 76
385	38,477	1,020	11.7	97 / 431
390	38,973	816	11.8	127 / 171
391	39,135	816	11.8	20 / 361
392	39,178	816	11.8	20 / 361
393	39,306	816	11.8	51 / 199
394	39,430	816	11.8	21 / 186
Mill Creek Tributary 1				
005	505	678	8.4[1]	74 / 172
010	997	678	8.4[1]	69 / 98
015	1,499	678	8.4[1]	42 / 108
020	2,001	678	8.4[1]	93 / 57
025	2,498	678	9.7	99 / 89
030	3,000	678	9.7	76 / 175
035	3,495	678	9.8	69 / 64
040	3,997	678	9.9	72 / 87
045	4,497	470	10.0	42 / 152
050	5,000	470	10.0	6 / 115
056	5,601	470	10.3	17 / 76
062	6,155	470	10.8	69 / 64
065	6,513	470	11.4	72 / 86
070	6,986	470	12.4	27 / 44
Mill Creek Tributary 2				
005	506	403	9.7[1]	32 / 66
010	985	403	9.7[1]	14 / 82
020	1,998	403	9.7[1]	48 / 28
025	2,494	403	9.7[1]	61 / 12
030	2,980	403	10.4	47 / 1
034	3,368	403	11.4	7 / 44
039	3,893	403	12.8	41 / 39
044	4,399	403	13.5	459 / 494
050	4,971	403	13.8	740 / 426
055	5,529	403	13.8	800 / 734
060	6,021	403	13.8	600 / 616
065	6,519	403	13.9	570 / 621
Perquimans River				
369	36,933	4,850	6.8	777 / 654
384	38,390	4,850	6.9	830 / 1,647
394	39,357	4,850	6.9	1,612 / 1,128
420	41,996	4,850	7.0	1,906 / 442

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
431	43,121	4,850	7.0	1,076 / 769
443	44,282	4,850	7.2	1,373 / 407
450	44,965	4,130	7.2	943 / 547
462	46,239	4,130	7.5	758 / 264
473	47,299	4,130	7.7	687 / 521
482	48,250	4,130	7.8	186 / 929
496	49,554	4,130	8.0	46 / 899
513	51,290	4,130	8.1	1,053 / 418
525	52,523	4,130	8.4	48 / 687
535	53,544	4,130	8.7	225 / 224
537	53,653	4,130	8.8	225 / 268
555	55,516	4,130	9.3	539 / 288
566	56,556	4,130	9.5	341 / 423
574	57,368	4,130	9.6	34 / 670
581	58,114	4,130	9.8	460 / 373
590	59,000	4,130	9.8	508 / 410
601	60,051	4,130	9.9	568 / 439
610	61,023	3,670	10.1	778 / 284
612	61,243	3,670	10.2	815 / 271
619	61,893	2,496	10.2	1,115 / 67
619	61,893	2,496	10.2	1,115 / 67
626	62,629	2,496	10.3	1,558 / 21
633	63,285	2,494	10.3	1,773 / 21
641	64,104	2,494	10.3	1,375 / 281
648	64,807	2,494	10.4	1,084 / 34
656	65,584	2,494	10.4	482 / 366
660	66,005	2,419	10.4	538 / 654
664	66,422	2,419	10.4	631 / 479
669	66,937	2,419	10.4	970 / 54
675	67,483	2,419	10.5	583 / 251
679	67,944	2,419	10.5	1,353 / 221
687	68,726	1,457	10.6	615 / 310
695	69,476	1,457	10.6	572 / 322
701	70,062	1,457	10.6	774 / 33
710	70,980	1,457	10.6	732 / 283
718	71,757	1,372	10.7	785 / 290
724	72,425	649	10.7	353 / 894
729	72,947	649	10.7	98 / 1,113
736	73,585	649	10.7	432 / 2,692
742	74,229	649	10.7	2,117 / 744
750	74,952	649	10.7	1,268 / 625
756	75,589	649	10.7	552 / 565
Perquimans River Tributary 2				
010	1,037	863	4.4	274 / 77
015	1,491	863	4.6	143 / 92

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
020	2,000	863	4.8	20 / 218
025	2,501	845	4.9	144 / 175
030	3,002	845	5.0	79 / 142
035	3,503	845	5.1	112 / 192
040	4,003	845	5.2	218 / 89
045	4,504	845	5.4	106 / 129
050	5,004	845	5.6	215 / 20
055	5,503	662	5.9	120 / 82
060	6,007	662	6.2	166 / 71
066	6,572	662	6.5	82 / 148
070	7,002	662	6.7	167 / 102
075	7,461	662	7.1	47 / 37
075	7,525	662	9.1	47 / 37
080	8,000	501	9.3	106 / 33
085	8,500	501	9.5	64 / 49
090	9,002	501	9.8	76 / 27
092	9,154	501	9.9	111 / 82
092	9,199	501	9.9	111 / 82
095	9,525	501	10.3	90 / 130
Raccoon Creek				
017	1,654	995	4.7	36 / 41
020	2,023	995	4.9	98 / 91
025	2,472	995	5.0	156 / 93
029	2,873	995	5.1	156 / 62
032	3,189	842	5.2	107 / 98
034	3,428	842	5.2	86 / 141
036	3,582	842	5.3	67 / 168
038	3,838	842	5.3	51 / 145
039	3,861	842	5.4	52 / 144
040	3,998	842	5.4	154 / 94
044	4,438	842	5.5	122 / 116
048	4,802	842	5.5	43 / 110
050	4,982	842	5.6	36 / 104
052	5,230	842	5.7	48 / 139
056	5,572	842	5.8	18 / 127
057	5,710	805	5.9	153 / 89
059	5,877	805	5.9	60 / 60
059	5,923	805	6.0	60 / 60
060	6,009	805	6.0	72 / 82
063	6,307	805	6.2	114 / 17
065	6,546	805	6.5	134 / 17
068	6,770	805	6.7	200 / 17
071	7,091	481	7.0	66 / 28
074	7,375	481	7.2	37 / 46
078	7,808	481	7.5	35 / 64

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
Raccoon Creek Tributary				
010	1,049	752	4.2	103 / 103
014	1,378	752	4.2	21 / 29
016	1,648	752	4.6	71 / 114
021	2,096	752	4.7	140 / 84
024	2,401	752	4.8	98 / 76
026	2,642	752	4.8	108 / 70
028	2,829	752	4.8	94 / 119
030	3,038	752	4.8	161 / 49
033	3,292	752	4.9	171 / 81
037	3,668	679	4.9	149 / 68
039	3,942	679	5.0	118 / 99
042	4,247	679	5.0	86 / 56
045	4,505	679	5.0	76 / 43
047	4,696	679	5.1	104 / 50
049	4,930	679	5.1	149 / 35
052	5,242	679	5.2	53 / 141
054	5,399	679	5.2	66 / 57
055	5,546	606	5.2	76 / 44
057	5,692	606	5.2	34 / 85
059	5,948	606	5.3	25 / 263
060	5,989	606	5.3	24 / 81
062	6,170	606	5.4	36 / 62
067	6,663	502	5.6	25 / 56
068	6,800	502	5.6	34 / 47
071	7,101	502	5.7	77 / 44
073	7,329	502	5.8	30 / 114
075	7,485	502	5.8	36 / 59
078	7,762	502	5.9	35 / 73
080	8,032	502	6.0	32 / 36
Sutton Creek				
146	14,575	1,720	4.4	232 / 283
147	14,726	1,720	4.4	84 / 186
148	14,790	1,720	4.8	85 / 186
149	14,865	1,720	4.9	231 / 339
151	15,124	1,720	4.9	182 / 402
154	15,413	1,720	5.0	325 / 327
157	15,650	1,720	5.0	339 / 313
161	16,120	1,720	5.0	347 / 296
165	16,487	1,720	5.1	345 / 346
167	16,678	1,720	5.1	191 / 348
172	17,152	1,720	5.2	227 / 359
175	17,488	1,720	5.2	164 / 283
178	17,847	1,595	5.3	234 / 252
180	18,014	1,595	5.3	92 / 270

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
180	18,014	1,595	5.6	92 / 270
185	18,504	1,595	5.7	256 / 158
190	18,999	1,595	5.8	260 / 184
195	19,503	1,535	5.8	432 / 402
203	20,278	1,328	5.9	166 / 285
206	20,605	1,328	5.9	255 / 236
210	20,997	1,328	5.9	413 / 241
215	21,497	1,328	6.0	237 / 170
220	21,994	1,328	6.0	278 / 169
225	22,500	1,328	6.1	110 / 257
230	23,005	1,328	6.2	176 / 179
235	23,523	1,328	6.4	98 / 240
240	24,007	1,328	6.5	87 / 250
245	24,505	1,328	7.2	134 / 48
250	25,004	1,249	7.4	47 / 295
255	25,496	1,249	7.5	76 / 230
260	25,995	1,249	7.7	79 / 167
266	26,577	1,249	7.8	168 / 125
274	27,384	1,009	8.1	60 / 187
281	28,075	1,009	8.3	172 / 107
286	28,589	610	8.4	61 / 141
293	29,275	610	10.9	107 / 93
296	29,578	610	10.9	88 / 124
301	30,111	597	11.0	104 / 107
306	30,582	597	11.0	92 / 102
311	31,077	597	11.0	63 / 146
315	31,544	597	11.1	90 / 128
321	32,072	597	11.1	53 / 203
326	32,565	597	11.2	57 / 120
331	33,092	597	11.4	56 / 120
336	33,571	597	11.7	54 / 81
344	34,424	597	13.1	160 / 173
350	35,011	597	13.4	58 / 470
Sutton Creek Tributary 3				
007	722	230	5.8[1]	37 / 39
010	992	230	5.8[1]	23 / 15
015	1,502	230	5.8[1]	17 / 26
019	1,914	230	6.2	37 / 18
025	2,453	230	7.6	30 / 27
030	3,007	230	8.4	11 / 15
036	3,558	230	11.7	147 / 30
040	3,992	230	11.7	21 / 14
047	4,657	230	13.2	192 / 65
Sutton Creek Tributary 4				
005	489	655	5.9[1]	112 / 118

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
010	1,002	655	5.9[1]	132 / 45
015	1,500	655	5.9[1]	65 / 94
020	1,985	655	5.9[1]	60 / 140
025	2,478	655	5.9[1]	68 / 102
030	3,002	655	5.9[1]	20 / 130
035	3,511	655	6.0	127 / 44
040	3,992	655	6.6	41 / 78
045	4,484	485	7.3	122 / 20
050	5,007	485	8.2	29 / 31
054	5,425	485	9.0	35 / 11
061	6,139	485	9.8	13 / 21
065	6,493	485	10.2	12 / 9
070	7,001	485	11.1	24 / 5
075	7,466	485	11.6	70 / 90
079	7,887	485	11.8	100 / 150
084	8,441	485	12.0	100 / 150
090	8,986	485	12.0	150 / 250
095	9,537	485	12.1	200 / 300
101	10,070	485	12.2	200 / 300
106	10,575	485	12.2	200 / 300
112	11,225	485	12.2	200 / 300
117	11,686	485	12.2	200 / 300
Sutton Creek Tributary 5				
005	523	198	7.2[1]	36 / 6
010	1,008	198	7.2[1]	22 / 19
017	1,651	198	10.1	8 / 19
Sutton Creek Tributary 6				
002	249	587	8.1[1]	80 / 30
008	752	587	8.1[1]	55 / 30
016	1,563	587	10.5	114 / 60
020	2,018	469	10.6	80 / 82
025	2,521	469	10.6	116 / 40
030	2,963	469	10.6	71 / 91
035	3,529	469	10.7	165 / 40
041	4,050	469	10.8	119 / 54
046	4,605	469	11.0	23 / 44
Sutton Creek Tributary 7				
005	482	742	8.4[1]	41 / 90
010	990	742	8.4[1]	59 / 72
015	1,491	742	8.4[1]	21 / 166
020	1,985	715	8.6	30 / 119
025	2,495	715	9.1	19 / 95
030	2,993	715	9.7	95 / 25
035	3,499	715	10.0	108 / 43
040	4,001	715	10.2	77 / 52
045	4,490	715	10.6	29 / 63

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
050	4,997	715	11.0	70 / 32
056	5,642	715	11.6	300 / 100
Tributary to Deep Creek				
038	3,782	949	4.1	127 / 57
040	4,049	949	4.3	146 / 26
044	4,395	847	4.5	121 / 46
048	4,827	847	4.8	107 / 46
053	5,260	847	5.1	45 / 93
056	5,598	847	5.4	48 / 71
057	5,654	847	5.4	48 / 78
059	5,943	847	5.5	68 / 79
063	6,276	847	5.7	94 / 91
066	6,608	847	5.9	145 / 105
069	6,930	847	6.1	144 / 116
071	7,071	847	6.2	227 / 113
072	7,244	847	6.3	180 / 130
076	7,578	791	6.5	114 / 136
078	7,798	735	6.7	24 / 143
080	7,995	735	6.8	58 / 64
084	8,383	735	6.9	40 / 46
087	8,710	735	7.1	32 / 87
090	9,028	735	7.2	32 / 29
093	9,349	735	7.6	97 / 75
097	9,666	669	7.8	69 / 56
101	10,135	669	8.1	26 / 76
Unnamed Tributary to Mill Creek				
010	973	980	10.5[1]	81 / 102
012	1,200	980	10.5[1]	23 / 122
017	1,679	980	10.5[1]	81 / 84
019	1,936	980	10.5[1]	51 / 63
020	1,989	980	10.5[1]	54 / 55
023	2,257	980	10.5[1]	11 / 83
025	2,520	980	10.5[1]	88 / 37
029	2,887	980	10.5[1]	37 / 113
034	3,398	980	10.5[1]	53 / 77
040	3,960	980	10.5[1]	19 / 96
043	4,251	980	10.5[1]	35 / 122
047	4,711	907	10.5[1]	64 / 58
052	5,152	907	10.5[1]	19 / 104
055	5,460	907	10.5[1]	19 / 107
Yeopim Creek				
034	3,389	494	4.0	114 / 32
038	3,771	494	4.1	157 / 17
041	4,071	494	4.2	93 / 65
045	4,521	494	4.4	106 / 17
Yeopim Creek Tributary 5				

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
006	576	921	4.3	155 / 30
008	757	921	4.3	55 / 54
010	989	921	4.4	52 / 103
012	1,225	921	4.4	142 / 85
014	1,418	921	4.4	163 / 27
016	1,616	921	4.5	103 / 101
018	1,788	921	4.5	51 / 176
020	2,009	921	4.6	105 / 79
024	2,417	921	4.7	83 / 110
027	2,687	921	4.8	76 / 103
030	2,958	921	4.8	137 / 20
031	3,117	921	4.9	137 / 18
033	3,278	921	5.0	133 / 49
035	3,499	921	5.0	177 / 40
037	3,747	921	5.1	67 / 124
040	4,049	514	5.1	36 / 36
043	4,277	514	5.2	76 / 36
044	4,434	514	5.2	111 / 17
047	4,704	514	5.2	17 / 89
049	4,856	514	5.2	17 / 93
051	5,058	514	5.3	17 / 74
052	5,216	514	5.3	48 / 39
054	5,390	514	5.4	18 / 45
056	5,597	514	5.5	35 / 56

[1]Elevation includes backwater effects

5.3 Coastal Analyses

For the areas of Perquimans County that are impacted by coastal flooding processes, coastal flood hazard analyses were performed to provide estimates of coastal BFEs. Coastal BFEs reflect the increase in water levels during a flood event due to extreme tides and storm surge as well as overland wave effects.

The following subsections provide summaries of how each coastal process was considered for the FIS Report. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation. Table 15 summarizes the methods and/or models used for each of the coastal analyses. Refer to Section 2.5.1 for descriptions of the terms used in this section.

Table 18P, “Summary of Coastal Analyses - Preliminary: Revised or Newly Studied”

Table 18P - Summary of Coastal Analyses - Preliminary: Revised or Newly Studied

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis Was Completed	Study Type
Albemarle Sound	Perquimans/Pasquotank County Boundary	Perquimans/Chowan County Boundary	*	2D WAVE MODEL	12/16/2011	DETAILED STUDY
Albemarle Sound	Perquimans/Pasquotank County Boundary	Perquimans/Chowan County Boundary	*	ADCIRC	12/6/2011	DETAILED STUDY
Albemarle Sound	Perquimans/Pasquotank County Boundary	Perquimans/Chowan County Boundary	*	TAW METHOD	7/9/2014	DETAILED STUDY
Albemarle Sound	Perquimans/Pasquotank County Boundary	Perquimans/Chowan County Boundary	*	WHAFIS 4.0	7/9/2014	DETAILED STUDY

Table 18, “Summary of Coastal Analyses”

Table 18 - Summary of Coastal Analyses

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis Was Completed
Albemarle Sound	Perquimans/Pasquotank County Boundary	Perquimans/Chowan County Boundary	*	2D WAVE MODEL	12/16/2011
Albemarle Sound	Perquimans/Pasquotank County Boundary	Perquimans/Chowan County Boundary	*	ADCIRC	12/6/2011
Albemarle Sound	Perquimans/Pasquotank County Boundary	Perquimans/Chowan County Boundary	*	TAW METHOD	7/9/2014
Albemarle Sound	Perquimans/Pasquotank County Boundary	Perquimans/Chowan County Boundary	*	WHAFIS 4.0	7/9/2014

5.3.1 Total Stillwater Elevations

The total stillwater elevations (stillwater including storm surge plus wave setup) for the 1% annual chance flood were determined for areas subject to coastal flooding. The models and methods that were used to determine storm surge and wave setup are listed in Table 15. The stillwater elevation that was used for each transect in coastal analyses is shown in Table 20, “Coastal Transect Parameters.”

Astronomical Tide

Astronomical tidal statistics were generated directly from local tidal constituents by sampling the predicted tide at random times throughout the tidal epoch.

Storm Surge Statistics

Storm surge is modeled based on characteristics of actual storms responsible for significant coastal flooding. The characteristics of these storms are typically determined by statistical study of the regional historical record of storms or by statistical study of tidal gages.

When historic records are used to calculate storm surge, characteristics such as the strength, size, track, etc., of storms are identified by site. Storm data was used in conjunction with numerical hydrodynamic models to determine the corresponding storm surge levels. An extreme value analysis was performed on the storm surge modeling results to determine a stillwater elevation for the 1% annual chance event.

Tidal gages can be used instead of historic records of storms when the available tidal gage record for the area represents both the astronomical tide component and the storm surge component. Table 16 provides the gage name, managing agency, gage type, gage identifier, start date, end date, and statistical methodology applied to each gage used to determine the stillwater elevations. For areas between gages, peak stillwater elevations for selected recurrence intervals were estimated by combining interpolation between gages and observed high water marks during major storms. A regionalized statistical approach was applied to the gage data so that stillwater elevations in areas between gages could be identified.

Table 19, “Tide Gage Analysis Specifics” is not applicable in Perquimans County.

Combined Riverine and Tidal Effects

Riverine and surge rates for the lower reaches of the Inundation River were combined by developing curves for rate of occurrence vs. flood level for each flood source.

Wave Setup Analysis

Wave setup was computed during the storm surge modeling through the methods and models listed in Table 15 and included in the frequency analysis for the determination of the total stillwater elevations. The oscillating component of wave setup, dynamic wave setup, was calculated for areas subject to wave runup hazards.

5.3.2 Waves

A coastal wave model (Coastal State University 2007) was used to calculate the nearshore wave fields required for the addition of wave setup effects. Three nested grids were used to obtain sufficient nearshore resolution to represent the radiation stress gradients required as ADCIRC inputs. Radiation stress fields output from the inner grids are used by ADCIRC to estimate the contribution of breaking waves (wave setup effects) to the total stillwater elevation.

5.3.3 Coastal Erosion

A single storm episode can cause extensive erosion in coastal areas. Storm-induced erosion was evaluated to determine the modification to existing topography that is expected to be associated with flooding events. Erosion was evaluated using the methods listed in Table 15. The post-event eroded profile was used for the subsequent transect-based onshore wave hazard analyses.

5.3.4 Wave Hazard Analyses

Overland wave hazards were evaluated to determine the combined effects of ground elevation, vegetation, and physical features on overland wave propagation and wave runup. These analyses were performed at representative transects along all shorelines for which waves were expected to be present during the floods of the selected recurrence intervals. The results of these analyses were used to determine elevations for the 1% annual chance flood.

Transect locations were chosen with consideration given to the physical land characteristics as well as development type and density so that they would closely represent conditions in their locality. Additional consideration was given to changes in the total stillwater elevation. Transects were spaced close together in areas of complex topography and dense development or where total stillwater elevations varied. In areas having more uniform characteristics, transects were spaced at larger intervals. Transects shown in Figure 9, “Transect Location Map,” are also depicted on the FIRM. Table 17 provides the location, stillwater elevations, and starting wave conditions for each transect evaluated for overland wave hazards. In this table, “starting” indicates the parameter value at the beginning of the transect.

Wave Height Analysis

Wave height analyses were performed to determine wave heights and corresponding wave crest elevations for the areas inundated by coastal flooding and subject to overland wave propagation hazards. Refer to Figure 6 for a schematic of a coastal transect evaluated for overland wave propagation hazards.

Wave heights and wave crest elevations were modeled using the methods and models listed in Table 18, “Summary of Coastal Analyses”.

Wave Runup Analysis

Wave runup analyses were performed to determine the height and extent of runup beyond the limit of stillwater inundation for the 1% annual chance flood. Wave runup elevations were modeled using the methods and models listed in Table 15.

Table 20, “Coastal Transect Parameters”

Table 20: Coastal Transect Parameters

Coastal Transect	Starting Wave Conditions for the 1% Annual Chance		Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations (ft NAVD88)				
	Significant Wave Height Hs (ft)	Peak Wave Period Tp (sec)	10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	.2% Annual Chance
Albemarle Sound		**From The Albermarle Sound**			**To Approximately 1000 feet Northwest of the intersection of Sandy Cross road and Belvidere road**		
1	0.9	3.0	*	*	*	3.8	*
			*	*	*	3.8 - 3.8	4.8 - 4.8
2	0.9	3.0	*	*	*	3.8	*
			*	*	*	3.8 - 3.8	4.8 - 4.8
3	0.9	3.0	*	*	*	3.8	*
			*	*	*	3.8 - 3.8	4.8 - 4.8
5	0.9	3.0	*	*	*	*	4.8
			*	*	*	3.8 - 3.8	*
6	0.9	3.0	*	*	*	3.8	*
			*	*	*	3.8 - 3.8	4.8 - 4.8
7	1.0	3.0	*	*	*	3.8	*
			*	*	*	3.8 - 3.8	4.8 - 4.8
9	1.2	3.0	*	*	*	*	4.8
			*	*	*	3.8 - 3.8	*
10	5.4	5.5	*	*	*	*	4.8
			*	*	*	3.8 - 3.8	*

Table 20: Coastal Transect Parameters

Coastal Transect	Starting Wave Conditions for the 1% Annual Chance		Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations (ft NAVD88)				
	Significant Wave Height Hs (ft)	Peak Wave Period Tp (sec)	10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	.2% Annual Chance
11	1.2	3.2	*	*	*	*	4.8
			*	*	*	3.8 - 3.8	4.8 - 4.8
12	0.8	3.1	*	*	*	3.8	*
			*	*	*	3.8 - 3.8	4.8 - 4.8
14	0.8	3.1	*	*	*	3.8	*
			*	*	*	3.8 - 3.8	4.8 - 4.8
15	5.4	5.4	*	*	*	3.8	*
			*	*	*	3.8 - 3.8	4.8 - 4.8
16	5.4	5.5	*	*	*	3.8	*
			*	*	*	3.7 - 3.8	4.7 - 4.8
17	5.0	5.2	*	*	*	3.7	*
			*	*	*	3.7 - 3.7	4.7 - 4.7
18	5.1	4.9	*	*	*	3.7	*
			*	*	*	3.7 - 3.7	4.7 - 4.7
19	5.1	4.6	*	*	*	3.6	*
			*	*	*	3.6 - 3.6	4.6 - 4.6
20	5.1	4.5	*	*	*	3.6	*
			*	*	*	3.6 - 3.6	4.6 - 4.6
21	5.1	4.2	*	*	*	3.6	*
			*	*	*	3.6 - 3.6	4.6 - 4.6
22	4.2	3.6	*	*	*	3.5	*
			*	*	*	3.5 - 3.6	4.5 - 4.5
23	2.7	3.2	*	*	*	3.6	*
			*	*	*	3.6 - 3.6	4.6 - 4.6
24	2.7	3.0	*	*	*	3.6	*
			*	*	*	3.6 - 3.6	4.6 - 4.6
25	2.3	2.8	*	*	*	3.6	*
			*	*	*	3.6 - 3.6	4.6 - 4.6
26	1.9	2.5	*	*	*	3.6	*
			*	*	*	3.6 - 3.6	4.7 - 4.7
27	1.5	2.2	*	*	*	3.7	*
			*	*	*	3.7 - 3.7	4.7 - 4.7
28	2.2	2.8	*	*	*	3.7	*
			*	*	*	3.7 - 3.7	4.7 - 4.7
29	2.2	2.8	*	*	*	3.7	*
			*	*	*	3.7 - 3.7	4.7 - 4.8
30	2.0	2.8	*	*	*	3.7	*
			*	*	*	3.7 - 3.8	4.8 - 4.8
31	2.1	2.6	*	*	*	3.8	*
			*	*	*	3.8 - 3.8	4.8 - 4.8
32	2.1	2.7	*	*	*	3.8	*
			*	*	*	3.8 - 3.8	4.8 - 4.8
34	1.6	2.1	*	*	*	*	4.9
			*	*	*	3.8 - 3.8	*
35	1.4	1.9	*	*	*	*	5.0
			*	*	*	3.9 - 3.9	*
36	0.9	1.3	*	*	*	*	5.0
			*	*	*	3.9 - 3.9	*
37	0.7	1.3	*	*	*	*	5.1
			*	*	*	4.0 - 4.0	*
38	0.7	1.3	*	*	*	*	5.1
			*	*	*	4.0 - 4.0	*
39	1.0	1.4	*	*	*	*	5.0
			*	*	*	4.0 - 4.0	*
40	0.7	1.2	*	*	*	*	5.0
			*	*	*	4.0 - 4.0	*
41	2.2	2.8	*	*	*	*	5.1
			*	*	*	4.0 - 4.1	5.0 - 5.1
43	0.9	1.3	*	*	*	*	5.0

Table 20: Coastal Transect Parameters

Coastal Transect	Starting Wave Conditions for the 1% Annual Chance		Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations (ft NAVD88)				
	Significant Wave Height Hs (ft)	Peak Wave Period Tp (sec)	10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	.2% Annual Chance
			*	*	*	4.0 - 4.0	*
44	1.3	1.7	*	*	*	*	5.0
			*	*	*	3.9 - 3.9	*
45	1.6	2.1	*	*	*	*	4.9
			*	*	*	3.9 - 3.9	*
46	1.8	2.3	*	*	*	*	4.9
			*	*	*	3.7 - 3.8	4.7 - 4.9
47	2.1	2.7	*	*	*	3.8	*
			*	*	*	3.8 - 3.8	4.8 - 4.9
48	2.1	2.7	*	*	*	3.8	*
			*	*	*	3.8 - 3.8	4.8 - 4.8
50	2.1	2.8	*	*	*	*	4.7
			*	*	*	3.7 - 3.7	*
51	1.5	2.2	*	*	*	*	4.7
			*	*	*	3.7 - 3.7	*
52	2.0	2.6	*	*	*	*	4.7
			*	*	*	3.6 - 3.6	*
53	2.6	2.9	*	*	*	*	4.6
			*	*	*	3.6 - 3.6	*
54	2.7	3.3	*	*	*	*	4.6
			*	*	*	3.6 - 3.6	*
55	2.6	3.0	*	*	*	*	4.6
			*	*	*	3.6 - 3.6	*
56	5.1	4.3	*	*	*	*	4.5
			*	*	*	3.5 - 3.5	*
57	2.5	3.7	*	*	*	*	4.5
			*	*	*	3.5 - 3.6	4.5 - 4.6
58	4.7	4.0	*	*	*	3.5	*
			*	*	*	3.5 - 3.5	4.5 - 4.5
59	4.1	4.5	*	*	*	3.5	*
			*	*	*	3.5 - 3.5	4.4 - 4.5
60	4.0	4.7	*	*	*	3.4	*
			*	*	*	3.4 - 3.4	4.4 - 4.4
61	3.9	4.9	*	*	*	3.4	*
			*	*	*	3.4 - 3.4	4.4 - 4.4
62	3.8	5.0	*	*	*	3.4	*
			*	*	*	3.4 - 3.4	4.4 - 4.4
64	1.8	2.5	*	*	*	*	4.5
			*	*	*	3.5 - 3.5	*
65	1.9	2.7	*	*	*	*	4.5
			*	*	*	3.5 - 3.5	*
66	1.7	2.5	*	*	*	*	4.5
			*	*	*	3.5 - 3.5	*
67	1.5	2.2	*	*	*	*	4.6
			*	*	*	3.5 - 3.5	*
68	1.2	1.6	*	*	*	*	4.6
			*	*	*	3.5 - 3.5	*
69	1.0	1.4	*	*	*	*	4.6
			*	*	*	3.6 - 3.6	*
70	0.8	1.2	*	*	*	*	4.6
			*	*	*	3.6 - 3.6	*
71	0.8	1.3	*	*	*	*	4.6
			*	*	*	3.6 - 3.6	*
72	0.5	0.9	*	*	*	3.6	*
			*	*	*	3.6 - 3.6	4.7 - 4.7
113	0.8	3.1	*	*	*	*	4.8
			*	*	*	3.8 - 3.8	*
Atlantic Ocean		**From The entire shoreline within the Pasquotank River Basin**			**To The entire shoreline within the Pasquotank River Basin**		

6.0 Mapping Methods

6.1 Vertical and Horizontal Control

Vertical Datum

All FISs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. With the finalization of the North American Vertical Datum of 1988 (NAVD 88), all North Carolina FISs have been prepared using NAVD 88 as the referenced vertical datum.

All flood elevations shown on the FIRM for Perquimans County are referenced to NAVD 88. Structure and ground elevations in the county must, therefore, be referenced to NAVD 88. It is important to note that FISs for adjacent communities in neighboring states may be referenced to NGVD 29. This may result in BFE differences across political boundaries between the communities.

As noted above, the elevations shown in this FIS are referenced to NAVD 88. Ground, structure, and flood elevations may be compared and/or referenced to NGVD 29 by applying a standard conversion factor. The conversion factor for Perquimans County is # feet. The locations used to establish the conversion factor were USGS quadrangle corners that fell within the county, as well as those that were within 2.5 miles outside the county. The benchmarks are referenced to NAVD 88. Table 21, "Datum Conversion Locations and Values," is shown below.

Table 21, "Datum Conversion Locations and Values."

Table 21 - Datum Conversion Locations and Values

Latitude	Longitude	Conversion from NGVD29 to NAVD88 (feet)
36.13	-76.50	-1.09
36.25	-76.50	-1.05
36.25	-76.37	-1.01
36.13	-76.37	-1.06
36.13	-76.25	-1.03
Average conversion in Perquimans County from NGVD 29 to NAVD 88 = -1.05 feet		

The vertical datum conversion factor for all flooding sources which run along a county boundary are in accordance with the conversion factor used in those contiguous counties.

BFEs shown on the FIRM represent whole-foot rounded values. For example, a 1% annual chance water-surface elevation of 102.4 feet will appear as 102 on the FIRM and 102.6 feet will appear as 103. Therefore, users who wish to convert the elevations in this FIS to NGVD 29 should apply the stated conversion factor(s) to elevations shown on the Flood Profiles and/or Water-surface elevation rasters and supporting data tables in the FIS Report, which are shown, at a minimum, to the nearest 0.1 foot.

For more information on NAVD 88, see Converting the National Flood Insurance Program to the North American Vertical Datum of 1988, or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Rockville, Maryland 20910 (http://www.ngs.noaa.gov).

Vertical Control Monuments

Qualifying bench marks within Perquimans County that are cataloged by the National Geodetic Survey (NGS) and entered into the National Spatial Reference System (NSRS) as First or Second Order Vertical, with a vertical stability classification of A, B, or C, are shown and labeled on the FIRM with their 6-character NSRS Permanent Identifier (PID).

The National Geodetic Survey establishes precisely located monuments on the North Carolina Grid System and Bench Marks referenced to a vertical datum (NGVD 1929 and NAVD 1988).

Bench marks cataloged by the NGS and entered into the NSRS vary widely in vertical stability classification. NSRS vertical stability classifications are as follows:

- •Stability A: Monuments of the most reliable nature, expected to hold position/elevation well (e.g., mounted in bedrock)
- •Stability B: Monuments which generally hold their position/elevation well (e.g., concrete bridge abutment)
- •Stability C: Monuments which may be affected by surface ground movements (e.g., concrete monument below frost line)
- •Stability D: Mark of questionable or unknown vertical stability (e.g., concrete monument above frost line, or steel witness post)

Monuments with a Stability D classification may be used as Elevation Reference Marks (ERMs) when a Stability C or better monument is not an option. These ERMs must be approved by NCGS and can be set and used as elevation bench marks to establish vertical control and produce NC DFIRMs. Including such ERMs will greatly augment North Carolina's useable vertical control network.

In addition, when local jurisdictions have established their own vertical monument network, these monuments may also be shown on the FIRM with the appropriate designations. Local monuments will be placed on the FIRM if the community has requested that they be included and if the monuments meet the aforementioned criteria.

North Carolina Geodetic Survey (NCGS) and contractor surveyed vertical control monuments will be shown on the FIRM panels. Those cataloged by NCGS meet similar requirements to the NGS monuments as described above. Most monuments that have been cataloged by NCGS have been established to NGS standards, but have not been submitted to NGS for inclusion into the NSRS. The qualifying criteria for depicting bench marks established by the State's contractors on the new digital FIRM panels include:

- •GPS surveying of permanent 3-D survey monuments to 5-centimeter or better local network accuracy guidelines, in accordance with NOAA Technical Memorandum NOS NGS-58 "Guidelines for Establishing GPS-Derived Ellipsoid Heights (Standards: 2 cm and 5 cm)," and conversion to NAVD 88 orthometric heights using NGS' latest geoid mode;
- •Requiring a stability classification of "C" or better; and
- •Submitting GPS files and station descriptions to NCGS.

To obtain current information for cataloging local bench marks in the NSRS, please visit the Data Sheet page of the NGS website at http://www.ngs.noaa.gov/cgi-bin/datasheet.prl, or contact the NGS Information Services Branch at:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-32822
(301) 713-3242

Information regarding the NCGS or State contractor bench marks can be obtained through the NCGS website at www.ncgs.state.nc.us, or by phone at (919) 733-3836.

It is important to note that temporary vertical monuments, sometimes called Elevation Reference Marks, are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, interested individuals may contact FEMA to access this information.

Horizontal Datum and Control
The digital files that comprise the FIRM are georeferenced to an established coordinate system. The coordinate system used for the production of this FIRM is North Carolina State Plane (FIPSZONE 3200) referenced to the North American Datum of 1983 (NAD83), GRS80 ellipsoid.

6.2 Base Map

The FIRMs and FIS Report for this project have been produced in a digital format. The flood hazard information was converted to a Geographic Information System (GIS) format that meets FEMA's FIRM database specifications and geographic information standards. This information is provided in a digital format so that it can be incorporated into a local GIS and be accessed more easily by the community. The FIRM Database includes most of the tabular information contained in the FIS Report in such a way that the data can be associated with pertinent spatial features.

The projection used in the preparation of this map was the North Carolina State Plane Coordinate System. The horizontal datum was NAD83, GRS80 spheroid. Differences in datum, spheroid, or projection used in the production of FIRMs for adjacent states may result in slight positional differences in map features across the state boundary. These differences do not affect the accuracy of this FIRM.

As part of the North Carolina CTS Initiative, North Carolina digital FIRM panel numbers are consistent with the North Carolina Land Records Management Program (LRMP).

The 11-digit digital FIRM panel numbering system for North Carolina is: SS MM LLLL PP X, where SS = State Federal Information Processing Code (37); MM = Easting-Northing (EN) 1,000,000-foot coordinates; LLLL = LRMP map numbers to include the EN 100,000-foot coordinates, and the EN 10,000-foot coordinates; PP = place holders for additional EN 1,000-foot coordinates; and X = suffix ("J" for the initial edition). North Carolina's State Plane Coordinate System origin is outside the State boundary to the southwest (in Georgia), the eastings range from approximately 0,404,000 (Tennessee border) to 3,040,000 (Atlantic Ocean); and the northings range from approximately 0,045,000 (South Carolina border) to 1,043,000 (Virginia border). Digital FIRM panels were compiled at either 1"=1,000', covering an area of 20,000 feet x 20,000 feet (20" x 20" panels); or at 1"=500', covering an area of 10,000 feet x 10,000 feet (20" x 20" panels). An additional 2 digits (both zeros) are held in reserve as a "place holder" in the event that future FIRMs are printed at a larger scale; e.g., 1"=250', covering an area of 5,000 feet x 5,000 feet for which the 1,000-foot coordinates would either be 0 or 5.

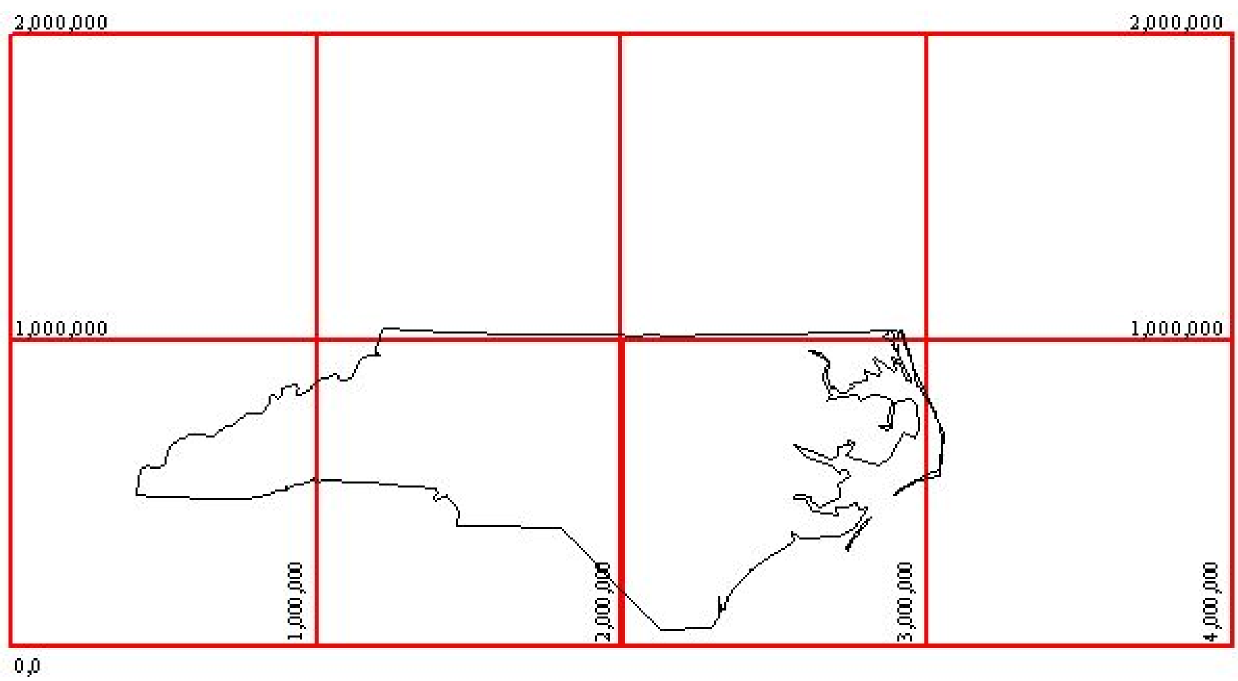


Figure 3 - North Carolina's State Plane Coordinate System

6.3 Floodplain and Floodway Delineation

Floodplain Boundaries

For streams restudied by detailed and limited detailed methods, the 1% and 0.2% annual chance floodplains were delineated using flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic data acquired using airborne Light Detection and Ranging (LIDAR). This LIDAR data was acquired during the (insert date from basin plan and update for map maintenance, if necessary) flying season.

The topographic data satisfies a vertical root-mean-square error (RMSE) accuracy standard of 20 cm (1.3 feet accuracy at the 95% confidence limit) for the Outer Banks and 25 cm (1.6 feet accuracy at the 95% confidence limit) for those portions of the basin lying west of the Outer Banks. These data could be contoured at roughly a 2-foot vertical contour interval. All elevations were referenced to the NAVD 88 and reflect orthometric heights. Variably spaced, bare-earth digital topographic data in ASCII point file format were combined with imagery (either flown concurrently with the LIDAR data or using existing digital orthophotos) to establish a Triangulated Irregular Network (TIN) of digital elevation points, which include selected breaklines to be used for hydraulic modeling. Furthermore, a uniformly spaced sampling of the TIN resulted in uniformly spaced Digital Elevation Models (DEMs), with 20 ft x 20 ft post spacing, which was generated in multiple file formats.

For coastal floodplains, after analyzing wave heights along each transect, wave elevations were interpolated between transects. Various source data were used in the interpolation, including topographic data described above. Controlling features affecting the elevations were identified and considered in relation to their positions at particular transect and their variation between transects. •

The 1% annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones VE, AO, AH, A99, AR, A, and AE), and the 0.2% annual chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% annual chance floodplain boundaries have been shown.

Floodway Delineation

The floodways presented in this FIS were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 22, “Floodway Data”). The computed floodway is shown on the FIRM. In cases where the floodway and 1% annual chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown. In areas where the top of the bridge or road is higher than the 1.0-percent annual chance (100-year) flood, the FIRM will show the flood discharge as contained within the structure for emergency management purposes. It is important to note that FEMA and community floodway regulations still apply in and around those areas.

Table 22 - Floodway Data

Floodway Source		Floodway			Water Surface Elevation			
Cross Section	Distance (Feet Above Mouth)	Width (Feet)	Section Area (Square Feet)	Mean Velocity (Feet Per Second)	Regulatory	Without Floodway	With Floodway	Increase
Little River								
593	59,343	709	2,697	1.7	4.0[1]	2.1	2.4	0.2
619	61,870	1,041	4,819	0.9	4.1[1]	3.0	3.7	0.7
642	64,193	1,203	5,947	0.8	4.2[1]	3.5	4.4	0.9
664	66,355	1,705	8,326	0.5	4.3[1]	3.9	4.8	1.0
684	68,443	1,435	6,382	0.7	4.6	4.6	5.2	0.6
698	69,825	947	5,348	0.8	4.9	4.9	5.6	0.7
708	70,829	121	997	4.3	5.4	5.4	6.2	0.8
738	73,786	2,413	17,258	0.2	6.2	6.2	6.9	0.8
757	75,737	1,175	7,971	0.5	6.2	6.2	7.0	0.8
784	78,417	2,006	10,656	0.4	6.5	6.5	7.2	0.7
Perquimans River								
000	48	479	2,858	1.9	4.1[1]	1.9	2.5	0.6
015	1,510	365	2,837	1.9	4.2[1]	2.2	2.8	0.6
043	4,304	882	4,310	1.2	4.2[1]	2.8	3.4	0.6
053	5,325	1,216	5,902	0.9	4.3[1]	3.0	3.7	0.6
061	6,107	1,376	6,668	0.8	4.3[1]	3.2	3.9	0.7
073	7,259	1,173	5,804	0.9	4.4[1]	3.4	4.1	0.7
095	9,537	751	4,496	1.2	4.5[1]	3.9	4.6	0.7
108	10,805	460	2,914	1.8	4.9[1]	4.5	5.3	0.8
137	13,703	1,650	6,804	0.8	5.2	5.2	6.1	0.9

Table 22 - Floodway Data

Floodway Source		Floodway			Water Surface Elevation			
Cross Section	Distance (Feet Above Mouth)	Width (Feet)	Section Area (Square Feet)	Mean Velocity (Feet Per Second)	Regulatory	Without Floodway	With Floodway	Increase
151	15,051	1,674	9,351	0.6	5.5	5.5	6.4	0.9
180	17,973	2,883	19,585	0.3	5.8	5.8	6.6	0.9
201	20,130	2,311	13,902	0.4	5.9	5.9	6.8	0.9
229	22,919	1,569	11,913	0.4	6.1	6.1	7.0	0.9
257	25,702	2,261	17,524	0.3	6.2	6.2	7.2	0.9
290	29,005	2,317	16,509	0.3	6.4	6.4	7.3	0.9
330	33,018	1,944	11,176	0.5	6.5	6.5	7.4	1.0
361	36,095	1,489	11,984	0.4	6.8	6.8	7.7	0.9
369	36,933	1,432	11,905	0.4	6.8	6.8	7.8	0.9

[1]**Elevation includes backwater effects**

6.4 Coastal Flood Hazard Mapping

Flood insurance zones and BFEs including the wave effects were identified on each transect based on the results from the onshore wave hazard analyses. Between transects, elevations were interpolated using topographic maps, land-use and land-cover data, and knowledge of coastal flood processes to determine the aerial extent of flooding. Sources for topographic data are shown in Table 23.

Zone VE is subdivided into elevation zones and BFEs are provided on the FIRM.

The limit of Zone VE shown on the FIRM is defined as the farthest inland extent of any of these criteria (determined for the 1% annual chance flood condition):

- *The primary frontal dune* zone is defined in 44 CFR Section 59.1 of the NFIP regulations. The primary frontal dune represents a continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes that occur immediately landward and adjacent to the beach. The primary frontal dune zone is subject to erosion and overtopping from high tides and waves during major coastal storms. The inland limit of the primary frontal dune zone occurs at the point where there is a distinct change from a relatively steep slope to a relatively mild slope.

- *The wave runup zone* occurs where the (eroded) ground profile is 3.0 feet or more below the 2-percent wave runup elevation.

- *The wave overtopping splash zone* is the area landward of the crest of an overtopped barrier, in cases where the potential 2-percent wave runup exceeds the barrier crest elevation by 3.0 feet or more.

- *The breaking wave height zone* occurs where 3-foot or greater wave heights could occur (this is the area where the wave crest profile is 2.1 feet or more above the total stillwater elevation).

- *The high-velocity flow zone* is landward of the overtopping splash zone (or area on a sloping beach or other shore type), where the product of depth of flow times the flow velocity squared (hv2) is greater than or equal to 200 ft3/sec2. This zone may only be used on the Pacific Coast.

The SFHA boundary indicates the limit of SFHAs shown on the FIRM as either “V” zones or “A” zones.

Table 23: Summary of Coastal Transect Mapping Considerations

Source	Coastal Transect	Primary Frontal Dune (PFD) Identified	Wave Runup Analysis	Wave Height Analysis	Zone VE Limit	SFHA Boundary
			Zone Designation and BFE (ft NAVD 88)	Zone Designation and BFE (ft NAVD 88)		
Albemarle Sound	6	*	*	AE 1-2	*	WHAFIS
	8	*	*	AE 1-2	*	WHAFIS
	9	*	*	AE 1-2	*	WHAFIS
	10	*	*	AE 5-5	*	WHAFIS
	15	*	*	AE 5-5	*	WHAFIS
	16	*	VE 7	AE 5-5 AO 5-5 VE 5-5	WAVE OVERTOPPING SPLASH ZONE	WHAFIS
	17	*	AE 7 VE 7-7	AE 5-5 VE 5-5	WAVE OVERTOPPING SPLASH ZONE	WHAFIS
	18	*	VE 7	AE 5-5 VE 5-5	WAVE OVERTOPPING SPLASH ZONE	WHAFIS
	19	*	VE 8	VE 4-5	WAVE OVERTOPPING SPLASH ZONE	WAVE OVERTOPPING SPLASH ZONE
	20	*	*	AE 4-5	*	WHAFIS
	21	*	VE 7	AE 5-5 AO 5-5 VE 5-5	WAVE OVERTOPPING SPLASH ZONE	WHAFIS
	22	*	VE 7	VE 4-4	WAVE OVERTOPPING SPLASH ZONE	WAVE OVERTOPPING SPLASH ZONE
	23	*	VE 7	VE 3-3	WAVE OVERTOPPING SPLASH ZONE	WAVE OVERTOPPING SPLASH ZONE
	24	*	VE 7	VE 3-3	WAVE OVERTOPPING SPLASH ZONE	WAVE OVERTOPPING SPLASH ZONE
	25	*	*	AE 2-2	*	WHAFIS
	26	*	*	AE 2-2	*	WHAFIS
	27	*	*	AE 1-1	*	WHAFIS
	28	*	*	AE 2-2	*	WHAFIS
	29	*	*	AE 2-2	*	WHAFIS
	30	*	*	AE 1-2	*	WHAFIS
	31	*	*	AE 1-2	*	WHAFIS
	32	*	*	AE 2-2	*	WHAFIS
	34	*	*	AE 2-2	*	WHAFIS
	33	*	*	AE 1-2	*	WHAFIS
	35	*	*	AE 1-2	*	WHAFIS
	36	*	*	AE 1-1	*	WHAFIS
	44	*	*	AE 1-1	*	WHAFIS
	45	*	*	AE 2-2	*	WHAFIS
	46	*	*	AE 1-2	*	WHAFIS
	47	*	*	AE 2-2	*	WHAFIS

Table 23: Summary of Coastal Transect Mapping Considerations

Source	Coastal Transect	Primary Frontal Dune (PFD) Identified	Wave Runup Analysis	Wave Height Analysis	Zone VE Limit	SFHA Boundary
			Zone Designation and BFE (ft NAVD 88)	Zone Designation and BFE (ft NAVD 88)		
	48	*	*	AE 1-2	*	WHAFIS
	49	*	*	AE 2-2	*	WHAFIS
	50	*	*	AE 2-2	*	WHAFIS
	51	*	*	AE 1-1	*	WHAFIS
	52	*	*	AE 2-2	*	WHAFIS
	53	*	*	AE 3-3	*	WHAFIS
	56	*	*	AE 5-5	*	WHAFIS
	57	*	*	AE 2-3	*	WHAFIS
	54	*	*	AE 3-3	*	WHAFIS
	55	*	*	AE 3-3	*	WHAFIS
	58	*	*	AE 5-5	*	WHAFIS
	59	*	*	AE 4-4	*	WHAFIS
	60	*	*	AE 4-4	*	WHAFIS
	61	*	*	AE 4-4	*	WHAFIS
	69	*	*	AE 1-1	*	WHAFIS
	68	*	*	AE 1-1	*	WHAFIS
	66	*	*	AE 2-2	*	WHAFIS
	65	*	*	AE 2-2	*	WHAFIS
	64	*	*	AE 2-2	*	WHAFIS
	63	*	*	AE 2-2	*	WHAFIS
	62	*	*	AE 4-4	*	WHAFIS
	67	*	*	AE 1-2	*	WHAFIS
	11	*	*	AE 1-1	*	WHAFIS
	12	*	*	AE 1-1	*	WHAFIS
	113	*	*	AE 1-1	*	WHAFIS
	14	*	*	AE 1-1	*	WHAFIS
	40	*	*	AE 1-1	*	WHAFIS
	72	*	*	AE 1-1	*	WHAFIS
	71	*	*	AE 1-1	*	WHAFIS
	73	*	*	AE 0-0	*	WHAFIS
	42	*	*	AE 1-1	*	WHAFIS
	43	*	*	AE 1-1	*	WHAFIS
	38	*	*	AE 1-1	*	WHAFIS
	37	*	*	AE 1-1	*	WHAFIS
	41	*	*	AE 2-2	*	WHAFIS
	39	*	*	AE 1-1	*	WHAFIS

Table 23: Summary of Coastal Transect Mapping Considerations

Source	Coastal Transect	Primary Frontal Dune (PFD) Identified	Wave Runup Analysis	Wave Height Analysis	Zone VE Limit	SFHA Boundary
			Zone Designation and BFE (ft NAVD 88)	Zone Designation and BFE (ft NAVD 88)		
	1	*	*	AE 1-2	*	WHAFIS
	3	*	*	AE 1-2	*	WHAFIS
	2	*	*	AE 1-2	*	WHAFIS
	4	*	*	AE 1-2	*	WHAFIS
	5	*	*	AE 1-2	*	WHAFIS
	7	*	*	AE 1-2	*	WHAFIS
	70	*	*	AE 1-1	*	WHAFIS

A LiMWA boundary has also been added in coastal areas subject to wave action for use by local communities in safe rebuilding practices. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. In areas where the Zone VE designation is based on the presence of a primary frontal dune the LiMWA was not delineated.

7.0 Revising the FIS

7.1 Letters of Map Amendment and Letters of Map Revision - Based on Fill

LOMAs and LOMR-Fs are documents issued by FEMA that officially remove a property and/or a structure from a Special Flood Hazard Area (SFHA), if data supporting the removal are submitted. LOMAs and LOMR-Fs are generally determinations regarding areas that are too small to be shown on a FIRM panel; consequently, the changes they describe become official without revising the FIRM or the FIS Report.

NFIP regulations require that the lowest adjacent grade (the lowest ground touching the structure) be at or above the 1% annual chance flood elevation for a LOMA to be issued. Currently, there is no fee for FEMA's review of a LOMA request, but the requester of a LOMA is responsible for providing all the information needed for the review, which may include structure and/or property elevations certified by a licensed land surveyor or professional engineer. Therefore, LOMA requesters may need to retain the services of a land surveyor or engineer.

A LOMA cannot be used for property on which fill has been placed. For those situations, a LOMR-F must be used. As a participant in the NFIP, a local government must adopt ordinances that meet the minimum Federal floodplain management standards, which are outlined in Section 60.3 of the NFIP regulations. For a number of reasons, these ordinances generally vary from community to community. Nonetheless, because the placement of fill within the floodplain can affect flood hazards in the surrounding area, additional information is needed before FEMA can process a LOMR-F request. Among the data required for a LOMR-F is the community acknowledgment form. This form is FEMA's assurance that all appropriate Federal, State, and local floodplain management requirements have been met. Furthermore, NFIP regulations require that the lowest adjacent grade (the lowest ground touching the structure) be at or above the 1% annual chance flood elevation for a LOMR-F to be issued removing the structure from the floodplain. Because LOMR-F requests are the result of changed physical conditions rather than limitations of scale or topographic definition, FEMA charges a fee for the review of a LOMR-F request. As with the LOMA, the requester of a LOMR-F is responsible for providing all supporting information, including structure and/or property elevation data.

In cases where property owners plan to add fill in the SFHA, NFIP regulations require plans and technical information to be submitted for review by FEMA before construction takes place. FEMA will issue a conditional LOMR-F stating how flood hazards would change and what portions of the property, if any, would remain in the SFHA if the project were built according to the submitted plans.

The issuance of a LOMA or LOMR-F ends the property owner's obligation to purchase flood insurance as a condition of Federal or federally backed financing. However, the property owner's mortgage company maintains the prerogative to require flood insurance as a condition of providing financing. Before attempting to obtain a LOMA or LOMR-F, property owners are advised to consult their mortgage companies regarding this policy. Even if the mortgage company indicates that it will require flood insurance if a LOMA or LOMR-F is issued, it may be advantageous for property owners to request a LOMA or LOMR-F because flood insurance premiums are lower for properties removed from the SFHA than for properties that remain within the SFHA.

For additional information regarding LOMAs, LOMR-Fs, conditional LOMR-Fs, or current application fees, please call the FEMA Map Information eXchange (FMIX) toll-free information line at 1-877-FEMA MAP (1-877-336-2627).

7.2 Letters of Map Revision

A Letter of Map Revision (LOMR) is a document issued by FEMA and the NCFMP that revises an FIS Report and/or FIRM. A LOMR is used to change flood risk zones, floodplain and/or floodway delineations, flood elevations, or planimetric features such as road systems or corporate limits. A LOMR provides FEMA and the NCFMP with a cost-effective means of revising the FIS information without physically changing and reprinting the map or report itself. A portion of the FIRM panel or FIS Report showing the revised information is issued with the LOMR. The LOMR is sent to all affected communities and is archived in the communities' NFIP map repository for public reference.

In cases where a proposed project (such as construction in the 1% annual chance floodplain) would result in a significant rise in 1% annual chance water-surface elevations, NFIP regulations require the community to submit plans and technical information for review by FEMA and the NCFMP before construction takes place. This assures communities participating in the NFIP that proposed projects meet minimum NFIP requirements. The result of FEMA and the NCFMP reviews is documented in a conditional LOMR.

For additional information regarding LOMRs, conditional LOMRs, or current application fees, please call the FEMA Map Assistance Center toll-free information line at 1-877-FEMA MAP (1-877-336-2627) or the NCFMP at 919-715-5711.

7.3 Physical Map Revisions

Physical Map Revisions (PMRs) are processed to incorporate information concerning conditions present in the community that are not reflected in the FIS, and involve distributing republished FISs that supersede the most current NFIP data in the community repository. PMRs may be initiated by a request from a community resident or agency, or FEMA may initiate a PMR to incorporate one or more LOMRs, to reflect significant changes in corporate limits, to correct errors, or to update flood hazards to match new information from an adjacent community's FIS. Due to the costs associated with updating and distributing FISs, map revisions will be processed as LOMRs rather than PMRs whenever possible. For more information regarding PMRs, please contact the FEMA Map Information eXchange (FMIX) toll-free information line at 1-877-FEMA MAP (1-877-336-2627), the FEMA Regional Office at the address listed on the Notice to Flood Insurance Study Users page at the front of this report, or the NCFMP at 919-715-5711.

7.4 Contracted Restudies

The NFIP provides for a periodic review and restudy of flood hazards in a given community. FEMA accomplishes this through a national mapping needs assessment process that assigns priorities and allocates funds to sponsor or subsidize new flood hazard analyses used to update FIS Reports. For map maintenance restudies within the state of North Carolina, scoping will be performed by county approximately 2.5-3.5 years after the previous effective date. Scoping will focus on streams with restudy needs within those previously effective counties rather than on full countywide restudies. A restudy refers specifically to updating or reevaluating engineering analyses that were performed for a flood mapping project that directly impact BFEs and/or flood hazard boundary extents or analysis of previously unstudied flood prone areas. Restudy project evaluation triggers and prioritization values are an essential component of the map maintenance program. For more information regarding NCFMP-contracted restudies, please contact the NCFMP at 919-715-5711 or at www.ncfloodmaps.com. For more information regarding FEMA-contracted restudies, please contact the FEMA Map Information eXchange (FMIX) toll-free information line at 1-877-FEMA MAP(1-877-336-2627) or the FEMA Regional Office at the address listed on the Notice to Flood Insurance Study Users page at the front of this report.

7.5 Map Revision History

The current FIRM is a subset of the Statewide FIRM, showing flood hazard information for the entire geographic area of Perquimans County. Previously, separate Flood Hazard Boundary Maps (FHBMs), Flood Boundary and Floodway Maps (FBFMs), and/or FIRMs were prepared for each identified flood prone jurisdiction within the county. Historical data relating to the NFIP maps prepared for each community prior to and including the 10/5/2004 North Carolina Statewide FIRM, which includes Perquimans County, are presented in Table 24, "Map Revision History."

Information pertaining to revised and unrevised flood hazards for each jurisdiction within Perquimans County has been compiled into this FIS. Therefore, this FIS supersedes all previously printed FIS Reports, FHBMs, FIRMs, and/or FBFMs for all of the incorporated and unincorporated jurisdictions within Perquimans County.

Table 24 - Map Revision History

Community	Initial Identification Date	Initial FIRM Effective Date	FIS Revision Date
PERQUIMANS COUNTY	7/28/1979	7/3/1985	10/05/2004
TOWN OF HERTFORD	2/15/1974	7/3/1985	10/05/2004
TOWN OF WINFALL	7/25/1975	7/3/1985	10/05/2004

8.0 Study Contracting and Community Coordination

8.1 Authority and Acknowledgments

The sources of authority for this FIS are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

This FIS revises and updates the previous countywide FIS for the geographic area of Perquimans County and Incorporated Areas. Table 25, "Authority and Acknowledgments," includes information for the previous countywide FIS and for this revision. This table also includes information for the single-jurisdiction FISs published for each community included in this countywide FIS (if available) as compiled from their previously printed FIS Reports

Table 25 — Authority and Acknowledgments

Community	FIS Dated	Study Contracted By	Data Source	Contract or IAA Number	Work Completed In
PERQUIMANS COUNTY	10/5/2004	NCFMP	NCFMP	286-000023	10/28/1014
PERQUIMANS COUNTY	10/5/2004	NCFMP	NCFMP	19-000017	10/29/2012
TOWN OF HERTFORD	10/5/2004	NCFMP	NCFMP	286-000023	10/28/1014
TOWN OF HERTFORD	10/5/2004	NCFMP	NCFMP	19-000017	10/29/2012
TOWN OF WINFALL	10/5/2004	NCFMP	NCFMP	286-000023	10/28/1014
TOWN OF WINFALL	10/5/2004	NCFMP	NCFMP	19-000017	10/29/2012

This FIS Report was produced through a unique cooperative partnership between the State of North Carolina and FEMA. The State of North Carolina, through FEMA's Cooperating Technical Partner (CTP) Initiative, has become the first Cooperating Technical State (CTS) and will assume primary ownership of the NFIP FIRM panels for all North Carolina communities. This role has traditionally been fulfilled by FEMA. The North Carolina Floodplain Mapping Program is conducting flood hazard analyses and producing updated, digital FIRM panels. The hydrologic and hydraulic analyses and the FIRM panels for the initial statewide mapping for Perquimans County were produced by NCFMP under contract with the State of North Carolina and issued on effective 11/30/2015. For this revision, the hydrologic and hydraulic analyses and the FIRM panels were produced by NCFMP, under contract with the State of North Carolina.

8.2 Consultation Coordination Officer's Meetings/Scoping Meetings

In general, for each FIS an initial Consultation Coordination Officer's (CCO) meeting is held with representatives from FEMA, the communities, and the study contractors to explain the nature and purpose of the FIS and to identify the streams to be studied by detailed methods. A final CCO meeting is held with representatives from FEMA, the communities, and the study contractors to review the results of the study

The dates of the initial and final CCO meetings held for Perquimans County and Incorporated Areas were compiled from the previous countywide FIS Report and are shown in Table 26, "Consultation Coordination Officer's Meetings

Table 26 — Consultation Coordination Officer's Meetings

Community	For FIS Dated	Initial CCO Date	Attended By	Final CCO Date	Attended By
PERQUIMANS COUNTY	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of FEMA, Tetra Tech, Inc., and Perquimans County
PERQUIMANS COUNTY	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of FEMA, Tetra Tech, Inc., and Town of Hertford
PERQUIMANS COUNTY	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of FEMA, Tetra Tech, Inc., and Town of Winfall
PERQUIMANS COUNTY	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of Tetra Tech Inc., FEMA, and the community
PERQUIMANS COUNTY	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of Tetra Tech Inc., FEMA, and the county
TOWN OF HERTFORD	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of FEMA, Tetra Tech, Inc., and Perquimans County
TOWN OF HERTFORD	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of FEMA, Tetra Tech, Inc., and Town of Hertford
TOWN OF HERTFORD	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of FEMA, Tetra Tech, Inc., and Town of Winfall
TOWN OF HERTFORD	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of Tetra Tech Inc., FEMA, and the community
TOWN OF HERTFORD	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of Tetra Tech Inc., FEMA, and the county
TOWN OF HERTFORD ETJ	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of FEMA, Tetra Tech, Inc., and Perquimans County
TOWN OF HERTFORD ETJ	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of FEMA, Tetra Tech, Inc., and Town of Hertford
TOWN OF HERTFORD ETJ	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of FEMA, Tetra Tech, Inc., and Town of Winfall
TOWN OF HERTFORD ETJ	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of Tetra Tech Inc., FEMA, and the community
TOWN OF HERTFORD ETJ	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of Tetra Tech Inc., FEMA, and the county
TOWN OF WINFALL	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of FEMA, Tetra Tech, Inc., and Perquimans County
TOWN OF WINFALL	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of FEMA, Tetra Tech, Inc., and Town of Hertford
TOWN OF WINFALL	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of FEMA, Tetra Tech, Inc., and Town of Winfall
TOWN OF WINFALL	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of Tetra Tech Inc., FEMA, and the community
TOWN OF WINFALL	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of Tetra Tech Inc., FEMA, and the county
TOWN OF WINFALL ETJ	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of FEMA, Tetra Tech, Inc., and Perquimans County
TOWN OF WINFALL ETJ	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of FEMA, Tetra Tech, Inc., and Town of Hertford
TOWN OF WINFALL ETJ	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of FEMA, Tetra Tech, Inc., and Town of Winfall
TOWN OF WINFALL ETJ	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of Tetra Tech Inc., FEMA, and the community
TOWN OF WINFALL ETJ	1/3/1985	8/8/8888	NP	5/22/1984	Representatives of Tetra Tech Inc., FEMA, and the county

For each FIS produced during the initial phase of statewide, an Initial Scoping Meeting was held with representatives from FEMA, the county, the incorporated communities, and the State of North Carolina. A Final Scoping meeting was held to review the Draft Basin Plan and finalize the streams to be studied by detailed methods. This information was then used to create the Final Basin Plan.

For map maintenance revisions, only one scoping meeting was held to identify the streams to be newly studied by detailed methods, redelineated, or to be studied by limited detailed methods. This information was then used to create the Map Maintenance Plan.

The historical dates of the Initial and Final Scoping Meetings held during the first round of statewide mapping for Perquimans County are shown in Table 28, “Scoping Meetings.” Meetings held for the map maintenance revision are also included below for Perquimans County.

Table 28 — Scoping Meetings

Community	Riverbasin	Initial Scoping Date	Attended By	Final Scoping Date	Attended By
PERQUIMANS COUNTY	PASQUOTANK	12/14/2000	Representatives of FEMA, Dewberry, and Perquimans County	5/17/2001	Representatives of FEMA, Dewberry, and Perquimans County
TOWN OF HERTFORD	PASQUOTANK	12/14/2000	Representatives of FEMA, Dewberry, and Town of Hertford	5/17/2001	Representatives of FEMA, Dewberry, and Town of Hertford
TOWN OF HERTFORD ETJ	PASQUOTANK	12/14/2000	Representatives of FEMA, Dewberry, and Town of Hertford	5/17/2001	Representatives of FEMA, Dewberry, and Town of Hertford
TOWN OF WINFALL	PASQUOTANK	12/14/2000	Representatives of FEMA, Dewberry, and Perquimans County	5/17/2001	Representatives of FEMA, Dewberry, and Perquimans County
TOWN OF WINFALL ETJ	PASQUOTANK	12/14/2000	Representatives of FEMA, Dewberry, and Perquimans County	5/17/2001	Representatives of FEMA, Dewberry, and Perquimans County

Table 30, “Preliminary and Public Participation Meetings” is not applicable in Perquimans County.

9.0 Guide to Additional Information

Information concerning the pertinent data used in the preparation of this FIS Report can be obtained by submitting an order with any required payment to the FEMA Engineering Library. For more information on this process, see http://www.fema.gov.

The Map Repositories table below lists locations where FIRMs for Perquimans County can be viewed. Please note that the maps at these locations are for reference only and are not for distribution. Also, please note that only the maps for the community listed in the table are available at that particular repository. A user may need to visit another repository to view maps from an adjacent community.

Table 27 — Map Repositories

Community	Address	City	State	Zip Code
Perquimans County	Inspections Department, 104 Dobbs Street	Hertford	NC	27944
Town of Hertford	Hertford Town Hall, 114 West Grubb Street	Hertford	NC	27944
Town of Winfall	Winfall Town Hall, 100 Park View Lane	Winfall	NC	27985

9.1 Additional Information

All FIRM panels created for the State of North Carolina are produced in a seamless statewide format; however, FIS Reports are produced for individual counties.

Copies of FIRM panels are available for a nominal fee. To obtain a copy of the current flood map for a specific community, contact the FEMA Map Service Center at 1-800-358-9616. To facilitate the processing of your request, please review the current flood map on file at your local community repository and obtain the panel number in which you are interested. If necessary, users may also order a FIRM Index from the Map Service Center to determine the appropriate panel numbers. The Map Service Center also accepts orders for the Community Status Book and the Flood Insurance Manual. The FIS Report, FIRM panels, and digital data used to produce the FIRM panels are available online at www.ncfloodmaps.com.

Information concerning the data used in the preparation of this FIS, contained in an Engineering Study Data Package, may be obtained by contacting the FEMA Regional Office at the address listed on the Notice to Flood Insurance Study Users page at the front of this report.

Table 29, “Additional Information” is not applicable in Perquimans County.

10.0 Appendix

10.1 Bibliography

All bibliography and reference information associated within this Flood Insurance Study are maintained and accessible within the geodatabase structure and associated metadata. Users requiring more specific information should contact the North Carolina Floodplain Mapping Program (NCFMP) at www.ncfloodmaps.com under the Contacts menu