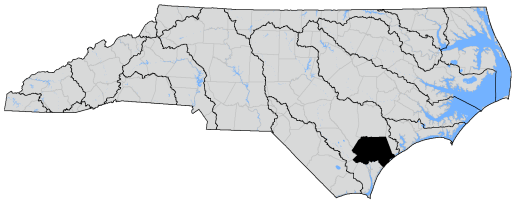
PRELIMINARY FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

A Report of Flood Hazards in

PENDER COUNTY, NORTH CAROLINA AND INCORPORATED AREAS



Community Name	Community Number
PENDER COUNTY	370344
TOWN OF ATKINSON	370542
TOWN OF BURGAW	370483
TOWN OF SURF CITY	370186
TOWN OF TOPSAIL BEACH	370187
TOWN OF WATHA	370486
VILLAGE OF SAINT HELENA	370649

NORTH CAROLINA
Cooperating Technical State
FEMA'S COOPERATING TECHNICAL PARTNER

PRELIMINARY: 4/30/2014
REVISED: 8/29/2014
Federal Emergency Management Agency
State of North Carolina
Flood Insurance Study Number
37141CV000
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
2/16/2007	Initial Countywide FIS Report Effective Date

This FIS has been produced as part of the North Carolina Floodplain Mapping Program. Pender 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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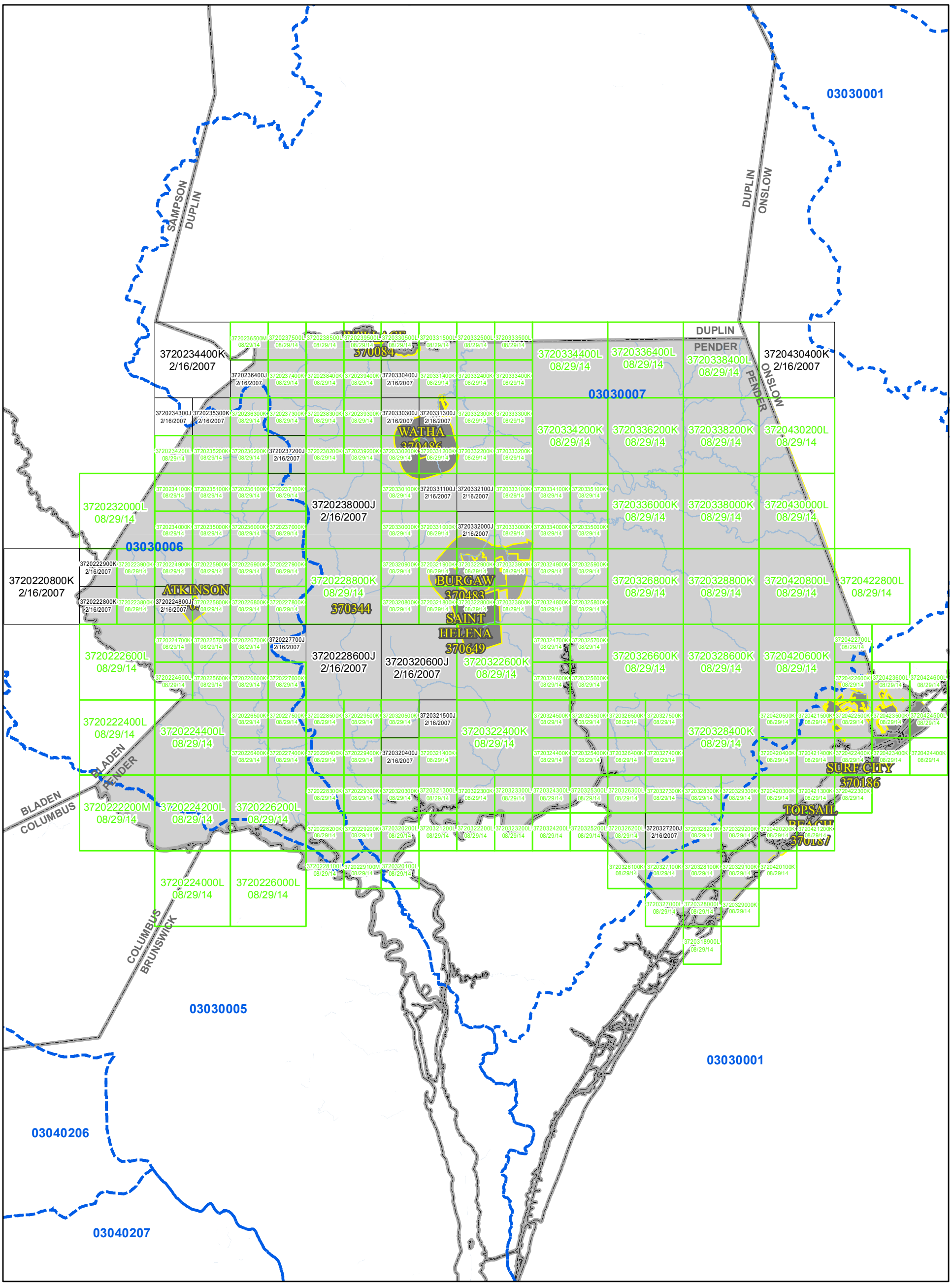


1 in = 5 miles

N

0 0.75 1.5 3 4.5 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

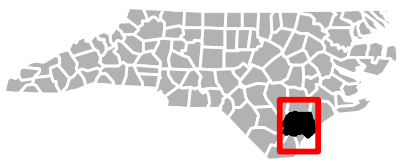
HTTP://FRIS.NC.GOV/FRIS

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

PRELIMINARY

08/29/2014

COUNTY LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

PENDER COUNTY, NORTH CAROLINA And Incorporated Areas

PANELS PRINTED:

2320, 2341, 2351, 2361, 2371, 2380, 3301, 3311, 3321, 3331, 3189, 2340, 2350, 2360, 2370, 3300, 3310, 3320, 3330, 3340, 3350, 2208, 2229, 2239, 2249, 2259, 2269, 2279, 2288, 2344, 2365, 2375, 2385, 2395, 3305, 3315, 3325, 3335, 3344, 3364, 3384, 4304, 2364, 2374, 2384, 2394, 3304, 3314, 3324, 3334, 2343, 2353, 2363, 2373, 2383, 2393, 3303, 3313, 3323, 3333, 3342, 3362, 3382, 4302, 2342, 2352, 2362, 2372, 2382, 2392, 3302, 3312, 3322, 3332, 3341, 3351, 3360, 3380, 4300, 3209, 3219, 3229, 3239, 3249, 3259, 3268, 3288, 4208, 4228, 2228, 2238, 2248, 2258, 2268, 2278, 3208, 3218, 3228, 3238, 3248, 3258, 2226, 2247, 2257, 2267, 2277, 2286, 3206, 3226, 3247, 3257, 3266, 3286, 4206, 4227, 2246, 2256, 2266, 2276, 3246, 3256, 4226, 4236, 4246, 2224, 2244, 2265, 2275, 2285, 2295, 3205, 3215, 3224, 3245, 3255, 3265, 3275, 3284, 4205, 4215, 4225, 4235, 4245, 2264, 2274, 2284, 2294, 3204, 3214, 3244, 3254, 3264, 3274, 4204, 4214, 4224, 4234, 4244, 2222, 2242, 2262, 2283, 2293, 3203, 3213, 3223, 3233, 3243, 3253, 3263, 3273, 3283, 3293, 4203, 4213, 4223, 2282, 2292, 3202, 3212, 3222, 3232, 3242, 3252, 3262, 3272, 3282, 3292, 4202, 4212, 2240, 2260, 2281, 2291, 3201, 3261, 3271, 3281, 3291, 4201, 3270, 3280, 3290

FEMA

MAP NUMBER

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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 Pender County and the jurisdictions therein (hereinafter referred to collectively as Pender 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 Pender County, North Carolina, including the jurisdictions listed in Table 1.

Table 1 - Jurisdictions in Pender County

Community	Included in this FIS	If Not Included, Location of Flood Hazard/Flood Insurance Rate Data
PENDER COUNTY	Yes	*
TOWN OF ATKINSON	Yes	*
TOWN OF BURGAW	Yes	*
TOWN OF SURF CITY	Yes	*
TOWN OF TOPSAIL BEACH	Yes	*
TOWN OF WATHA	Yes	*
VILLAGE OF SAINT HELENA	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 Pender became Effective on 2/16/2007. 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.

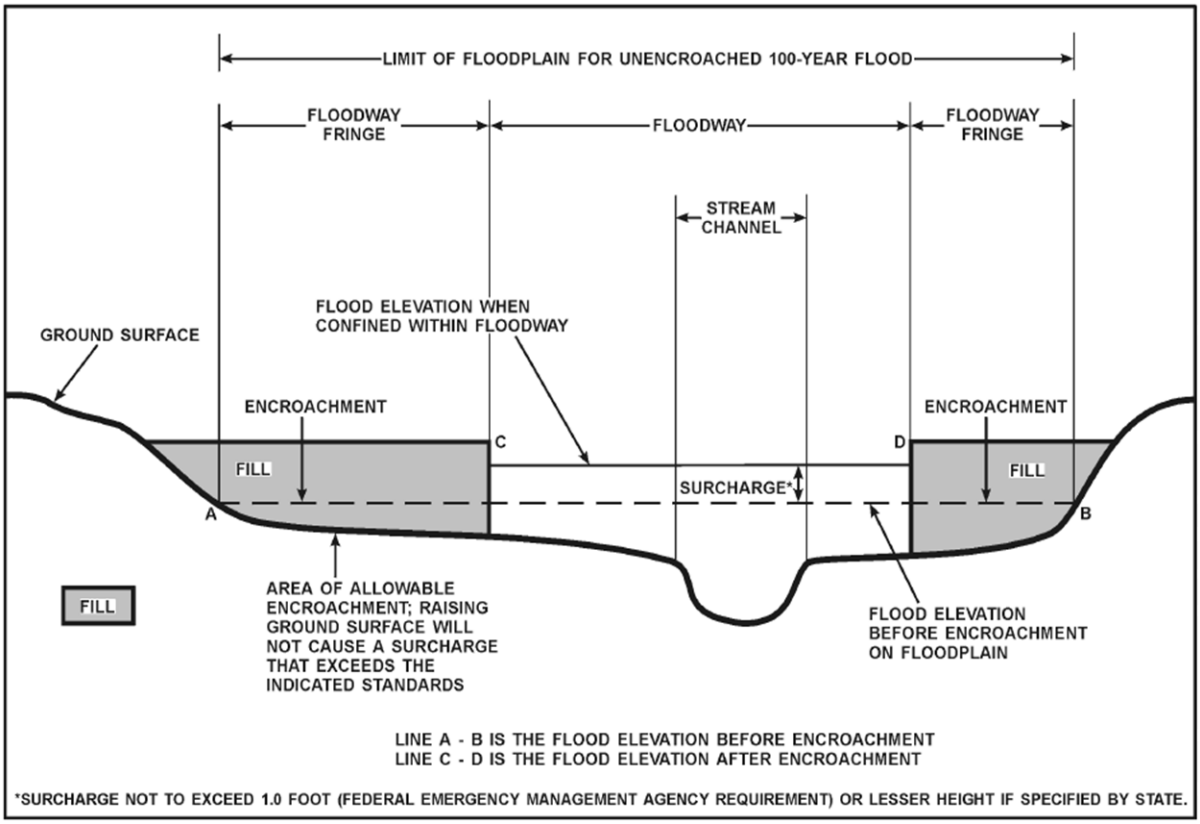

Figure 1- Floodway Schematic

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.

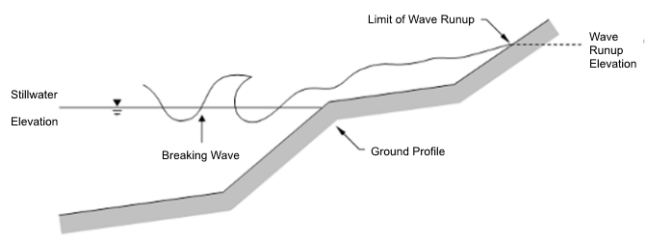

Figure 5: Wave Runup Transect Schematic

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 5, “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 26 presents the types of coastal analyses that were used in mapping the 1% annual chance floodplain in coastal areas.

Coastal BFEs

Where 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 the Appendix, “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.

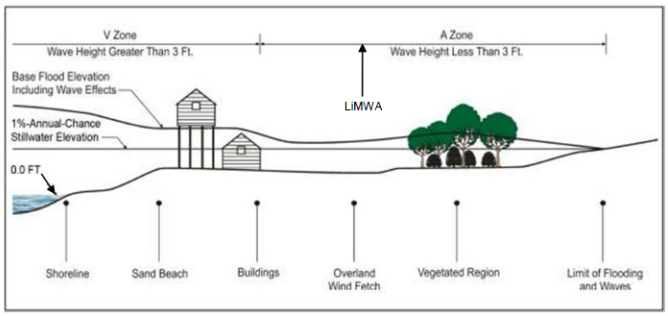

Figure 6: Coastal Transect Schematic

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. 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

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 Pender County.

4.0 Area Studied

Pender County is found in the Coastal Plain region of North Carolina. It is surrounded by Duplin County to the north, Bladen and Sampson counties to the west, Onslow County to the northeast, and the Atlantic Ocean to the southeast.

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)
Black	03030006	Black River	The Black River Basin begins in the northeastern region of Harnett County, North Carolina. The basin then drains southeast through significant portions of Bladen, Cumberland, and Sampson Counties, ending at the Cape Fear River in Pender County.	1,574
Lower Cape Fear	03030005	Cape Fear River	The Lower Cape Fear River Basin begins in Cumberland County, southeast of Fayetteville, North Carolina. The basin then drains southeast through Bladen, Brunswick, Columbus, New Hanover, and Pender Counties.	1,122
New River	03020302	New River	The New River Basin begins above the northwestern corner of Onslow County. The basin also includes coastal regions of Brunswick, New Hanover, Pender, and Onslow Counties.	891
Northeast Cape Fear	03030007	Northeast Cape Fear River	The Northeast Cape Fear River Basin begins in the northeastern region of Sampson County and along the Wayne/Duplin County boundary. The basin then drains south through Pender County, ending at the Cape Fear River in New Hanover County.	1,741

4.2 Principal Flood Problems

Table 4, “Principal Flood Problems” contains a list of principal flooding problems in Pender County.

Table 4 - Principal Flood Problems

Flooding Source	Problem
All Sources	The dominant source of flooding in Pender County is wind driven surge generated in the Atlantic Ocean by tropical storms and hurricanes which propagate into Topsail Sound. During such an event, flooding can occur along the oceanfront. High winds associ
All Sources	The dominant source of flooding in Pender County is wind driven surge generated in the Atlantic Ocean by tropical storms and hurricanes which propagate into Topsail Sound. During such an event, flooding can occur along the oceanfront. High winds associated with tropical storms can also produce extremely high waves which create higher than normal tides. The wave action during a tidal flood an be much more damaging than the higher water level. Areas located adjacent to Topsail Sound are subject to these wave attacks. Riverine flooding from heavy rainfall occurs in Bear Den Branch, Bull Branch, Bulltail Creek, Burgaw Creek, Burgaw Creek Tributary, Buxton Branch, Colvins Creek, Crooked Run Brook, Doctors Creek, Lewis Creek, Long Creek (near Burgaw), Long Creek (near Montague), Mill Branch (of Buxton Branch), Mill Branch (of Moores Creek), Moores Creek, Mulberry Branch, Northeast Cape Fear River, Rileys Creek, Rockfish Creek, Sills Creek, Sills Creek Tributaries 1 and 2, Taylor Branch, and Tuckahoe Branch. Not all storms which pass close to the study area produce extremely high surge. Similarly, storms which produce flooding conditions in one area may not necessarily produce flooding conditions in other parts of the study area. North Carolina experiences hurricanes, tropical storms, and severe extratropical cyclones usually referred to as northeasters. Unlike a hurricane which may pass over a coastal location in a fraction of a day, a northeaster may blow from the same direction and over long distances for several days (Baker, 1978). Through a special analysis, the contribution from northeasters to the overall storm surge elevation in the Pender County area was found to be insignificant compared to hurricanes; therefore, only the effects of hurricane and tropical storm induced surge elevations were considered. In other areas of North Carolina, particularly the Outer Banks area of the northern part of the State, northeasters were found to provide a significant contribution to the overall storm surge.

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”, lists selected flooding sources in Pender County with records of past stages. The table shows the historic peak, a location description, approximate stream station, the date of the historic peak, and approximate recurrence interval of the flood elevation. The approximate recurrence interval for a flood is often estimated based on an analysis of rainfall amounts from a storm and /or stream gage data.

Table 5 - Historic Flood Elevations

Flooding Source/Tropical Storm	Location Description	Approx. Stream Station	Historic Peak (Feet NAVD 88)	Date	Approximate Recurrence Interval (in years)
Black River / Hurricane Floyd	At Beattys Bridge Road	175997	25.4	9/1/1999	*
Doctors Creek / Hurricane Floyd	At NC Highway 41 - Trailer	36931	59.6	9/1/1999	*
Northeast Cape Fear River / Hurricane Floyd	Deep Bottom Road	433108	32.8	9/1/1999	500
Northeast Cape Fear River / Hurricane Floyd	Approximately 5.3 miles downstream of Deep Bottom Road	404913	35.2	9/1/1999	500
Northeast Cape Fear River / Hurricane Floyd	Window	455062	41.4	9/1/1999	500
Northeast Cape Fear River / Hurricane Floyd	At NC Highway 24 Westbound	532819	49.5	9/1/1999	500
Northeast Cape Fear River / Hurricane Floyd	At NC Highway 11	600379	68.3	9/1/1999	500
Northeast Cape Fear River / Hurricane Floyd	John Grady Road	624313	77.3	9/1/1999	500
Northeast Cape Fear River / Hurricane Floyd	Outlaw Road	640381	84.1	9/1/1999	500

* Data Not Available

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 Pender County.

Table 7, “Levees” is not applicable in Pender County.

4.5 Scope of Study

For this map maintenance revision, a scoping meeting was held in Pender 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 Pender 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 Pender 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	
Bear Den Branch	The confluence with Moores Creek (near Atkinson)	Approximately 50 feet upstream of U.S. Highway 421	Pender County
Bull Branch	The confluence with Doctors Creek	Approximately 0.2 mile upstream of Sunny Trail Road	Pender County
Bulltail Creek	Approximately 0.4 mile upstream of Indian Hill Road	Approximately 0.5 mile upstream of Indian Hill Road	Pender County
Burgaw Creek[1]	The confluence with Northeast Cape Fear River	Approximately 2.46 miles upstream of Stag Park Road	Pender County Town Of Burgaw
Buxton Branch	The confluence with Moores Creek (near Atkinson)	Approximately 50 feet upstream of U.S. Highway 421	Pender County
Cape Fear River	Approximately 2.6 miles downstream of the confluence with Black River	Approximately 15.6 miles upstream of the confluence of Hood Creek	Pender County
Cape Fear River	The confluence with Cape Fear River	Approximately 1.5 miles upstream of NC Highway 210	Pender County
Crooked Run	The confluence with Sills Creek	The upstream side of Pelham Road	Pender County
Doctors Creek	Approximately 2.3 miles upstream of the confluence with Rockfish Creek	Just downstream of Alderman Road (SR 1157)	Pender County
Dry Branch	The confluence with Moores Creek (near Atkinson)	Approximately 20 feet upstream of U.S. Highway 421	Pender County
Guffords Branch	Just downstream of NC Highway 210	Approximately 0.3 mile upstream of Highsmith Road	Pender County
Horse Branch Creek	The confluence with Long Creek	Approximately 100 feet upstream of Lake Road	Pender County
Island Creek	Approximately 150 feet upstream of confluence with Island Creek Tributary	Approximately 1 mile upstream of Sidbury Road	Pender County
Island Creek	The confluence with Northeast Cape Fear River	Approximately 150 feet upstream of confluence with Island Creek Tributary	Pender County
Jones Creek	Just downstream of the unnamed road at the outlet of Lake Ann	Approximately 110 feet upstream of Beattys Bridge Road	Pender County
Lewis Creek	The confluence with Northeast Cape Fear River	Just upstream of the confluence of North Branch	Pender County Town Of Watha
Long Creek	Approximately 1,300 feet downstream of NC Highway 53	Approximately 170 feet upstream of Coras Grove Road	Pender County

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

Source	Riverine Sources		Affected Communties
	From	To	
Long Creek[1]	Approximately 3.5 miles upstream of confluence with Northeast Cape Fear River	Approximately 1,585 feet upstream of NC Highway 210	Pender County
Mill Branch (of Buxton Branch)	The confluence with Buxton Branch	Approximately 60 feet upstream of NC Highway 53	Pender County
Mill Branch (of Moores Creek)	Approximately 150 feet upstream of NC Highway 53	Approximately 0.5 mile upstream of NC Highway 53	Pender County Town Of Atkinson
Moores Creek (near Atkinson)	Approximately 1,600 feet downstream of John Henry Store Road	Approximately 1 mile upstream of U.S. Highway 421	Pender County
Moores Creek (near Atkinson)	The confluence with Cape Fear River	Approximately 0.6 mile upstream of NC Highway 210	Pender County
Mulberry Branch	The confluence with Long Creek	Approximately 0.4 mile upstream of Herrings Chapel Road	Pender County
North Branch	The confluence with Lewis Creek	Approximately 125 feet upstream of Mary Slocum Road Northeast	Town Of Watha
Northeast Cape Fear River	Approximately 900 feet downstream of NC Highway 210	Approximately 2.2 miles upstream of Crooms Bridge Road	Pender County
Osgood Canal	The confluence with Burgaw Creek	Approximately 75 feet downstream of Railroad	Town Of Burgaw
Rockfish Creek	Approximately 560 feet downstream of Willard Railroad Street	Approximately 1.16 miles upstream of Wallace Airport Road (SR 1307)	Pender County Town Of Wallace
Rockfish Creek	The confluence with the Northeast Cape Fear River	Approximately 0.5 mile upstream of the confluence of Little Rockfish Creek	Pender County Town Of Wallace
Sills Creek	Approximately 450 feet downstream of Old Mill Road	Approximately 390 feet upstream of Englishtown Road	Pender County Town Of Wallace
Sills Creek Tributary 1	The confluence with Sills Creek	Approximately 30 feet upstream of Raccoon Road	Pender County
Sills Creek Tributary 2	The confluence with Sills Creek	Approximately 0.1 mile upstream of Raccoon Road	Pender County
Taylor Branch	The confluence with Moores Creek (near Atkinson)	Approximately 30 feet upstream of U.S. Highway 421	Pender County
Tuckahoe Branch	The confluence with White Oak Branch	Approximately 75 feet upstream of Halfway Branch School Road	Pender County
Turkey Creek	The confluence with Northeast Cape Fear River	Approximately 2.3 miles upstream of NC Highway 133	Pender County
White Oak Branch	The confluence with Moores Creek (near Atkinson)	The confluence with Tuckahoe Branch	Pender County

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

Table 9P, “Scope of Revisions: Redelineated - Preliminary” is not applicable in Pender 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	
Ashes Creek[1]	Approximately 2.2 miles downstream of Shaw Highway	Approximately 240 feet upstream of Shaw Highway	Pender County
Bear Den Branch	Approximately 50 feet upstream of U.S. Highwayy 421	Approximately 0.8 mile upstream of U.S. Highway 421	Pender County
Beckys Creek[1]	Approximately 1.5 miles downstream of NC Highway 210	Approximately 28 feet downstream of NC Highway 210	Pender County Town Of Surf City
Big Branch[1]	The confluence with Colvins Creek	Slocum Trail	Pender County
Black River[1]	Approximately 9.4 miles upstream of the confluence with the Cape Fear River	Approximately 6.9 miles upstream of the confluence with the Cape Fear River	Pender County
Bull Branch	Approximately 0.2 mile upstream of Sunny Trail Road	Approximately 0.8 mile upstream of Sunny Trail Road	Pender County
Catskin Creek	The confluence with Merricks Creek	Approximately 6.6 miles upstream of confluence with Merricks Creek	Pender County
Colly Creek[1]	The confluence with Black River	Approximately 2.7 miles upstream of NC Highway 11	Pender County
Colvins Creek[1]	The confluence with Black River	Approximately 2.8 miles upstream of the confluence with Black River	Pender County
Cypress Creek (near Stag Park)[1]	The confluence with Northeast Cape Fear River	Approximately 1 mile upstream of Stag Park Road	Pender County Village Of Saint Helena

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

Source	Riverine Sources		Affected Communties
	From	To	
Dry Branch	Approximately 20 feet upstream of NC Highway 421	Approximately 1 mile upstream of NC Highway 421	Pender County
Godfrey Creek	Approximately 2.1 miles upstream of confluence with Harrisons Creek	The confluence of Godfrey Creek Tributary	Pender County
Guffords Branch	Approximately 0.3 mile upstream of Highsmith Road	Approximately 0.7 mile upstream of Highsmith Road	Pender County
Harrisons Creek[1]	The downstream side of NC Highway 210	Approximately 1,035 feet upstream of NC Highway 210	Pender County
Holly Shelter Creek[1]	The confluence with Northeast Cape Fear River	Approximately 5 miles upstream of Shaw Highway	Pender County
Island Creek Tributary[1]	Approximately 0.4 mile upstream of the confluence with Island Creek	Approximately 0.8 mile upstream of the confluence with Island Creek	Pender County
Lillington Creek[1]	Approximately 0.8 mile downstream of Shaw Highway	Approximately 0.8 mile upstream of Shaw Highway	Pender County
Lillington Creek Tributary[1]	The confluence with Lillington Creek	Approximately 1,425 feet upstream of the confluence with Lillington Creek	Pender County
Merricks Creek	Approximately 100 feet downstream of NC Highway 210	Approximately 0.3 mile upstream of NC Highway 210	Pender County
Mill Branch (of Buxton Branch)	Approximately 60 feet upstream of NC Highway 53	Approximately 0.6 mile upstream of NC Highway 53	Pender County
Mill Pond	Approximately 1.5 miles upstream of NC Highway 53	Approximately 2.2 miles upstream of NC Highway 53	Pender County
Mill Pond[1]	The confluence with Holly Shelter Creek	Approximately 1.5 miles upstream of NC Highway 53	Pender County
Moores Creek (near Atkinson)	Approximately 0.6 miles upstream of NC Highway 210	Approximately 1,600 feet downstream of John Henry Store Road	Pender County
North Branch	Approximately 125 feet upstream of Mary Slocum Road Northeast	Approximately 0.3 mile upstream of Mary Slocum Road NE	Town Of Watha
Pike Creek[1]	The confluence with Northeast Cape Fear River	Approximately 1,055 feet downstream of Ashton Lake Road	Pender County
Players Creek	The confluence with Merricks Creek	Approximately 2.5 miles upstream of confluence with Merricks Creek	Pender County
Rockfish Creek	Approximately 0.5 mile upstream of the confluence of Little Rockfish Creek	Approximately 500 feet downstream of Williard Railroad Street	Pender County Town Of Wallace
Sawyer Creek[1]	The confluence with Sills Creek	Approximately 0.75 mile upstream of confluence with Sills Creek	Pender County Town Of Wallace
Sills Creek[1]	The confluence with Sawyer Creek	Approximately 0.85 mile upstream of confluence with Rockfish Creek	Pender County Town Of Wallace
Sills Creek Tributary 2	Approximately 0.1 mile upstream of Raccoon Road	Approximately 0.5 mile upstream of the confluence with Sills Creek Tributary 2	Pender County
Tuckahoe Branch	Approximately 75 feet upstream of Halfway Branch School Road	Approximately 0.6 mile upstream of Halfway Branch School Road	Pender County
Turkey Creek Tributary[1]	The confluence with Turkey Creek	Approximately 540 feet upstream of the confluence with Turkey Creek	Pender County
White Oak Branch	Approximately 3.5 miles upstream of Tuckahoe Road	Approximately 3.8 miles upstream of Tuckahoe Road	Pender County
White Oak Branch	The confluence with Tuckahoe Branch	Approximately 3.5 miles upstream of Tuckahoe Road	Pender 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	
Bear Den Branch	The confluence with Moores Creek (near Atkinson)	Approximately 50 feet upstream of U.S. Highway 421	Pender County
Black River	Approximately 3.7 miles downstream of Beattys Bridge Road	At the confluence of South River	Pender County
Bull Branch	The confluence with Doctors Creek	Approximately 0.2 mile upstream of Sunny Trail Road	Pender County
Bulltail Creek	Approximately 0.4 mile upstream of Indian Hill Road	Approximately 0.5 mile upstream of Indian Hill Road	Pender County
Burgaw Creek	The confluence with Northeast Cape Fear River	Approximately 0.3 mile upstream of NC Highway 53	Pender County Town Of Burgaw
Buxton Branch	The confluence with Moores Creek (near Atkinson)	Approximately 50 feet upstream of U.S. Highway 421	Pender County

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

Source	Riverine Sources		Affected Communties
	From	To	
Cape Fear River	Approximately 2.6 miles downstream of the confluence with Black River	Approximately 15.6 miles upstream of the confluence of Hood Creek	Pender County
Cape Fear River	The confluence with Cape Fear River	Approximately 1.5 miles upstream of NC Highway 210	Pender County
Colvins Creek	Approximately 97 feet downstream of first crossing of Slocum Trail	Approximately 315 feet upstream of Beattys Bridge Road	Pender County
Crooked Run	The confluence with Sills Creek	The upstream side of Pelham Road	Pender County
Doctors Creek	Approximately 2.3 miles upstream of the confluence with Rockfish Creek	Just downstream of Alderman Road (SR 1157)	Pender County
Dry Branch	The confluence with Moores Creek (near Atkinson)	Approximately 20 feet upstream of U.S. Highway 421	Pender County
Guffords Branch	Just downstream of NC Highway 210	Approximately 0.3 mile upstream of Highsmith Road	Pender County
Horse Branch Creek	The confluence with Long Creek	Approximately 100 feet upstream of Lake Road	Pender County
Island Creek	Approximately 370 feet upstream of Holy Shelter Road	Approximately 4.6 miles upstream of Holy Shelter Road	Pender County
Island Creek	The confluence with Northeast Cape Fear River	Approximately 0.6 mile upstream of confluence with Island Creek Tributary	Pender County
Jones Creek	Just downstream of the unnamed road at the outlet of Lake Ann	Approximately 110 feet upstream of Beattys Bridge Road	Pender County
Jones Creek	The confluence with Colvins Creek	Just downstream of the unnamed road at the outlet of Lake Ann	Pender County
Lewis Creek	The confluence with Northeast Cape Fear River	Just upstream of the confluence of North Branch	Pender County Town Of Watha
Long Creek	Approximately 1,300 feet downstream of NC Highway 53	Approximately 170 feet upstream of Coras Grove Road	Pender County
Long Creek	Approximately 3.5 miles upstream of confluence with NE Cape Fear River	Approximately 0.3 mile upstream of NC Hwy 210	Pender County
Long Creek	Approximately 3.5 miles upstream of confluence with Northeast Cape Fear River	Approximately 0.3 mile upstream of NC Highway 210	Pender County
Mill Branch (of Buxton Branch)	The confluence with Buxton Branch	Approximately 60 feet upstream of NC Highway 53	Pender County
Mill Branch (of Moores Creek)	Approximately 150 feet upstream of NC Highway 53	Approximately 0.5 mile upstream of NC Highway 53	Pender County Town Of Atkinson
Moores Creek (near Atkinson)	Approximately 1,600 feet downstream of John Henry Store Road	Approximately 1 mile upstream of U.S. Highway 421	Pender County
Moores Creek (near Atkinson)	The confluence with Cape Fear River	Approximately 0.6 mile upstream of NC Highway 210	Pender County
Mulberry Branch	The confluence with Long Creek	Approximately 0.4 mile upstream of Herrings Chapel Road	Pender County
North Branch	The confluence with Lewis Creek	Approximately 125 feet upstream of Mary Slocum Road Northeast	Town Of Watha
Northeast Cape Fear River	Approximately 900 feet downstream of NC Highway 210	Approximately 2.2 miles upstream of Crooms Bridge Road	Pender County
Osgood Canal	The confluence with Burgaw Creek	Approximately 75 feet downstream of Railroad	Town Of Burgaw
Rileys Creek	The confluence with Long Creek	Approximately 2.2 miles upstream of confluence with Long Creek	Pender County
Rockfish Creek	Approximately 560 feet downstream of Willard Railroad Street	Approximately 1.16 miles upstream of Wallace Airport Road (SR 1307)	Pender County Town Of Wallace
Rockfish Creek	The confluence with the Northeast Cape Fear River	Approximately 0.5 mile upstream of the confluence of Little Rockfish Creek	Pender County Town Of Wallace
Sills Creek	Approximately 450 feet downstream of Old Mill Road	Approximately 390 feet upstream of Englishtown Road	Pender County Town Of Wallace
Sills Creek Tributary 1	The confluence with Sills Creek	Approximately 30 feet upstream of Raccoon Road	Pender County
Sills Creek Tributary 2	The confluence with Sills Creek	Approximately 0.1 mile upstream of Raccoon Road	Pender County
Taylor Branch	The confluence with Moores Creek (near Atkinson)	Approximately 30 feet upstream of U.S. Highway 421	Pender County
Tuckahoe Branch	The confluence with White Oak Branch	Approximately 75 feet upstream of Halfway Branch School Road	Pender County
Turkey Creek	The confluence with Northeast Cape Fear River	Approximately 2.3 miles upstream of NC Highway 133	Pender County
White Oak Branch	The confluence with Moores Creek (near Atkinson)	The confluence with Tuckahoe Branch	Pender County

Table 9, “Flooding Sources Studied by Detailed Methods: Redelineated”, lists all flooding sources that were studied by detailed

methods for the pre- statewide FIS and redelineated for previous FISs. These flooding sources were not part of this revision and their effective analyses remain valid.

Table 9 - Flooding Sources Studied by Detailed Methods: Redelineated

Source	Riverine Sources		Affected Communties
	From	To	
Doctors Creek	Confluence of Bull Branch	Approximately 2.4 miles upstream of confluence of the Bull Branch	Pender 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	
Angola Creek	The confluence with Holly Shelter Creek	Approximately 0.3 mile downstream of the Duplin/Pender County line	Pender County
Angola Creek Tributary 3	The confluence with Angola Creek	Approximately 0.6 mile upstream of NC Hwy 50	Pender County
Angola Creek Tributary 4	The confluence with Angola Creek	Approximately 0.2 mile upstream of Murphy Honor Road	Pender County
Ashes Creek	Approximately 2.2 miles downstream of Shaw Highway	Approximately 12.4 miles upstream of Shaw Highway	Pender County
Bear Branch	The confluence with the Black River	Approximately 0.4 mile upstream of Blueberry Road	Pender County
Bear Den Branch	Approximately 50 feet upstream of U.S. Highwayy 421	Approximately 0.8 mile upstream of U.S. Highway 421	Pender County
Beckys Creek	Approximately 1.5 miles downstream of NC Highway 210	Approximately 1.0 mile upstream of NC Highway 210	Pender County Town Of Surf City
Bee Branch	Approximately 0.3 mile downstream of Messick Road	Approximately 700 feet upstream of Shiloh Road	Pender County
Big Branch	The confluence with Colvins Creek	The confluence with Big Branch Tributary	Pender County
Big Branch Tributary	The confluence with Big Branch	Approximately 0.3 mile upstream of the confluence with Big Branch	Pender County
Black River	Approximately 9.4 miles upstream of the confluence with the Cape Fear River	Approximately 3.7 miles downstream of Beattys Bridge Road	Pender County
Bull Branch	Approximately 0.2 mile upstream of Sunny Trail Road	Approximately 0.8 mile upstream of Sunny Trail Road	Pender County
Cape Fear River	Confluence with the Black River	Approximately 190 feet downstream of Bladen/Cumberland County boundary	Pender County
Cat Creek	Confluence with Black River	Approximately 1.0 mile upstream of Private Road	Pender County
Catskin Creek	At the confluence with Merricks Creek	Approximately 6.6 miles upstream of confluence with Merricks Creek	Pender County
Catskin Creek	The confluence with Merricks Creek	Approximately 6.6 miles upstream of confluence with Merricks Creek	Pender County
Colly Creek	The confluence with Black River	Approximately 0.3 mile upstream of Susie Sand Hill Road	Pender County
Colvins Creek	Approximately 320 feet upstream of Beattys Bridge Road	Approximately 210 feet upstream of a private road	Pender County
Colvins Creek	The confluence with Black River	Approximately 100 feet upstream of the first crossing of Slocum Trail	Pender County
Colvins Creek Tributary	The confluence with Colvins Creek	Approximately 0.5 mile upstream of Slocum Trail	Pender County
Cypress Creek (near Stag Park)	The confluence with Northeast Cape Fear River	Approximately 800 feet upstream of Front Street	Pender County Village Of Saint Helena
Cypress Creek (near Wards Corner)	The confluence with Long Creek	Approximately 0.5 mile upstream of Shiloh Road	Pender County
Doctors Creek	Approximately 85 feet downstream of Alderman Road	Sampson-Duplin County boundary	Pender County
Doctors Creek	Confluence with Rockfish Creek	Approximately 1.3 miles upstream of Doctors Creek Road	Pender County
Dry Branch	Approximately 20 feet upstream of NC Highway 421	Approximately 1 mile upstream of NC Highway 421	Pender County
Flat Swamp	Confluence with Juniper Swamp	Approximately 2.3 miles upstream of Preston Wells Road	Pender County
Godfrey Creek	Approximately 2.1 miles upstream of confluence with Harrisons Creek	The confluence of Godfrey Creek Tributary	Pender County
Godfrey Creek	At the confluence with Harrisons Creek	Approximately 2.1 miles upstream of confluence with Harrisons Creek	Pender County

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

Source	Riverine Sources		Affected Communties
	From	To	
Guffords Branch	Approximately 0.3 mile upstream of Highsmith Road	Approximately 0.7 mile upstream of Highsmith Road	Pender County
Harrisons Creek	The downstream side of NC Highway 210	Approximately 300 feet upstream of Holiday Drive	Pender County
Holly Shelter Creek	The confluence with Northeast Cape Fear River	Approximately 1.6 miles upstream of Onslow/Pender County boundary	Pender County
Island Creek Tributary	Approximately 0.4 mile upstream of confluence with Island Creek	Approximately 2.8 miles upstream of confluence with Island Creek	Pender County
Island Creek Tributary	Approximately 0.4 mile upstream of the confluence with Island Creek	Approximately 2.8 miles upstream of the confluence with Island Creek	Pender County
Juniper Swamp	The confluence with Shaken Creek	Approximately 4.7 miles upstream of U.S. Highway 50	Pender County
Kellys Creek	The confluence with Rileys Creek	Approximately 300 feet upstream of Little Kelly Road	Pender County
Lillington Creek	Approximately 0.8 mile downstream of Shaw Highway	Approximately 2.7 miles upstream of Shaw Highway	Pender County
Lillington Creek Tributary	The confluence with Lillington Creek	Approximately 0.9 mile upstream of Vogler Drive	Pender County
Long Creek	Approximately 0.3 mile upstream of NC Hwy 210	At NC Hwy 53	Pender County
Long Creek Tributary	The confluence with Long Creek	Approximately 0.3 mile upstream of confluence with Long Creek	Pender County
Merricks Creek	Approximately 100 feet downstream of NC Highway 210	Approximately 0.3 mile upstream of NC Highway 210	Pender County
Mill Branch (of Buxton Branch)	Approximately 60 feet upstream of NC Highway 53	Approximately 0.6 mile upstream of NC Highway 53	Pender County
Mill Creek	The confluence with Holly Shelter Creek	Approximately 1.5 miles upstream of Hwy 53	Pender County
Mill Creek Tributary	Approximately 0.2 mile upstream of confluence with Muddy Creek	Approximately 3.2 miles upstream of Lyman Road	Pender County
Mill Pond	Approximately 1.5 miles upstream of NC Highway 53	Approximately 2.2 miles upstream of NC Highway 53	Pender County
Mill Pond	The confluence with Holly Shelter Creek	Approximately 1.5 miles upstream of NC Highway 53	Pender County
Moores Creek	The confluence with Holly Shelter Creek	Approximately 1.6 miles upstream of Andemora Road	Pender County
Moores Creek (near Atkinson)	Approximately 0.6 miles upstream of NC Highway 210	Approximately 1,600 feet downstream of John Henry Store Road	Pender County
Moores Creek Tributary 1	The confluence with Moores Creek	Approximately 1.0 mile upstream of Tomahawk Road	Pender County
Moores Creek Tributary 2	The confluence with Moores Creek	Approximately 570 feet upstream of NC Highway 53	Pender County
Moores Creek Tributary 6	The confluence with Moores Creek	Approximately 1.3 miles upstream of Joshua James Road	Pender County
Moores Creek Tributary 7	The confluence with Moores Creek Tributary 6	Approximately 1.0 mile upstream of Cypress Creek Road	Pender County
North Branch	Approximately 125 feet upstream of Mary Slocum Road Northeast	Approximately 0.3 mile upstream of Mary Slocum Road NE	Town Of Watha
Northeast Cape Fear River	Approximately 2.2 miles upstream of Crooms Bridge Road	Approximately 0.3 mile downstream of Bennetts Bridge Road	Pender County
Pike Creek	The confluence with Northeast Cape Fear River	Approximately 2.1 miles upstream of Interstate 40	Pender County
Players Creek	The confluence with Merricks Creek	Approximately 2.5 miles upstream of confluence with Merricks Creek	Pender County
Rileys Creek	Approximately 2.2 miles upstream of the confluence with Long Creek	At the confluence ofRizzo Creek and Mill Creek	Pender County
Rizzo Creek	The confluence with Rileys Creek	Approximately 0.5 mile upstream of confluence with Rileys Creek	Pender County
Rockfish Creek	Approximately 0.5 mile upstream of the confluence of Little Rockfish Creek	Approximately 500 feet downstream of Williard Railroad Street	Pender County Town Of Wallace
Rockfish Creek	Confluence of Rockfish Creek Tributary	Approximately 0.9 mile upstream of Blue Newkirk Road	Pender County Town Of Wallace
Sandy Run Swamp	The confluence with Holly Shelter Creek	Approximately 0.9 mile upstream of Haw Run Road	Pender County
Sawyer Creek	The confluence with Sills Creek	Approximately 1.0 mile upstream of Test Farm Road	Pender County Town Of Wallace
Shaken Creek	The confluence with Holly Shelter Creek	Approximately 0.3 mile downstream of the Onslow/Pender County line	Pender County
Shelter Swamp Creek	The confluence with Sandy Run Swamp	Approximately 3.2 miles upstream of South Coston Road	Pender County
Sills Creek	The confluence with Sawyer Creek	Approximately 450 feet downstream of Old Mill Road	Pender County Town Of Wallace
Sills Creek Tributary 2	Approximately 0.1 mile upstream of Raccoon Road	Approximately 0.5 mile upstream of the confluence with Sills Creek Tributary 2	Pender County

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

Source	Riverine Sources		Affected Communties
	From	To	
Trumpeter Swamp	The confluence with Catskin Creek	Approximately 1.2 miles upstream of JA Drive	Pender County
Tuckahoe Branch	Approximately 75 feet upstream of Halfway Branch School Road	Approximately 0.6 mile upstream of Halfway Branch School Road	Pender County
Turkey Creek Tributary	The confluence with Turkey Creek	Approximately 850 feet upstream of Arvida Spur Road	Pender County
Washington Creek	The confluence with Northeast Cape Fear River	Approximately 0.7 mile upstream of Interstate 40	Pender County Town Of Watha
Washington Creek Tributary	The confluence with Washington Creek	Approximately 0.7 mile upstream of confluence with Washington Creek	Pender County Town Of Watha
White Oak Branch	Approximately 3.5 miles upstream of Tuckahoe Road	Approximately 3.8 miles upstream of Tuckahoe Road	Pender County
White Oak Branch	The confluence with Tuckahoe Branch	Approximately 3.5 miles upstream of Tuckahoe Road	Pender County

Additional Flooding Sources included in this FIS Report studied by Other Methods

Source	Riverine Sources		Affected Communties	Study Type
	From	To		
Mulberry Branch	Approximately 0.4 mile upstream of Herrings Chapel Road	Approximately 0.6 mile upstream of Herrings Chapel Road	Pender County	DIGITAL CONVERSION
NP	NP	NP	Pender County Town Of Burgaw Town Of Surf City Village Of Saint Helena	NP
Taylor Branch	Approximately 30 feet upstream of U.S. Highway 421	Approximately 0.6 mile upstream of U.S. Highway 421	Pender County	DIGITAL CONVERSION

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

Table 12, “Letters of Map Revision” is not applicable in Pender 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
Angola Creek					
The confluence with Holly Shelter Creek	69.67	*	*	6970	*
Approximately 700 feet downstream of NC Hwy 53	65.64	*	*	6730	*
Approximately 1.0 mile upstream of NC Hwy 53	28.06	*	*	4160	*
Approximately 2.1 miles upstream of NC Hwy 53	22.75	*	*	3690	*
Approximately 3.4 miles upstream of NC Hwy 53	19.57	*	*	3390	*
Approximately 4.6 miles upstream of NC Hwy 53	17.61	*	*	3190	*
Approximately 4.8 miles upstream of NC Hwy 53	16.19	*	*	3050	*
Approximately 5.3 miles upstream of NC Hwy 53	14.81	*	*	2900	*
Angola Creek Tributary 3					
The confluence with Angola Creek	2.24	*	*	992	*
Approximately 700 feet upstream of NC Hwy 50	1.52	*	*	798	*
Approximately 400 feet downstream of Cypress Creek Road	0.32	*	*	326	*
Angola Creek Tributary 4					
The confluence with Angola Creek	4.56	*	*	1480	*
At NC Hwy 50	3.38	*	*	1250	*
Approximately 0.5 mile downstream of Murphy Honour Road	2.56	*	*	1070	*
Approximately 0.3 mile upstream of Murphy Honour Road	1.32	*	*	736	*
Ashes Creek					
Approximately 3.4 miles downstream of Shaw Highway	48.57	*	*	5680	*
Approximately 1.2 miles upstream of Shaw Highway	46.96	*	*	5570	*
Approximately 3.3 miles upstream of Shaw Highway	44.57	*	*	5410	*
Approximately 6.5 miles upstream of Shaw Highway	40.52	*	*	5120	*
Approximately 7.9 miles upstream of Shaw Highway	37.24	*	*	4880	*
Approximately 10.3 miles upstream of Shaw Highway	32.20	*	*	4500	*
Approximately 12.0 miles upstream of Shaw Highway	27.07	*	*	4080	*
Bear Branch					
The confluence with Black River	2.29	*	*	747	*
Approximately 800 feet downstream of Blueberry Road	0.78	*	*	406	*
Bear Den Branch					
At the confluence with Moores Creek (near Atkinson)	4.05	525	1008	1275	2074
Approximately 0.45 mile downstream of U.S. Highway 421	3.63	491	944	1195	1947
Just upstream of U.S. Highway 421	3.15	450	867	1099	1792
Approximately 0.55 mile upstream of U.S. Highway 421	2.07	347	674	856	1403
Beckys Creek					
Approximately 1.6 miles downstream of NC Hwy 210	3.25	*	*	1230	*
Approximately 1.0 mile downstream of NC Hwy 210	2.95	*	*	1160	*
Approximately 200 feet downstream of NC Hwy 210	2.04	*	*	941	*
Approximately 0.5 mile upstream of Atkinson Loop Road	1.33	*	*	737	*
Bee Branch					
Approximately 0.4 mile downstream of Messick Road	6.16	*	*	1760	*
Approximately 0.5 mile upstream of Messick Road	5.14	*	*	1590	*
At Shiloh Road	3.16	*	*	1210	*

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
Big Branch					
The confluence with Colvins Creek	2.68	*	*	817	*
Approximately 0.4 mile upstream of Slocum Trail	1.04	*	*	479	*
Big Branch Tributary					
The confluence with Big Branch	0.62	*	*	355	*
Black River					
Just upstream of confluence with Cape Fear River	1573.92	16313	25597	30131	40164
Approximately 16.1 miles downstream of NC Hwy 210	1573.56	*	*	30200	*
Approximately 10.7 miles downstream of NC Hwy 210	1544.60	*	*	29900	*
Approximately 9.8 miles downstream of NC Hwy 210	1543.16	*	*	29800	*
Approximately 8.1 miles downstream of NC Hwy 210	1541.37	*	*	29800	*
Approximately 7.0 miles downstream of NC Hwy 210	1539.06	*	*	29800	*
Approximately 6.0 miles downstream of NC Hwy 210	1536.97	*	*	29800	*
Approximately 4.8 miles downstream of NC Hwy 210	1532.52	*	*	29700	*
Approximately 4.45 miles upstream of confluence with Cape Fear River	1527.82	16017	25144	29603	39474
Approximately 2.8 miles downstream of confluence with Moores Creek (near Atkinson)	1518.68	15957	25054	29498	39336
Approximately 3.6 miles downstream of NC Hwy 210	1439.36	*	*	28700	*
Approximately 1.4 miles downstream of NC Hwy 210	1437.48	*	*	28700	*
At confluence with Moores Creek (near Atkinson)	1417.66	15294	24040	28316	37789
At N.C. Highway 210	1415.51	15280	24019	28291	37756
Approximately 0.6 mile upstream of NC Hwy 210	1301.11	*	*	27100	*
Approximately 0.55 miles upstream of N.C. Highway 210	1293.24	14451	22751	26812	35819
Approximately 3.7 miles downstream of Beattys Bridge Road	1277.40	15300	23100	26800	36500
Approximately 3.7 miles downstream of Beattys Bridge Road	1277.36	15300	23100	26800	36500
Approximately 0.95 mile downstream of Pender/Bladen County boundary	1269.78	14289	22503	26522	35438
Bull Branch					
Just upstream of confluence with Doctors Creek	3.86	510	980	1240	2019
Just upstream of Willard Road	3.31	464	893	1131	1845
Approximately 1,665 feet downstream of Sunny Trail Road	2.13	353	686	871	1427
Approximately 2,415 feet upstream of Sunny Trail Road	1.28	257	504	642	1058
Bulltail Creek					
Just upstream of confluence with Moores Crek (near Atkinson)	3.75	501	963	1220	1986
Approximately 1,500 feet downstream of Indian Hill Road	2.06	346	672	853	1398
Approximately 2,540 feet upstream of Indian Hill Road	1.06	229	450	575	949
Burgaw Creek					
Approximately 2.6 miles downstream of the downstream crossing of Stag Park Road	30.18	1530	3430	4330	7090
Approximately 0.5 mile upstream of the downstream crossing of Stag Park Road	27.43	1440	3240	4110	6720
Approximately 1.0 mile downstream of NC Hwy 53	23.05	1290	2940	3720	6100
Approximately 900 feet upstream of I-40	16.43	1050	2420	3070	5050
Approximately 0.7 mile downstream of Old Savannah Road	5.56	540	1300	1660	2760
Approximately 800 feet downstream of Old Savannah Road	2.44	667	1210	1420	2030
Approximately 0.6 mile downstream of West Wallace Street	1.90	619	1120	1310	1860
Approximately 0.3 mile downstream of West Wilmington Street	1.15	381	743	881	1310

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
Buxton Branch					
Just upstream of confluence with Moores Creek (near Atkinson)	6.50	703	1340	1690	2735
Approximately 190 feet upstream of Bell Williams Road	4.59	567	1086	1374	2231
Approximately 1,425 feet upstream of Bell Williams Road	4.51	561	1076	1360	2210
Approximately 0.8 mile upstream of Bell Williams Road	1.60	296	577	734	1207
Approximately 0.9 mile upstream of Bell Williams Road	1.51	285	557	709	1165
Approximately 550 feet downstream of U.S. Highway 421	1.01	223	439	560	924
Cape Fear River					
Downstream of Black River	7055.00	71800	108000	131000	195000
At confluence with Black River	5465.78	66920	104540	124150	177920
Approximately 2.5 miles upstream of Pender/Brunswick/ Columbus county boundaries	5407.97	66730	104420	123910	177290
Approximately 1.8 miles downstream of Pender/Bladen/Columbus county bondaries	5298.65	66370	104180	123430	176100
At the Columbus/ Pender/Brunswick County boundary	5258.00	*	*	123000	*
At the Bladen/Columbus County boundary	5022.30	*	*	121000	*
Catskin Creek					
The confluence with Merricks Creek	34.35	*	*	4660	*
Approximately 0.8 mile upstream of the confluence with Merricks Creek	34.10	*	*	4650	*
Approximately 1.5 miles upstream of the confluence with Merricks Creek	33.77	*	*	4620	*
Approximately 2.4 miles upstream of the confluence with Merricks Creek	33.12	*	*	4570	*
Approximately 2.8 miles upstream of the confluence with Merricks Creek	19.85	*	*	3420	*
Approximately 3.9 miles upstream of the confluence with Merricks Creek	19.12	*	*	3350	*
Approximately 4.6 miles upstream of the confluence with Merricks Creek	17.73	*	*	3210	*
Approximately 6.1 miles upstream of the confluence with Merricks Creek	15.93	*	*	3020	*
Colly Creek					
At the Bladen/Pender County boundary	122.50	*	*	2773	*
Colvins Creek					
The confluence with Black River	20.79	*	*	2920	*
Approximately 2.5 miles downstream of NC Hwy 53	17.16	*	*	2620	*
Approximately 0.7 mile downstream of NC Hwy 53	14.75	1100	1950	2400	3690
At Slocum Trail	13.56	1050	1860	2290	3530
Approximately 1.4 miles downstream of Slocum Trail	7.48	726	1320	1640	2560
Approximately 0.6 mile downstream of Slocum Trail	6.62	673	1230	1530	2400
Approximately 1,000 feet upstream of Slocum Trail	5.04	570	1050	1310	2070
Approximately 315 feet upstream of Beattys Bridge Road	2.90	*	*	957	*
At Beattys Bridge Road	2.90	405	761	957	1540
Colvins Creek Tributary					
The confluence with Colvins Creek	1.49	*	*	587	*
Approximately 0.3 mile upstream of Slocum Trail	0.62	*	*	357	*
Crooked Run					
Just upstream of confluence with Sills Creek	4.36	550	1055	1334	2168
Approximately 570 feet upstream of Pelham Road	3.23	457	881	1116	1820
Just upstream of Penderlea Highway	1.83	322	626	796	1306
Cypress Creek (near Stag Park)					

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
The confluence with Northeast Cape Fear River	6.47	*	*	1810	*
Approximately 1.8 miles downstream of I-40	5.10	*	*	1580	*
Approximately 1,000 feet downstream of I-40	3.42	*	*	1260	*
Approximately 0.8 mile upstream of I-40	1.90	*	*	904	*
Approximately 0.3 mile upstream of US Hwy 117	0.84	*	*	570	*
Cypress Creek (near Wards Corner)					
Approximately 1.4 miles downstream of NC Hwy 53	20.55	*	*	3490	*
Approximately 0.6 mile downstream of NC Hwy 53	18.53	*	*	3290	*
Approximately 0.7 mile downstream of Piney Woods Road	16.64	*	*	3090	*
Approximately 210 feet downstream of Piney Woods Road	14.68	*	*	2880	*
Approximately 0.8 mile upstream of Piney Woods Road	13.19	*	*	2710	*
Approximately 2.5 miles downstream of Shiloh Road	12.11	*	*	2580	*
Approximately 1.9 miles downstream of Shiloh Road	11.31	*	*	2480	*
Approximately 1.1 miles downstream of Shiloh Road	10.00	*	*	2320	*
Approximately 0.5 mile downstream of Shiloh Road	2.60	*	*	1080	*
Approximately 160 feet downstream of Shiloh Road	2.34	*	*	1020	*
Doctors Creek					
The confluence with Rockfish Creek	50.80	*	*	5820	*
Approximately 1.1 miles upstream of the confluence with Rockfish Creek	49.79	*	*	5760	*
At confluence with Bull Branch	49.06	*	*	5642	*
Approximately1.3 mile downstream of Alderman Road	46.49	*	*	5465	*
Approximately 0.78 mile downstream of Alderman Road	45.51	*	*	5396	*
Just upstream of the confluence of Bull Branch	44.90	*	*	5430	*
Just upstream of the confluence of Mill Creek	22.73	*	*	3690	*
Dry Branch					
At confluence with Moores Creek (near Atkinson)	3.29	462	889	1127	1837
Approximately 0.5 mile upstream of US Hwy 421	2.18	*	*	727	*
Godfrey Creek					
Approximately 330 feet upstream of confluence with Harrisons Creek	4.51	562	1076	1361	2211
Approximately 1.0 mile upstream of confluence with Harrisons Creek	3.35	467	900	1140	1859
Approximately 1.75 miles upstream of confluence with Harrisons Creek	2.61	401	775	984	1608
Approximately 0.7 mile downstream of Hoover Road	1.68	305	595	757	1244
Guffords Branch					
At confluence with Rileys Creek	2.02	341	663	843	1382
Approximately 1,300 feet upstream of N.C. Highway 210	1.64	301	586	746	1225
Approximately 530 feet downstream of Highsmith Road	1.11	237	465	592	977
Harrisons Creek					
At NC Hwy 210	14.72	*	*	2890	*
Approximately 0.4 mile upstream of NC Hwy 210	14.31	*	*	2840	*
Approximately 1.6 miles upstream of NC Hwy 210	12.33	*	*	2610	*
Approximately 1.7 miles downstream of Holiday Drive	12.06	*	*	2580	*
Approximately 1.0 mile downstream of Holiday Drive	2.48	*	*	1050	*
Approximately 0.6 mile downstream of Holiday Drive	2.34	*	*	1020	*
At Holiday Drive	1.99	*	*	927	*

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
Holly Shelter Creek					
The confluence with Northeast Cape Fear River	270.27	*	*	12000	*
Approximately 5.3 miles downstream of Shaw Highway	269.58	*	*	12000	*
Approximately 3.8 miles downstream of Shaw Highway	267.84	*	*	11900	*
Approximately 2.9 miles downstream of Shaw Highway	265.94	*	*	11900	*
Approximately 1.0 mile downstream of Shaw Highway	262.43	*	*	11800	*
Approximately 0.5 mile upstream of Shaw Highway	259.91	*	*	11700	*
Approximately 3.1 miles upstream of Shaw Highway	249.25	*	*	11500	*
Approximately 5.6 miles upstream of Shaw Highway	248.47	*	*	11400	*
Approximately 6.5 miles downstream of Old Maple Hill Road	176.74	*	*	9420	*
Approximately 5.5 miles downstream of Old Maple Hill Road	176.29	*	*	9400	*
Approximately 0.4 mile downstream of Old Maple Hill Road	101.27	*	*	6850	*
Approximately 1.2 miles upstream of Old Maple Hill Road	100.42	*	*	6810	*
Approximately 2.1 miles upstream of Old Maple Hill Road	22.51	*	*	2900	*
Approximately 2.4 miles downstream of NC Hwy 50	21.56	*	*	2830	*
Approximately 1.4 miles downstream of NC Hwy 50	20.82	*	*	2770	*
Approximately 0.3 mile downstream of NC Hwy 50	20.01	*	*	2710	*
Approximately 700 feet upstream of NC Hwy 50	19.62	*	*	2680	*
Approximately 0.6 mile downstream of Maple Hill School Road	4.79	*	*	1200	*
Approximately 0.6 mile downstream of Webbtown Road	3.19	*	*	947	*
Horse Branch Creek					
Just upstream of confluence with Long Creek	10.10	923	1745	2196	3536
Approximately 1,900 feet upstream of Long Creek	9.75	903	1708	2149	3463
Approximately 2,200 feet upstream of Coras Grove Road	8.83	850	1610	2027	3270
Approximately 1.4 miles upstream of Coras Grove Road	7.58	773	1468	1851	2990
Approximately 1.8 miles upstream of Coras Grove Road	7.01	736	1401	1767	2857
Approximately 2,300 feet downstream of Mary Slocum Road	5.85	659	1257	1587	2571
Approximately 1,130 feet downstream of Mary Slocum Road	5.30	620	1185	1496	2427
Just upstream of Mary Slocum Road	4.09	528	1014	1284	2088
Approximately 1,240 feet upstream of Mary Slocum Road	2.73	412	796	1010	1650
Approximately 1,720 feet upstream of Mary Slocum Road	2.33	374	724	919	1505
Approximately 2,060 feet upstream of Lake Road	0.61	163	323	413	687
Island Creek					
Just upstream of confluence with Northeast Cape Fear River	18.60	1345	2516	3155	5047
Approximately 0.56 mile upstream of confluence with Northeast Cape Fear River	18.28	1331	2491	3123	4997
Approximately 1.5 miles upstream of confluence with Northeast Cape Fear River	16.49	1249	2341	2938	4705
At Holly Shelter Road	16.25	1239	2331	2928	4689
Approximately 0.85 mile downstream of Island Creek Road	15.98	1225	2297	2883	4619
Just upstream of Island Creek Road	14.19	1138	2139	2686	4310
Approximately 0.9 mile upstream of Holly Shelter Road	11.77	1016	1921	2417	3885
Approximately 1 mile upstream of Island Creek Road	8.81	848	1607	2024	3264
Island Creek Tributary					
Approximately 0.3 mile upstream of confluence with Island Creek	4.22	*	*	1420	*
Approximately 0.9 mile upstream of confluence with Island Creek	3.46	*	*	1270	*

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 1.8 miles upstream of confluence with Island Creek	2.63	*	*	1090	*
Approximately 2.4 miles upstream of confluence with Island Creek	1.87	*	*	895	*
Jones Creek					
At confluence with Colvins Creek	5.45	631	1206	1523	2469
Approximately 1.3 miles upstream of confluence with Colvins Creek	4.58	567	1086	1373	2231
Approximately 0.93 mile upstream of Slocum Trail	4.10	529	1015	1284	2089
Approximately 2,240 feet downstream of Beatty's Bridge Road	3.45	476	916	1160	1891
Approximately 0.7 mile upstream of Beattys Bridge Road	2.37	*	*	854	*
Approximately 1,885 feet upstream of Beatty's Bridge Road	2.36	377	730	926	1516
Juniper Swamp					
The confluence with Shaken Creek	41.21	*	*	5170	*
Kellys Creek					
The confluence with Rileys Creek	8.18	*	*	2070	*
Approximately 800 feet downstream of Little Kelly Road	7.49	*	*	1970	*
Lewis Creek					
At confluence with Northeast Cape Fear River	9.00	859	1628	2050	3305
Approximately 125 feet upstream of confluence with Northeast Cape Fear River	8.49	829	1572	1981	3196
Approximately 1,725 feet downstream of U.S. Highway 117	7.91	794	1507	1899	3066
Approximately 315 feet upstream of U.S. Highway 117	7.41	762	1449	1826	2951
Approximately 3,215feet upstream of U.S. Highway 117	6.21	683	1303	1644	2662
Lillington Creek					
The confluence with Northeast Cape Fear River	16.81	*	*	3110	*
Approximately 1.1 miles downstream of Shaw Highway	14.30	*	*	2840	*
Approximately 0.3 mile downstream of Shaw Highway	13.40	*	*	2730	*
Approximately 0.6 mile upstream of Shaw Highway	9.59	*	*	2260	*
Approximately 1.6 miles upstream of Shaw Highway	7.55	*	*	1980	*
Approximately 2.4 miles upstream of Shaw Highway	4.83	*	*	1530	*
Lillington Creek Tributary					
The confluence with Lillington Creek	1.99	*	*	928	*
Approximately 0.5 mile upstream of confluence with Lillington Creek	1.77	*	*	867	*
Approximately 0.8 mile upstream of confluence with Lillington Creek	0.54	*	*	444	*
Long Creek					
At confluence with Northeast Cape Fear River	141.40	4702	8499	10527	16468
At confluence with Morgan Creek	134.95	4569	8264	10239	16025
Approximately 1.5 miles upstream of confluence with Morgan Creek	131.95	4506	8154	10103	15817
Approximately 7.7 miles downstream of NC Hwy 210	130.25	3760	7910	9930	16000
Approximately 7.3 miles downstream of NC Hwy 210	129.67	3750	7890	9910	16000
Approximately 6.2 miles downstream of NC Hwy 210	128.83	3730	7860	9870	15900
Approximately 5.3 miles downstream of NC Hwy 210	126.30	3690	7770	9760	15700
Approximately 4.6 miles downstream of NC Hwy 210	125.39	3670	7740	9720	15700
Approximately 3.3 miles downstream of NC Hwy 210	123.48	3630	7670	9640	15500
Approximately 2.6 miles downstream of NC Hwy 210	121.03	3590	7580	9530	15400
At confluence with Rileys Creek	87.89	3507	6390	7937	12481
Just upstream of confluence with Mulberry Branch	83.12	3388	6179	7678	12081

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 1.4 miles upstream of NC Hwy 210	78.90	*	*	7470	*
Approximately 2.1 miles upstream of NC Hwy 210	74.71	*	*	7250	*
Approximately 3.3 miles downstream of Malpass Corner Road	68.06	*	*	6870	*
Approximately 2.4 miles downstream of Malpass Corner Road	66.10	*	*	6760	*
Approximately 1.1 miles downstream of Malpass Corner Road	61.45	*	*	6490	*
Approximately 0.3 mile downstream of Malpass Corner Road	58.54	*	*	6310	*
At confluence with Cypress Creek (near Wards Corner)	35.32	1998	3697	4618	7335
Approximately 1.98 miles upstream of confluence with Cypress Creek (near Wards Corner)	31.35	1856	3442	4302	6843
Approximately 0.6 mile downstream of confluence with Keith Branch	25.38	1630	3033	3795	6050
Just downstream of confluence with Keith Branch	19.41	1381	2582	3236	5174
Approximately 0.55 mile upstream of confluence with Keith Branch	18.50	1341	2508	3145	5031
Approximately 0.92 mile upstream of confluence with Keith Branch	17.85	1311	2455	3079	4927
Just downstream of confluence with Horse Branch Creek	7.50	768	1460	1840	2973
Approximately 2,400 feet upstream of confluence with Horse Branch Creek	7.24	752	1429	1802	2912
Approximately 5,300 feet upstream of confluence with Horse Branch Creek	6.27	688	1311	1654	2677
Approximately 620 feet upstream of Coras Grove Road	3.70	497	955	1210	1970
Long Creek Tributary					
The confluence with Long Creek	0.62	*	*	478	*
Merricks Creek					
Approximately 600 feet downstream of NC Hwy 210	42.13	*	*	5240	*
Approximately 350 feet upstream of NC Hwy 210	41.94	*	*	5220	*
Mill Branch (of Buxton Branch)					
Approximately 1,275 feet upstream of Buxton Branch	1.69	306	597	759	1246
Approximately 615 feet upstream of N.C. Highway 53	1.49	283	554	705	1159
Approximately 1.6 miles upstream of N.C. Highway 53	1.06	230	451	575	950
Mill Branch (of Moores Creek)					
Approximately 70 feet upstream of confluence with Moores Creek (near Atkinson)	6.25	686	1308	1650	2672
Approximately 2,550 feet downstream of Point Caswell Road	5.65	645	1231	1554	2519
Approximately 245 feet upstream of Point Caswell Road	4.62	570	1092	1380	2242
Mill Creek					
Approximately 0.4 mile downstream of Highsmith Road	3.79	*	*	1340	*
Mill Pond					
At confluence with Holly Shelter Creek	8.19	811	1538	1938	3128
Approximately 1.3 miles upstream of confluence with Holly Shelter Creek	5.88	661	1261	1591	2578
Approximately 1.62 miles upstream of confluence with Holly Shelter Creek	4.43	555	1064	1346	2187
Approximately 1.77 miles upstream of confluence with Holly Shelter Creek	3.94	516	992	1255	2042
Moores Creek					
The confluence with Holly Shelter Creek	14.25	*	*	2830	*
Approximately 0.7 mile downstream of Webbtown Road	13.78	*	*	2780	*
Approximately 1,000 feet upstream of Webbtown Road	11.20	*	*	2470	*
Approximately 1,000 feet upstream of NC Hwy 53	10.87	*	*	2430	*
Approximately 0.4 mile upstream of NC Hwy 53	10.78	*	*	2420	*
Approximately 1.0 mile upstream of NC Hwy 53	10.22	*	*	2350	*

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 1.1 miles upstream of NC Hwy 53	6.72	*	*	1850	*
Approximately 1.6 miles upstream of NC Hwy 53	5.36	*	*	1630	*
Approximately 2.1 miles upstream of NC Hwy 53	5.14	*	*	1590	*
Moores Creek (near Atkinson)					
Just upstream of confluence with Black River	93.49	3643	6631	8233	12938
Approximately 1.2 miles upstream of NC Hwy 210	86.35	*	*	6540	*
Approximately 1.7 miles upstream of NC Hwy 210	81.69	*	*	6330	*
Approximately 2.1 miles downstream of John Henry Store Road	79.25	*	*	6230	*
Approximately 0.9 mile downstream of John Henry Store Road	76.98	*	*	6130	*
Approximately 2,600 feet downstream of confluence with Mill Branch (of Moores Creek)	75.40	3190	5828	7246	11413
Just upstream of confluence with Mill Branch (of Moores Creek)	68.73	3013	5513	6858	10814
Approximately 0.7 mile upstream of confluence with Mill Branch (of Moores Creek)	67.20	2972	5439	6767	10673
Approximately 725 feet upstream of N.C. Highway 53	64.44	2896	5304	6601	10415
Approximately 85 feet upstream of confluence with Buxton Branch	57.36	2695	4946	6160	9732
Approximately 0.5 mile upstream of confluence with Buxton Branch	56.38	2666	4895	6097	9634
Approximately 0.65 mile downstream of Point Caswell Road	55.47	2640	4848	6038	9544
Approximately 0.12 mile upstream of Point Caswell Road	51.64	2526	4644	5787	9154
Approximately 1 mile upstream of Point Caswell Road	50.86	2502	4602	5735	9073
Approximately 40 feet upstream of confluence with Bear Den Branch	45.88	2348	4326	5394	8544
Approximately 55 feet upstream of confluence with Taylor Branch	44.25	2296	4233	5279	8365
At confluence with White Oak Branch	23.12	1538	2867	3590	5729
Approximately 0.75 mile upstream of confluence with White Oak Branch	22.38	1508	2812	3522	5622
Approximately 0.58 mile upstream of Shiloh Road	21.88	1487	2774	3475	5549
Approximately 215 feet uostream of confluence with Dry Branch	17.71	1305	2444	3065	4906
Approximately 2,070 feet upstream of Tedder Road	16.62	1255	2352	2951	4726
Approximately 3,125 feet downstream of confluence of Laurel Creek	15.52	1203	2258	2834	4542
At confluence with Laurel Creek	12.43	1049	1976	2484	3991
Approximately 140 feet upstream of Bulltail Creek	8.51	830	1574	1983	3199
Approximately 1,415 feet downstream of U.S. Highway 421	8.01	800	1518	1913	3089
Approximately 875 feet downstream of U.S. Highway 421	7.52	770	1462	1843	2978
Approximately 300 feet upstream of U.S. Highway 421	6.60	710	1351	1705	2758
At confluence with Bullhead Branch	4.60	568	1089	1376	2236
Approximately 2,150 feet upstream of confluence with Bullhead Branch	2.99	435	840	1065	1738
Approximately 3,375 feet upstream of confluence with Bullhead Branch	2.17	357	693	880	1442
Approximately 5,415 feet upstream of confluence with Bullhead Branch	1.70	308	600	763	1252
Moores Creek Tributary 1					
The confluence with Moores Creek	2.15	*	*	970	*
Approximately 0.8 mile upstream of the confluence with Moores Creek	1.54	*	*	801	*
Approximately 1.1 miles upstream of the confluence with Moores Creek	1.37	*	*	752	*
Moores Creek Tributary 2					
The confluence with Moores Creek	1.21	*	*	700	*
Approximately 0.2 mile upstream of the confluence with Moores Creek	0.92	*	*	598	*
Moores Creek Tributary 6					

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
The confluence with Moores Creek	3.32	*	*	1240	*
Approximately 800 feet upstream of Joshua James Road	2.36	*	*	1020	*
Approximately 0.6 mile upstream of Joshua James Road	2.00	*	*	929	*
Approximately 1.2 miles upstream of Joshua James Road	1.56	*	*	807	*
Moores Creek Tributary 7					
The confluence with Moores Creek Tributary 6	0.68	*	*	506	*
At Cypress Creek Road	0.59	*	*	467	*
Approximately 0.7 mile upstream of Cypress Creek Road	0.37	*	*	359	*
Approximately 1.0 mile upstream of Cypress Creek Road	0.17	*	*	230	*
Mulberry Branch					
Just upstream of confluence with Long Creek	0.81	195	384	490	812
Approximately 75 feet upstream of Herrings Chapel Road	0.53	149	297	381	633
North Branch					
At confluence with Lewis Creek	2.89	427	824	1045	1706
Approximately 2,550 feet upstream of confluence with Lewis Creek	2.04	344	669	850	1392
Approximately 850 feet downstream of Mary Slocum Road	1.46	280	547	696	1146
Northeast Cape Fear River					
At confluence with Long Creek	1534.04	20472	35531	43383	66110
At confluence with Turkey Creek	1519.05	20348	35322	43131	65733
At Interstate 40	1493.61	20137	34966	42701	65089
At confluence with Island Creek	1462.70	19879	34530	42174	64300
Approximately 1.2 miles upstream of confluence with Island Creek	1408.32	19420	33754	41235	62895
Approximately 5,125 feet upstream of N.C. Highway 210	1389.24	19257	33479	40902	62397
Approximately 3.2 miles upstream of N.C. Highway 210	1377.66	19158	33311	40699	62093
Approximately 9.5 miles downstream of NC Hwy 210	1338.17	15700	30000	37200	58600
At confluence with Burgaw Creek	1320.05	18660	32468	39680	60566
Approximately 1.3 miles downstream of confluence with Ashes Creek	1309.08	18564	32306	39483	60272
At the confluence with Ashes Creek	1246.91	18015	31377	38359	58587
At the confluence with Holly Shelter Creek	990.81	15632	27334	33462	51238
Just upstream of N.C. Highway 53	986.18	15587	27257	33369	51098
Approximately 2 miles downstream of Croomsbridge Road	978.76	15515	27134	33220	50873
Approximately 1,280 feet upstream of Croomsbridge Road	967.79	15407	26951	32998	50540
Just upstream of confluence with Lewis Creek	954.89	15280	26735	32736	50146
Approximately 3.4 miles upstream of Croomsbridge Road	945.00	*	*	30551	*
NP	938.90	*	*	30440	*
Approximately 1.4 miles upstream of the confluence of Washington Creek	937.70	*	*	30417	*
Approximately 2.7 miles upstream of the confluence of Washington Creek	934.80	*	*	30365	*
At confluence with Rockfish Creek	763.33	*	*	27189	*
Osgood Canal					
The confluence with Burgaw Creek	2.90	400	815	1060	1870
Pike Creek					
The confluence with Northeast Cape Fear River	9.40	*	*	2240	*
Approximately 1.2 miles downstream of Ashton Lake Road	7.54	*	*	1970	*
Approximately 0.4 mile downstream of Ashton Lake Road	6.43	*	*	1800	*

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 I-40	4.22	*	*	1420	*
Approximately 1.3 miles upstream of I-40	2.04	*	*	941	*
Players Creek					
The confluence with Merricks Creek	7.53	*	*	1970	*
Approximately 0.4 mile upstream of the confluence with Merricks Creek	6.52	*	*	1820	*
Approximately 0.8 mile upstream of the confluence with Merricks Creek	6.09	*	*	1750	*
Approximately 1.8 miles upstream of the confluence with Merricks Creek	5.41	*	*	1640	*
Rileys Creek					
The confluence with Long Creek	35.13	1680	3740	4720	7720
Approximately 1.0 mile upstream of confluence with Long Creek	34.32	1650	3690	4660	7620
Approximately 1.1 miles downstream of NC Hwy 210	32.22	1590	3560	4500	7350
Approximately 0.3 mile downstream of NC Hwy 210	29.53	*	*	4280	*
Approximately 0.2 mile upstream of NC Hwy 210	28.32	*	*	4180	*
Approximately 0.3 mile upstream of Scott Road	27.57	*	*	4120	*
Approximately 1.0 mile upstream of Scott Road	26.85	*	*	4060	*
Approximately 1.5 miles upstream of Scott Road	22.17	*	*	3640	*
Approximately 2.4 miles upstream of Scott Road	13.10	*	*	2700	*
Rizzo Creek					
The confluence with Rileys Creek	9.04	*	*	2190	*
Rockfish Creek					
At the confluence with Northeast Cape Fear River	178.50	5429	9774	12089	18863
At Confluence with Northeast Cape Fear River	177.78	*	*	12123	*
Approximately 0.75 mile upstream of Interstate 40	174.10	5346	9628	11911	18590
Approximately 1.4 miles upstream of Interstate 40	173.00	5325	9591	11865	18520
Approximately 0.95 mile downstream of US Highway 117	162.40	5122	9236	11430	17854
At the confluence of Little Rockfish Creek	161.42	*	*	11448	*
Approximately 0.3 mile upstream of Railroad	132.95	4527	8190	10148	15887
At the confluence with Sills Creek	132.81	*	*	10195	*
At confluence with Rockfish Creek Tributary	129.32	*	*	10035	*
Approximately 1.1 miles upstream of Wallace Airport Road	128.86	*	*	9870	*
Approximately 1.4 miles upstream of Wallace Airport Road	126.38	*	*	9760	*
Approximately 2.2 miles upstream of Wallace Airport Road	124.95	*	*	9700	*
Approximately 0.8 mile downstream of the confluence of Doctors Creek	123.47	*	*	9640	*
Rockfish Creek Tributary					
At the confluence with Rockfish Creek	1.63	*	*	1081	*
Sandy Run Swamp					
The confluence with Holly Shelter Creek	77.14	*	*	7380	*
Approximately 4.0 miles downstream of Williams Road	76.98	*	*	7370	*
Approximately 3.1 miles downstream of Williams Road	75.55	*	*	7290	*
Approximately 2.3 miles downstream of Williams Road	73.59	*	*	7190	*
Approximately 1.0 mile downstream of Williams Road	23.76	*	*	3780	*
Approximately 0.5 mile upstream of Williams Road	22.82	*	*	3700	*
Approximately 1.6 miles upstream of Williams Road	20.59	*	*	3490	*
Sawyer Creek					

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
The confluence with Sills Creek	6.13	*	*	1760	*
Approximately 0.7 mile downstream of NC Hwy 11	5.13	*	*	1590	*
At NC Hwy 11	1.44	*	*	772	*
Shaken Creek					
The confluence with Holly Shelter Creek	71.49	*	*	7070	*
Approximately 2.3 miles upstream of Old Maple Hill Road	70.46	*	*	7010	*
Approximately 4.0 miles upstream of Old Maple Hill Road	68.40	*	*	6890	*
Approximately 5.7 miles upstream of Old Maple Hill Road	63.73	*	*	6620	*
Approximately 9.6 miles upstream of Old Maple Hill Road	57.30	*	*	6240	*
Approximately 10.2 miles upstream of Old Maple Hill Road	53.38	*	*	5990	*
Approximately 12.8 miles upstream of Old Maple Hill Road	44.67	*	*	5410	*
Approximately 14.3 miles upstream of Old Maple Hill Road	1.25	*	*	712	*
Shelter Swamp Creek					
The confluence with Sandy Run Swamp	48.58	*	*	5680	*
Approximately 1.4 miles downstream of Williams Road	47.85	*	*	5630	*
Approximately 500 feet upstream of Williams Road	46.96	*	*	5570	*
Approximately 0.8 mile upstream of Williams Road	45.64	*	*	5480	*
Approximately 1.1 miles upstream of Williams Road	45.24	*	*	5450	*
Approximately 2.0 miles upstream of Williams Road	43.78	*	*	5350	*
Sills Creek					
Approximately 200 feet upstream of confluence with Rockfish Creek	20.30	1420	2652	3323	5311
Approximately 3,670 feet downstream of Willard Road	18.92	1360	2543	3188	5098
Approximately 135 feet downstream of Willard Road	17.76	1307	2447	3069	4912
Approximately 2,380 feet upstream of Willard Road	16.51	1250	2343	2940	4709
Approximately 1.4 miles upstream of Willard Road	14.06	1132	2128	2672	4288
Approximately 0.8 mile downstream of Crooked Run Road	12.42	1049	1975	2483	3989
Approximately 0.35 mile downstream of Crooked Run Road	12.05	1029	1940	2438	3919
Just upstream of confluence with Crooked Run Creek	7.24	751	1428	1801	2911
Just downstream of confluence with Sills Creek Tributary 1	6.21	683	1303	1644	2662
Approximately 1,045 feet downstream of confluence with Sills Creek Tributary 2	4.42	554	1063	1344	2184
Approximately 115 feet upstream of confluence with Sills Creek Tributary 2	1.65	302	589	749	1231
Sills Creek Tributary 1					
Just upstream of confluence with Sills Creek	0.79	191	377	482	799
Approximately 600 feet downstream of Giddeons Pond Road	0.65	170	336	430	713
Approximately 90 feet upstream of Giddeons Pond Road	0.54	151	301	385	640
Approximately 170 feet downstream of Sills Creek Road	0.49	142	283	362	603
Approximately 830 feet upstream of Sills Creek Road	0.42	131	261	334	557
Approximately 565 feet downstream of Racoon Road	0.36	118	235	302	504
Sills Creek Tributary 2					
Just upstream of confluence with Sills Creek	2.66	405	784	994	1625
Approximately 185 feet upstream of Racoon Road	1.37	270	527	671	1105
Taylor Branch					
Approximately 40 feet upstream of confluence with Moores Creek (near Atkinson)	1.60	296	578	735	1208
Approximately 3,030 feet upstream of confluence with Moores Creek (near Atkinson)	1.28	258	505	643	1059

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 275 feet upstream of U.S. Highway 421	1.03	226	444	566	935
Trumpeter Swamp					
The confluence with Catskin Creek	12.65	*	*	2650	*
Approximately 1.2 miles upstream of confluence of Catskin Creek	11.88	*	*	2560	*
Approximately 3.3 miles downstream of J A Drive	10.55	*	*	2390	*
Approximately 1.4 miles downstream of J A Drive	8.70	*	*	2140	*
Approximately 200 feet downstream of J A Drive	5.25	*	*	1610	*
Approximately 0.8 mile upstream of J A Drive	1.14	*	*	678	*
Tuckahoe Branch					
Approximately 50 feet upstream of confluence with White Oak Branch	5.87	792	1545	1960	3192
Approximately 0.55 mile upstream of confluence with White Oak Branch	5.31	620	1186	1498	2430
Approximately 0.77 mile upstream of confluence with White Oak Branch	4.69	575	1101	1392	2261
Approximately 1,300 feet downstream of Halfway Branch School	4.22	539	1033	1307	2125
Just upstream of Halfway Branch School	3.73	499	960	1215	1978
Approximately 2,550 feet upstream of Halfway Branch School	3.00	437	843	1068	1743
Turkey Creek					
Just upstream of confluence with Northeast Cape Fear River	14.64	1160	2180	2737	4389
Approximately 2 miles upstream of confluence with Northeast Cape Fear River	12.36	1106	2120	2675	4319
Approximately 2.25 miles upstream of confluence with Northeast Cape Fear River	11.06	1070	2075	2627	4258
Approximately 0.65 mile downstream of N.C. Highway 133	10.29	1045	2040	2586	4202
Just downstream of N.C. Highway 133	9.56	1018	2000	2539	4134
Approximately 0.6 mile upstream of N.C. Highway 133	7.37	818	1589	2014	3274
At confluence with Turkey Creek Tributary	5.29	629	1208	1527	2480
Approximately 0.4 mile upstream of confluence with Turkey Creek Tributary	3.04	440	849	1076	1756
Approximately 0.65 mile upstream of confluence with Turkey Creek Tributary	2.29	369	715	908	1487
Approximately 1 mile downstream of N.C. Highway 210	1.87	326	634	806	1322
Approximately 0.73 mile downstream of N.C. Highway 210	1.42	275	538	685	1126
Turkey Creek Tributary					
Approximately 0.8 mile downstream of Arvida Spur Road	1.80	*	*	876	*
Approximately 400 feet upstream of Arvida Spur Road	1.12	*	*	670	*
Washington Creek					
NP	4.06	*	*	1390	*
Washington Creek Tributary					
The confluence with Washington Creek	2.95	*	*	1160	*
White Oak Branch					
At confluence with Tuckahoe Branch	20.94	1447	2702	3385	5408
Approximately 70 feet upstream of confluence with tuckahoe Branch	14.98	1177	2210	2774	4448
At confluence with Big Rattlesnake Creek	5.07	604	1154	1458	2367

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

Table 15, “Gage Information”, lists the stream gages located in Pender County, including the drainage area of the flooding source at the gage and the period of record available at the time of the publication of this FIS Report.

Table 15 - Gage Information

Gage Number	Flooding Source	Site Name	Drainage Area (square miles)	Period of Record	
				From	To
02108610	Pike Creek	PIKE CREEK NEAR BURGAW, N. C.	1.10	1953	1971
02108630	Turkey Creek	TURKEY CREEK NEAR CASTLE HAYNE, N. C.	10.19	1953	1971

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"
Angola Creek	0.050	0.150
Angola Creek Tributary 3	0.050	0.150
Angola Creek Tributary 4	0.040	0.120
Ashes Creek	0.040	0.130
Bear Branch	0.045	0.100 to 0.150
Bear Den Branch	0.050 to 0.090	0.060 to 0.200
Beckys Creek	0.013 to 0.045	0.090 to 0.150
Bee Branch	0.024 to 0.041	0.101
Big Branch	0.045	0.159
Big Branch Tributary	0.045	0.159
Black River	0.038 to 0.072	0.070 to 0.280
Bull Branch	0.055 to 0.090	0.070 to 0.200
Bulltail Creek	0.050 to 0.090	0.060 to 0.200
Burgaw Creek	0.015 to 0.060	0.080 to 0.200

Table 16 - Roughness Coefficients

Stream	Channel "n"	Overbank "n"
Buxton Branch	0.052 to 0.090	0.060 to 0.200
Cape Fear River	0.030 to 0.059	0.050 to 0.666
Cat Creek	0.045 to 0.050	0.110 to 0.150
Catskin Creek	0.022 to 0.040	0.130
Colly Creek	0.040 to 0.050	0.110 to 0.150
Colvins Creek	0.040 to 0.045	0.090 to 0.200
Colvins Creek Tributary	0.045	0.100 to 0.150
Crooked Run	0.050 to 0.090	0.060 to 0.200
Cypress Creek (near Stag Park)	0.015 to 0.050	0.110 to 0.140
Cypress Creek (near Wards Corner)	0.024 to 0.350	0.100 to 0.160
Cypress Lake	0.045 to 0.050	0.140 to 0.150
Doctors Creek	0.025 to 0.090	0.060 to 0.200
Dry Branch	0.045 to 0.090	0.060 to 0.200
Flat Swamp	0.045 to 0.050	0.110 to 0.150
Godfrey Creek	0.035 to 0.045	0.081 to 0.120
Guffords Branch	0.050 to 0.090	0.070 to 0.200
Harrisons Creek	0.035	0.080
Holly Shelter Creek	0.037 to 0.050	0.100 to 0.135
Horse Branch Creek	0.035 to 0.090	0.060 to 0.200
Island Creek	0.030 to 0.090	0.070 to 0.500
Island Creek Tributary	0.045	0.131
Jones Creek	0.035 to 0.090	0.020 to 0.200
Juniper Swamp	0.045 to 0.050	0.120 to 0.150
Kellys Creek	0.045	0.140 to 0.150
Lewis Creek	0.052 to 0.090	0.050 to 0.200
Lillington Creek	0.025 to 0.065	0.180
Lillington Creek Tributary	0.023 to 0.045	0.090 to 0.120
Long Creek	0.045 to 0.090	0.060 to 0.200
Long Creek Tributary	0.045	0.140
Merricks Creek	0.045	0.101
Mill Branch (of Buxton Branch)	0.055 to 0.090	0.060 to 0.200
Mill Branch (of Moores Creek)	0.050 to 0.090	0.060 to 0.200
Mill Creek	0.025 to 0.045	0.140
Mill Creek Tributary	0.045	0.140
Mill Pond	0.041	0.120
Moores Creek	0.040 to 0.050	0.125 to 0.150
Moores Creek (near Atkinson)	0.035 to 0.090	0.035 to 0.200
Moores Creek Tributary 1	0.045	0.120 to 0.130
Moores Creek Tributary 2	0.040 to 0.045	0.120 to 0.130
Moores Creek Tributary 6	0.042	0.130
Moores Creek Tributary 7	0.050	0.150
Mulberry Branch	0.060 to 0.090	0.060 to 0.200
North Branch	0.048 to 0.090	0.035 to 0.200
Northeast Cape Fear River	0.030 to 0.090	0.035 to 0.240
Osgood Canal	0.044 to 0.090	0.080 to 0.200
Pike Creek	0.020 to 0.040	0.101
Players Creek	0.045	0.150
Rileys Creek	0.013 to 0.060	0.150 to 0.180
Rizzo Creek	0.045 to 0.060	0.170 to 0.180
Rockfish Creek	0.013 to 0.090	0.030 to 0.200
Sandy Run Swamp	0.035 to 0.050	0.110 to 0.150
Sawyer Creek	0.025 to 0.045	0.140
Shaken Creek	0.040 to 0.050	0.120 to 0.130
Shelter Swamp Creek	0.040 to 0.050	0.120 to 0.150
Sills Creek	0.040 to 0.090	0.060 to 0.200
Sills Creek Tributary 1	0.035 to 0.090	0.060 to 0.200
Sills Creek Tributary 2	0.055 to 0.090	0.060 to 0.200
Taylor Branch	0.035 to 0.090	0.060 to 0.200
Trumpeter Swamp	0.024 to 0.065	0.180
Tuckahoe Branch	0.050 to 0.090	0.060 to 0.200
Turkey Creek	0.052 to 0.520	0.140

Table 16 - Roughness Coefficients

Stream	Channel "n"	Overbank "n"
Turkey Creek Tributary	0.045	0.140
Washington Creek	0.013 to 0.050	0.160
Washington Creek Tributary	0.045	0.140
White Oak Branch	0.024 to 0.090	0.050 to 0.200

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
Angola Creek				
016	1,590	6,970	20.0	298 / 373
022	2,218	6,970	20.1	650 / 381
031	3,073	6,970	20.3	540 / 247
039	3,910	6,970	20.5	343 / 434
046	4,552	6,970	20.6	250 / 358
053	5,320	6,970	20.8	348 / 302
066	6,648	6,730	21.3	70 / 70
067	6,698	6,730	21.8	70 / 70
072	7,214	6,730	22.4	306 / 781
080	8,033	6,730	22.5	1,252 / 343
092	9,170	6,730	22.6	1,218 / 172

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
106	10,606	6,730	22.9	381 / 323
134	13,388	4,160	23.8	604 / 669
142	14,178	4,160	24.0	743 / 424
147	14,747	4,160	24.1	638 / 470
155	15,524	4,160	24.4	428 / 366
165	16,515	4,160	24.8	388 / 496
175	17,481	4,160	25.4	438 / 383
193	19,315	3,690	26.9	132 / 569
210	21,020	3,690	27.6	713 / 759
220	22,004	3,690	27.8	560 / 648
229	22,897	3,690	28.0	589 / 609
236	23,576	3,690	28.2	556 / 606
243	24,335	3,690	28.5	551 / 636
252	25,227	3,390	28.8	412 / 667
261	26,113	3,390	29.0	468 / 812
269	26,926	3,390	29.2	189 / 755
278	27,796	3,390	29.5	402 / 583
288	28,831	3,390	29.7	217 / 877
296	29,585	3,390	29.9	502 / 831
305	30,513	3,390	30.1	638 / 817
313	31,304	3,190	30.2	728 / 767
320	31,952	3,190	30.3	608 / 836
331	33,055	3,050	30.4	601 / 892
340	34,014	3,050	30.6	672 / 385
350	35,020	3,050	30.8	790 / 840
359	35,915	2,900	30.9	745 / 825
369	36,882	2,900	31.0	721 / 813
380	37,959	2,900	31.1	749 / 811
397	39,694	2,900	31.4	725 / 784
Angola Creek Tributary 3				
048	4,792	992	22.9[1]	277 / 332
055	5,496	992	23.5	122 / 354
063	6,303	992	26.0	50 / 181
070	6,972	992	28.1	45 / 88
070	7,049	992	29.3	45 / 88
076	7,585	798	30.1	14 / 80
081	8,096	326	31.7	60 / 44
084	8,438	326	32.0	30 / 64
085	8,512	326	32.0	30 / 64
089	8,859	326	33.0	0 / 86
Angola Creek Tributary 4				
032	3,217	1,480	26.9[1]	487 / 13
038	3,762	1,480	26.9	131 / 141
052	5,153	1,250	29.6	6 / 312
064	6,419	1,250	31.6	200 / 196

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
065	6,498	1,250	34.6	200 / 196
076	7,623	1,250	34.8	323 / 18
086	8,558	1,250	35.1	116 / 310
095	9,491	1,250	35.6	157 / 256
104	10,406	1,070	36.5	62 / 216
111	11,143	1,070	37.6	150 / 200
121	12,088	1,070	38.8	5 / 330
121	12,148	1,070	39.4	5 / 330
129	12,913	1,070	40.6	4 / 185
135	13,472	1,070	42.1	84 / 85
Ashes Creek				
073	7,278	5,680	17.6[2]	156 / 84
082	8,208	5,680	17.6[2]	130 / 100
099	9,943	5,680	17.6[2]	76 / 226
122	12,226	5,680	17.6[2]	400 / 130
148	14,833	5,680	17.6[2]	50 / 300
165	16,459	5,680	17.6[2]	200 / 130
180	18,024	5,680	17.6[2]	130 / 155
187	18,724	5,680	17.6[2]	100 / 100
188	18,770	5,680	17.6[2]	100 / 100
196	19,572	5,680	17.8	238 / 206
200	20,027	5,680	17.9	279 / 336
205	20,525	5,680	17.8	130 / 724
214	21,445	5,680	18.0	142 / 385
223	22,349	5,680	18.0	231 / 390
230	23,029	5,680	18.0	288 / 266
234	23,406	5,680	18.1	385 / 382
239	23,948	5,680	18.2	582 / 340
246	24,578	5,680	18.2	514 / 318
251	25,075	5,680	18.3	224 / 311
257	25,705	5,570	18.3	277 / 352
262	26,156	5,570	18.4	429 / 302
269	26,871	5,570	18.4	495 / 295
273	27,328	5,570	18.4	129 / 359
280	28,014	5,570	18.5	373 / 129
285	28,471	5,570	18.6	280 / 325
292	29,200	5,570	18.7	442 / 339
304	30,388	5,570	18.8	55 / 519
312	31,157	5,570	18.9	437 / 185
319	31,941	5,570	19.1	301 / 377
327	32,655	5,570	19.2	673 / 391
337	33,710	5,570	19.4	129 / 152
351	35,052	5,570	19.8	40 / 483
362	36,170	5,570	20.1	129 / 129
370	36,962	5,410	20.4	78 / 307

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
381	38,122	5,410	20.7	422 / 180
405	40,488	5,410	21.6	229 / 305
414	41,407	5,410	21.7	727 / 315
420	42,043	5,410	21.8	700 / 300
425	42,523	5,410	21.8	907 / 558
439	43,924	5,410	22.1	872 / 236
454	45,357	5,410	22.4	459 / 331
461	46,080	5,410	22.5	400 / 350
468	46,821	5,410	22.7	350 / 350
476	47,598	5,410	22.8	691 / 400
483	48,338	5,410	22.9	800 / 371
492	49,221	5,410	22.9	800 / 356
493	49,267	5,410	22.9	800 / 356
499	49,912	5,410	23.0	300 / 700
507	50,699	5,410	23.1	128 / 847
517	51,737	5,410	23.2	400 / 800
525	52,478	5,410	23.3	600 / 700
533	53,323	5,410	23.4	796 / 128
542	54,223	5,120	23.7	600 / 391
555	55,475	5,120	24.1	271 / 416
564	56,423	5,120	24.4	126 / 543
572	57,195	5,120	24.8	126 / 393
584	58,380	5,120	25.3	221 / 619
593	59,336	5,120	25.6	241 / 634
604	60,355	5,120	25.9	550 / 450
618	61,756	4,880	26.2	310 / 950
642	64,194	4,880	26.6	200 / 970
655	65,537	4,880	26.8	650 / 1,000
665	66,526	4,880	26.9	390 / 1,040
683	68,290	4,880	27.2	300 / 1,200
694	69,429	4,880	27.4	315 / 870
707	70,738	4,880	27.7	190 / 650
718	71,774	4,880	28.0	400 / 700
724	72,395	4,880	28.2	350 / 275
737	73,733	4,880	29.2	250 / 475
747	74,737	4,880	29.9	625 / 340
763	76,342	4,500	30.6	565 / 515
781	78,054	4,500	31.1	585 / 275
789	78,910	4,500	31.5	350 / 150
806	80,563	4,500	32.9	750 / 550
806	80,609	4,500	33.2	750 / 550
820	81,996	4,500	33.7	650 / 650
833	83,301	4,500	34.2	1,050 / 700
848	84,810	4,080	34.5	1,250 / 1,000
858	85,817	4,080	34.7	2,150 / 400

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
870	87,037	4,080	34.8	2,600 / 1,500
891	89,082	4,080	34.9	4,000 / 450
Bear Branch				
047	4,671	747	18.5[3]	23 / 100
053	5,255	747	18.5[3]	55 / 24
059	5,931	747	18.5[1]	28 / 63
064	6,412	747	18.5[1]	12 / 50
069	6,907	747	18.5[1]	42 / 20
078	7,758	747	18.5[1]	28 / 40
086	8,615	747	18.5[1]	48 / 27
094	9,365	406	19.8	14 / 53
100	9,991	406	22.9	15 / 30
100	10,024	406	23.7	16 / 16
101	10,124	406	27.2	16 / 16
108	10,792	406	27.6	40 / 30
115	11,524	406	27.8	50 / 40
121	12,055	406	28.2	40 / 40
Bear Den Branch				
078	7,831	1,099	46.3	35 / 115
084	8,431	1,099	46.5	30 / 195
090	9,011	1,099	46.8	30 / 155
100	10,041	856	47.9	30 / 105
107	10,706	856	49.0	12 / 175
115	11,464	856	50.3	10 / 130
Beckys Creek				
134	13,363	941	14.7	75 / 75
138	13,831	941	14.7	75 / 75
144	14,365	941	14.7	75 / 75
144	14,450	941	15.1	75 / 75
149	14,892	941	15.3	41 / 80
155	15,495	941	16.9	39 / 68
160	15,988	941	18.7	105 / 34
168	16,806	941	22.2	49 / 27
173	17,296	737	24.9	12 / 72
178	17,766	737	27.2	22 / 102
185	18,485	737	29.4	227 / 60
Bee Branch				
007	687	1,760	45.8[1]	169 / 189
015	1,473	1,760	45.8[1]	292 / 75
021	2,082	1,760	46.2	18 / 312
023	2,329	1,760	46.2	27 / 27
024	2,401	1,760	48.5	27 / 27
030	3,003	1,760	49.1	291 / 20
038	3,756	1,760	49.3	324 / 18
046	4,575	1,760	49.6	160 / 243
050	5,046	1,590	49.8	54 / 230

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
059	5,856	1,590	50.4	133 / 77
065	6,495	1,590	51.0	92 / 308
072	7,212	1,590	51.5	49 / 209
080	7,984	1,590	52.2	136 / 122
087	8,732	1,590	53.0	26 / 235
095	9,468	1,590	53.8	147 / 122
098	9,770	1,210	54.2	132 / 133
099	9,909	1,210	54.2	70 / 70
100	9,978	1,210	54.2	70 / 70
106	10,605	1,210	54.9	20 / 50
Big Branch				
003	319	817	19.7[1]	110 / 34
008	765	817	19.7[1]	100 / 30
013	1,255	817	19.7[1]	80 / 30
019	1,857	817	19.7[1]	30 / 80
025	2,452	817	19.7[1]	81 / 50
029	2,890	817	19.7[1]	28 / 151
032	3,211	817	19.7[1]	69 / 26
036	3,607	817	19.7[1]	129 / 60
037	3,705	817	19.7[1]	22 / 22
038	3,778	817	21.3	22 / 22
044	4,365	817	21.6	50 / 50
049	4,934	817	22.1	70 / 54
054	5,372	817	22.6	70 / 40
057	5,699	817	23.3	50 / 50
Big Branch Tributary				
002	192	355	23.1	25 / 25
008	807	355	26.1	25 / 20
013	1,317	355	28.6	20 / 20
020	1,982	355	33.2	20 / 20
Black River				
943	94,315	27,099	19.7[1]	189 / 1,841
951	95,149	27,099	19.7[1]	189 / 1,902
960	95,974	27,099	19.7[1]	189 / 1,699
970	97,020	27,099	19.7[1]	573 / 1,897
979	97,910	27,099	19.7[1]	773 / 1,679
989	98,884	27,099	19.7[1]	679 / 1,770
999	99,875	27,099	19.7[1]	189 / 1,971
1007	100,737	27,099	19.7[1]	189 / 1,194
1015	101,501	26,818	19.7[1]	571 / 1,504
1026	102,585	26,818	19.7[1]	930 / 1,488
1042	104,218	26,818	19.7[1]	1,730 / 547
1052	105,179	26,818	19.7[1]	1,535 / 507
1062	106,155	26,818	19.7[1]	1,780 / 391
1082	108,232	26,818	19.7[1]	1,746 / 577
1102	110,187	26,818	19.7[1]	2,223 / 372

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
1124	112,388	26,818	19.7[1]	2,117 / 234
1142	114,156	26,818	19.7[1]	1,558 / 868
1161	116,113	26,818	19.7[1]	1,430 / 187
1165	116,514	26,818	19.7[1]	238 / 145
1166	116,573	26,818	19.7[1]	238 / 145
1176	117,574	26,818	19.7[1]	1,795 / 120
1196	119,641	26,818	19.7[1]	1,553 / 1,061
1216	121,555	26,818	19.7[1]	589 / 2,212
1232	123,189	26,818	19.7[1]	198 / 2,612
1258	125,789	26,818	19.7[1]	438 / 2,221
1271	127,100	26,818	19.7[1]	593 / 1,858
1287	128,670	26,818	19.7[1]	418 / 1,224
1298	129,778	26,818	19.7[1]	198 / 1,298
1312	131,207	26,818	19.7[1]	198 / 2,394
1330	132,973	26,818	19.7[1]	732 / 1,327
1350	135,001	26,818	19.7[1]	1,155 / 694
1372	137,181	26,818	19.7[1]	1,400 / 926
1391	139,075	26,818	19.7[1]	583 / 1,731
1406	140,580	26,818	19.7[1]	745 / 1,537
1426	142,599	26,818	19.7[1]	929 / 1,540
1442	144,231	26,818	19.8	1,213 / 1,297
1460	145,972	26,818	19.9	1,100 / 1,848
1472	147,247	26,818	19.9	900 / 1,920
1508	150,763	26,818	20.2	135 / 2,700
1524	152,426	26,818	20.3	459 / 2,032
1536	153,589	26,818	20.4	202 / 1,900
1550	155,026	26,818	20.5	138 / 2,800
1566	156,579	26,818	20.7	495 / 2,000
Bull Branch				
113	11,280	871	61.0	82 / 35
121	12,113	871	62.3	9 / 162
127	12,654	871	63.1	124 / 79
132	13,177	642	63.9	73 / 174
139	13,908	642	64.9	124 / 45
144	14,403	642	65.8	53 / 91
Cape Fear River				
2849	284,857	123,000	19.1	13,200 / 1,595
2870	286,956	123,000	19.4	12,500 / 859
2895	289,500	123,000	19.9	11,000 / 1,800
2928	292,761	123,000	20.4	13,800 / 217
2955	295,459	123,000	20.8	12,100 / 1,232
2978	297,760	123,000	21.2	11,500 / 421
3014	301,371	123,000	21.8	9,000 / 2,100
3044	304,414	123,000	22.5	9,300 / 450
Catskin Creek				
000	1	4,660	10.1	502 / 38

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
001	136	4,660	10.1	460 / 95
007	659	4,660	10.4	370 / 256
011	1,134	4,660	10.7	40 / 150
016	1,599	4,660	11.3	259 / 281
019	1,860	4,660	11.4	346 / 648
023	2,280	4,660	11.5	816 / 300
028	2,787	4,660	11.6	912 / 67
031	3,089	4,660	11.6	984 / 33
036	3,552	4,660	11.7	361 / 50
041	4,088	4,650	12.5	33 / 400
048	4,845	4,650	13.2	68 / 500
054	5,438	4,650	13.4	224 / 550
057	5,708	4,650	13.5	24 / 850
057	5,728	4,650	13.5	24 / 850
057	5,748	4,650	13.5	24 / 850
062	6,203	4,650	13.7	384 / 1,000
066	6,587	4,650	13.7	939 / 876
074	7,406	4,650	13.8	33 / 1,481
079	7,905	4,620	13.9	33 / 1,279
089	8,860	4,620	14.0	247 / 990
096	9,580	4,620	14.2	400 / 499
105	10,485	4,620	14.5	571 / 175
111	11,088	4,620	14.9	467 / 277
118	11,820	4,620	15.2	281 / 445
124	12,375	4,620	15.4	33 / 629
129	12,868	4,570	15.5	33 / 726
135	13,521	4,570	15.7	86 / 720
149	14,887	3,420	16.3	30 / 541
156	15,574	3,420	16.9	97 / 255
162	16,233	3,420	17.5	27 / 268
171	17,075	3,420	18.1	456 / 70
177	17,663	3,420	18.3	26 / 444
186	18,561	3,420	18.7	218 / 268
192	19,250	3,420	19.0	102 / 520
200	19,954	3,420	19.6	108 / 278
208	20,769	3,350	20.3	186 / 246
216	21,633	3,350	20.9	188 / 235
225	22,522	3,350	21.7	180 / 261
234	23,420	3,350	22.4	158 / 458
245	24,549	3,210	23.4	110 / 218
255	25,455	3,210	24.4	101 / 366
264	26,387	3,210	25.0	177 / 312
276	27,644	3,210	26.0	82 / 259
288	28,827	3,210	27.5	183 / 121
304	30,386	3,210	29.2	231 / 337

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
316	31,568	3,210	30.2	163 / 108
326	32,644	3,020	31.6	136 / 191
338	33,759	3,020	32.7	56 / 341
352	35,178	3,020	34.0	745 / 106
Colvins Creek				
023	2,310	2,920	19.7[1]	67 / 396
030	2,952	2,920	19.7[1]	123 / 67
035	3,506	2,920	19.7[1]	67 / 262
041	4,130	2,920	19.7[1]	310 / 67
052	5,184	2,920	19.7[1]	153 / 200
060	5,974	2,920	19.7[1]	163 / 223
067	6,707	2,920	19.7[1]	67 / 142
072	7,214	2,920	19.7[1]	67 / 243
076	7,565	2,920	19.7[1]	229 / 170
082	8,199	2,920	19.7[1]	166 / 153
089	8,867	2,620	19.7[1]	284 / 64
094	9,430	2,620	19.7[1]	324 / 132
101	10,144	2,620	19.7[1]	88 / 80
107	10,715	2,620	19.7[1]	129 / 109
111	11,142	2,620	19.7[1]	64 / 101
116	11,645	2,620	19.7[1]	250 / 50
122	12,223	2,620	19.7[1]	250 / 35
127	12,747	2,620	19.7[1]	73 / 64
132	13,177	2,620	19.7[1]	157 / 158
138	13,841	2,620	19.7[1]	150 / 86
143	14,304	2,620	19.7[1]	129 / 173
149	14,854	2,620	20.0	64 / 239
157	15,708	2,620	21.2	136 / 223
162	16,225	2,620	21.8	115 / 91
167	16,684	2,620	22.7	294 / 64
173	17,303	2,620	23.6	64 / 241
179	17,879	2,620	24.6	64 / 155
183	18,273	2,400	25.2	138 / 92
187	18,663	2,400	25.5	193 / 206
191	19,058	2,400	25.7	63 / 129
196	19,581	2,400	26.3	78 / 123
201	20,057	2,400	26.8	122 / 124
206	20,551	2,400	27.2	120 / 181
211	21,064	2,400	27.6	125 / 186
215	21,462	2,400	27.9	229 / 200
216	21,574	2,400	27.7	26 / 26
216	21,647	2,400	28.9	26 / 26
222	22,199	2,400	29.8	160 / 87
229	22,878	2,400	30.1	63 / 410
235	23,545	2,400	30.3	66 / 173

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
241	24,069	2,400	30.8	158 / 63
246	24,584	2,400	31.4	30 / 286
252	25,161	2,400	32.0	63 / 167
259	25,902	2,400	32.8	177 / 63
263	26,262	2,400	33.2	124 / 100
267	26,717	2,400	33.7	200 / 200
275	27,475	2,400	34.1	90 / 264
281	28,108	2,400	34.5	90 / 130
286	28,632	2,400	35.0	100 / 150
289	28,947	2,400	35.2	100 / 100
471	47,079	957	60.1	75 / 194
477	47,743	957	60.2	190 / 41
482	48,228	957	61.0	75 / 69
483	48,298	957	61.1	75 / 69
491	49,142	957	64.4	81 / 19
500	50,033	957	68.5	175 / 20
506	50,560	957	68.9	80 / 80
506	50,616	957	69.6	80 / 80
508	50,820	957	69.7	75 / 50
Colvins Creek Tributary				
002	228	587	25.2[1]	62 / 20
008	835	587	25.2[1]	34 / 75
012	1,209	587	25.2[1]	57 / 33
017	1,651	587	26.1	68 / 12
022	2,165	587	27.6	50 / 20
028	2,805	587	29.5	20 / 65
033	3,327	587	31.4	20 / 25
035	3,452	587	32.2	20 / 20
035	3,522	587	37.5	20 / 20
038	3,849	587	37.6	123 / 56
042	4,231	587	37.8	26 / 85
048	4,774	587	38.4	29 / 40
052	5,225	357	39.9	25 / 26
057	5,679	357	41.7	37 / 11
062	6,195	357	43.8	14 / 36
Cypress Creek (near Stag Park)				
003	288	1,810	13.0[1]	221 / 54
007	664	1,810	13.0[1]	163 / 178
012	1,247	1,810	13.0[1]	83 / 266
016	1,632	1,810	13.0[1]	60 / 60
017	1,680	1,810	13.0[1]	60 / 60
019	1,887	1,810	13.0[1]	46 / 214
023	2,343	1,810	13.0[1]	109 / 70
028	2,783	1,810	13.0[1]	47 / 152
033	3,271	1,810	13.0[1]	195 / 72

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
041	4,057	1,810	13.0[1]	48 / 145
049	4,907	1,810	13.0[1]	290 / 62
060	5,969	1,810	13.0[1]	55 / 106
066	6,605	1,810	13.0[1]	183 / 67
074	7,351	1,810	13.4	57 / 99
080	7,964	1,810	14.6	49 / 176
084	8,428	1,810	15.4	160 / 52
090	8,977	1,580	16.2	204 / 93
095	9,498	1,580	16.8	89 / 128
099	9,907	1,580	17.4	82 / 94
103	10,332	1,580	17.9	45 / 227
107	10,705	1,580	18.3	62 / 250
111	11,143	1,580	18.8	23 / 183
116	11,580	1,580	19.4	79 / 159
124	12,359	1,580	20.4	17 / 161
129	12,930	1,580	21.4	184 / 17
134	13,428	1,580	22.2	20 / 264
140	13,955	1,580	23.1	97 / 117
149	14,896	1,580	24.6	206 / 51
157	15,652	1,580	25.9	67 / 152
162	16,153	1,580	27.3	115 / 108
169	16,908	1,580	28.8	175 / 45
175	17,522	1,260	29.8	179 / 16
180	18,048	1,260	30.4	185 / 69
182	18,240	1,260	30.4	25 / 25
184	18,440	1,260	37.0	25 / 25
191	19,076	1,260	37.0	153 / 335
198	19,795	1,260	37.1	277 / 97
205	20,531	1,260	37.2	143 / 79
211	21,066	1,260	37.5	237 / 21
216	21,601	1,260	38.0	36 / 202
224	22,398	904	38.6	198 / 15
229	22,902	904	39.1	31 / 94
234	23,428	904	40.4	15 / 130
240	24,017	904	41.5	15 / 212
245	24,530	904	42.5	129 / 56
249	24,878	904	42.6	30 / 30
250	24,954	904	45.0	30 / 30
252	25,205	904	45.2	104 / 137
257	25,663	904	45.3	138 / 60
261	26,104	904	45.7	39 / 88
265	26,541	904	47.2	45 / 53
271	27,112	904	49.3	64 / 20
278	27,760	570	50.3	54 / 88
284	28,393	570	50.7	14 / 48

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
287	28,697	570	50.8	50 / 50
288	28,767	570	52.8	50 / 50
288	28,770	570	52.8	50 / 50
289	28,860	570	56.6	50 / 50
295	29,505	570	56.6	200 / 326
Cypress Creek (near Wards Corner)				
010	990	3,490	25.4[1]	622 / 436
023	2,310	3,490	25.4[1]	161 / 365
036	3,633	3,490	26.2	432 / 169
047	4,662	3,290	26.7	269 / 483
057	5,738	3,290	27.0	370 / 610
072	7,174	3,290	27.3	112 / 463
076	7,587	3,290	27.5	69 / 68
076	7,644	3,290	27.6	69 / 68
083	8,272	3,290	28.5	224 / 265
088	8,804	3,290	28.9	256 / 66
098	9,783	3,290	30.0	172 / 524
109	10,894	3,290	30.6	25 / 500
118	11,849	3,290	30.9	560 / 381
135	13,477	3,090	31.4	100 / 392
141	14,129	3,090	31.8	447 / 82
151	15,065	3,090	32.5	309 / 254
161	16,114	3,090	33.1	148 / 255
171	17,067	3,090	34.0	64 / 63
171	17,121	2,880	34.2	64 / 63
178	17,757	2,880	35.2	140 / 514
185	18,455	2,880	35.4	433 / 195
189	18,907	2,880	35.7	346 / 236
195	19,542	2,880	36.2	64 / 402
202	20,152	2,880	36.8	211 / 248
209	20,929	2,880	37.4	212 / 324
216	21,566	2,710	37.7	204 / 134
222	22,176	2,710	38.1	118 / 349
232	23,155	2,710	38.7	247 / 420
240	23,983	2,710	39.2	240 / 109
247	24,677	2,580	40.0	476 / 274
253	25,312	2,580	40.3	397 / 234
263	26,257	2,580	40.9	146 / 452
271	27,110	2,580	41.2	177 / 177
272	27,150	2,480	42.1	177 / 177
275	27,469	2,480	42.2	464 / 368
284	28,422	2,480	42.4	317 / 190
295	29,550	2,480	42.6	284 / 634
302	30,234	2,480	42.7	194 / 432
313	31,280	2,320	43.1	147 / 483

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
319	31,890	2,320	43.4	273 / 132
325	32,491	2,320	43.8	133 / 348
334	33,383	2,320	44.4	48 / 381
340	33,983	2,320	44.8	211 / 283
349	34,857	1,080	45.4	149 / 252
353	35,267	1,080	45.8	249 / 17
355	35,502	1,080	46.1	186 / 17
360	35,972	1,080	47.0	133 / 101
365	36,495	1,080	48.1	9 / 266
369	36,942	1,080	48.5	22 / 23
370	37,009	1,020	51.0	22 / 23
376	37,559	1,020	51.2	152 / 119
378	37,840	1,020	51.3	179 / 136
386	38,565	1,020	51.9	164 / 13
395	39,483	1,020	53.4	48 / 102
Doctors Creek				
005	481	5,820	39.3[1]	188 / 143
008	766	5,820	39.3[1]	190 / 269
010	1,050	5,820	39.3[1]	46 / 46
017	1,730	5,820	39.3[1]	363 / 55
022	2,242	5,820	39.3[1]	46 / 46
027	2,715	5,820	39.3[1]	263 / 46
031	3,078	5,820	39.3[1]	387 / 46
037	3,708	5,820	39.3[1]	319 / 46
041	4,133	5,820	39.3[1]	925 / 126
046	4,594	5,820	39.3[1]	46 / 46
051	5,125	5,820	39.3[1]	88 / 46
056	5,609	5,820	39.3[1]	136 / 46
061	6,057	5,760	39.3[1]	46 / 152
065	6,489	5,760	39.3[1]	150 / 150
065	6,535	5,760	39.3[1]	150 / 150
069	6,858	5,760	39.3[1]	200 / 100
072	7,243	5,760	39.3[1]	200 / 200
079	7,865	5,760	39.3[1]	200 / 200
083	8,350	5,760	39.3[1]	200 / 200
089	8,902	5,760	39.3	200 / 100
093	9,347	5,760	39.5	200 / 100
100	9,977	5,760	39.6	137 / 544
104	10,389	5,760	39.7	400 / 83
109	10,949	5,760	40.0	300 / 200
115	11,452	5,760	40.2	150 / 200
246	24,643	5,430	50.2	486 / 160
247	24,719	5,430	50.2	260 / 300
248	24,775	5,430	50.6	260 / 300
254	25,438	5,430	50.8	425 / 450

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
260	25,956	5,430	51.0	475 / 400
628	62,772	980	87.5	50 / 168
Dry Branch				
033	3,336	1,127	49.7	64 / 214
040	4,040	1,127	50.1	143 / 168
046	4,610	1,127	50.4	160 / 102
052	5,247	1,127	50.9	242 / 63
061	6,075	1,127	51.9	69 / 157
066	6,574	1,127	52.8	123 / 75
073	7,276	1,127	54.1	44 / 131
078	7,802	1,127	55.4	44 / 76
Godfrey Creek				
004	384	1,500	15.7[1]	44 / 47
005	479	1,500	15.7[1]	66 / 72
011	1,053	1,500	17.6	99 / 185
014	1,409	1,500	18.3	112 / 62
019	1,851	1,500	19.5	28 / 138
022	2,220	1,500	20.3	130 / 96
027	2,672	1,500	20.8	17 / 158
029	2,924	1,500	21.2	17 / 126
032	3,241	1,460	22.0	97 / 96
036	3,564	1,460	22.4	89 / 115
039	3,863	1,460	22.8	51 / 135
042	4,203	1,460	23.3	55 / 96
047	4,688	1,460	24.0	127 / 62
050	5,046	1,460	24.3	16 / 164
054	5,358	1,460	24.7	38 / 156
057	5,695	1,460	25.0	70 / 85
060	6,034	1,390	25.5	147 / 28
064	6,400	1,390	26.1	49 / 142
066	6,623	1,390	26.4	65 / 94
069	6,940	1,390	26.9	80 / 88
072	7,201	1,390	27.3	134 / 48
075	7,516	1,390	27.7	98 / 16
078	7,763	1,390	28.2	152 / 29
081	8,088	1,390	28.5	143 / 25
085	8,522	1,390	29.0	86 / 53
090	8,985	1,390	29.7	68 / 43
093	9,290	1,390	30.2	41 / 101
097	9,731	1,390	30.8	16 / 98
102	10,201	1,190	31.5	65 / 91
106	10,619	1,190	31.8	157 / 90
111	11,058	984	32.1	77 / 17
113	11,308	984	33.2	119 / 9
116	11,600	984	33.7	109 / 125

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
119	11,943	984	34.1	78 / 248
124	12,400	984	34.9	59 / 139
128	12,800	984	35.7	187 / 34
132	13,200	984	36.2	137 / 74
135	13,495	984	36.7	190 / 29
140	14,000	757	37.7	46 / 240
Guffords Branch				
068	6,826	592	25.4	51 / 56
072	7,152	592	26.4	74 / 23
075	7,533	592	27.4	70 / 38
078	7,799	592	28.0	12 / 77
081	8,054	592	28.8	75 / 18
083	8,345	592	29.7	35 / 52
Harrisons Creek				
196	19,628	2,890	8.8[1]	68 / 66
197	19,681	2,890	9.0	68 / 66
200	19,957	2,890	9.1	23 / 447
204	20,390	2,890	9.2	131 / 483
207	20,727	2,890	9.2	101 / 401
210	20,953	2,890	9.3	87 / 506
211	21,131	2,890	9.3	47 / 481
215	21,470	2,890	9.4	391 / 142
217	21,729	2,840	9.5	503 / 208
221	22,086	2,840	9.6	297 / 252
223	22,284	2,840	9.7	281 / 482
225	22,479	2,840	9.7	246 / 329
227	22,720	2,840	9.8	257 / 158
232	23,153	2,840	10.0	248 / 238
234	23,380	2,840	10.1	229 / 306
237	23,749	2,840	10.3	143 / 346
242	24,161	2,840	10.5	283 / 220
243	24,332	2,840	10.6	103 / 307
249	24,860	2,840	10.9	23 / 443
252	25,234	2,840	11.1	55 / 513
257	25,690	2,840	11.3	23 / 475
259	25,892	2,610	11.4	58 / 469
262	26,210	2,610	11.6	158 / 333
267	26,653	2,610	11.8	448 / 181
269	26,860	2,610	11.9	333 / 254
273	27,270	2,610	12.1	90 / 385
276	27,591	2,610	12.3	110 / 564
281	28,065	2,610	12.5	233 / 397
284	28,362	2,610	12.7	125 / 442
287	28,690	2,610	12.9	184 / 289
289	28,920	2,610	13.1	106 / 352

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
291	29,116	2,610	13.4	229 / 258
295	29,504	2,580	13.7	426 / 129
298	29,820	2,580	14.0	305 / 249
304	30,379	2,580	14.8	97 / 299
308	30,795	2,580	15.5	128 / 385
310	31,011	2,580	15.7	269 / 57
314	31,356	1,050	16.3	178 / 141
316	31,640	1,050	16.6	30 / 162
320	31,974	1,050	17.4	118 / 139
323	32,321	1,050	18.2	78 / 104
327	32,744	1,050	19.4	30 / 176
332	33,170	1,050	20.5	50 / 128
338	33,816	1,050	21.3	70 / 70
339	33,869	1,050	21.5	70 / 70
343	34,272	1,020	22.4	70 / 130
346	34,604	1,020	23.4	156 / 50
350	35,013	1,020	24.0	95 / 50
354	35,444	1,020	24.6	93 / 60
358	35,824	1,020	25.3	137 / 13
362	36,239	1,020	26.1	147 / 40
367	36,747	1,020	27.2	108 / 3
371	37,061	1,020	28.3	64 / 13
371	37,107	1,020	28.4	30 / 29
372	37,160	927	29.2	30 / 29
375	37,454	927	29.3	24 / 59
Holly Shelter Creek				
063	6,319	15,000	17.8[2]	650 / 1,440
080	7,974	15,000	17.8[2]	1,025 / 475
093	9,273	15,000	17.8[2]	750 / 420
105	10,547	15,000	17.8[2]	925 / 340
114	11,393	14,900	17.9[2]	600 / 610
120	11,958	14,900	17.9[2]	840 / 310
126	12,632	14,900	17.9[2]	790 / 400
139	13,924	14,900	17.9[2]	380 / 1,200
157	15,729	14,900	18.0[2]	1,430 / 220
164	16,396	14,900	18.0[2]	1,360 / 320
174	17,437	14,900	17.9[2]	800 / 1,100
181	18,133	14,900	18.0[2]	1,170 / 1,075
197	19,710	14,900	17.8[2]	450 / 1,700
214	21,416	14,900	17.8[2]	380 / 1,700
220	21,992	14,900	17.8[2]	880 / 1,200
231	23,129	14,900	17.8[2]	640 / 1,675
236	23,648	14,900	17.8[2]	750 / 1,300
250	24,961	14,900	17.8[2]	115 / 825
263	26,285	14,800	17.8[2]	175 / 260

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
268	26,776	14,800	17.8[2]	212 / 209
274	27,450	14,800	17.8[2]	190 / 105
282	28,169	14,800	17.8[2]	105 / 105
290	28,968	14,800	17.8[2]	170 / 108
298	29,848	14,800	17.8[2]	105 / 105
305	30,462	14,800	17.8[2]	105 / 105
311	31,135	14,800	17.8[2]	105 / 303
312	31,246	14,800	17.8[2]	110 / 103
313	31,302	14,800	17.8[2]	110 / 103
317	31,658	14,800	17.8[2]	144 / 399
322	32,194	14,800	17.7[2]	105 / 177
328	32,836	14,800	17.7[2]	148 / 357
333	33,308	14,800	17.7[2]	105 / 123
338	33,847	14,800	17.7[2]	104 / 104
343	34,260	14,700	17.7[2]	195 / 491
351	35,066	14,700	17.7[2]	107 / 104
358	35,783	14,700	17.7[1]	339 / 104
364	36,406	14,700	17.7[1]	350 / 64
374	37,439	14,700	17.7[1]	104 / 104
381	38,142	14,700	17.7[1]	104 / 104
388	38,833	14,700	17.7[1]	104 / 381
397	39,745	14,700	17.7[1]	710 / 98
402	40,242	14,700	17.7[1]	458 / 224
407	40,744	14,700	17.7[1]	98 / 265
414	41,385	14,700	17.7[1]	98 / 281
422	42,192	14,700	17.7[1]	110 / 110
432	43,162	14,700	17.7[1]	256 / 110
441	44,057	14,700	17.7[1]	110 / 212
450	44,960	14,700	17.7[1]	104 / 244
455	45,515	14,700	17.7[1]	189 / 104
463	46,280	14,700	17.7[1]	104 / 180
471	47,050	14,700	17.7[1]	104 / 104
486	48,568	14,300	17.7[1]	372 / 102
494	49,397	14,300	17.7[1]	102 / 172
501	50,073	14,300	17.7[1]	102 / 102
513	51,331	14,300	17.7[1]	137 / 102
522	52,195	14,300	17.7[1]	102 / 356
529	52,938	14,300	17.7[1]	102 / 102
546	54,554	14,300	17.7[1]	102 / 211
560	55,957	14,300	17.7[1]	192 / 102
572	57,216	14,300	17.7[1]	573 / 371
578	57,808	14,300	17.7	102 / 102
589	58,933	14,300	17.9	102 / 499
594	59,382	14,300	17.9	102 / 344
600	59,982	14,300	18.0	102 / 725

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
615	61,483	11,800	18.1	1,854 / 669
628	62,801	11,800	18.2	266 / 2,126
638	63,844	11,800	18.3	310 / 903
651	65,108	11,800	18.4	90 / 449
661	66,085	11,800	18.4	220 / 1,015
666	66,624	11,800	18.5	221 / 507
674	67,399	11,800	18.6	422 / 1,903
683	68,300	11,800	18.6	85 / 2,172
693	69,274	11,800	18.6	490 / 2,155
698	69,757	11,800	18.7	128 / 1,937
703	70,340	11,800	18.7	157 / 1,658
709	70,908	11,800	18.7	85 / 2,119
714	71,375	11,800	18.7	1,067 / 2,151
720	72,049	11,800	18.8	1,349 / 1,947
728	72,812	11,800	18.8	1,607 / 548
734	73,369	11,800	18.8	1,473 / 406
745	74,458	11,800	18.8	920 / 549
753	75,325	11,800	18.9	729 / 1,578
757	75,693	11,800	18.9	480 / 1,568
764	76,395	11,800	18.9	85 / 527
771	77,081	11,800	19.0	605 / 1,057
778	77,829	11,800	19.0	439 / 1,084
787	78,702	11,800	19.1	85 / 1,443
801	80,133	11,800	19.3	85 / 1,428
825	82,458	11,800	19.6	1,198 / 194
837	83,665	11,800	19.7	187 / 2,031
845	84,521	11,800	19.8	671 / 2,570
861	86,120	11,800	19.8	227 / 2,807
872	87,166	11,800	19.8	85 / 2,798
885	88,515	11,800	19.8	85 / 2,846
899	89,873	11,800	19.8	1,126 / 236
914	91,445	11,800	20.0	905 / 1,146
943	94,314	8,610	20.1	495 / 2,259
953	95,300	8,610	20.2	1,675 / 1,937
953	95,341	8,610	20.2	1,675 / 1,937
976	97,559	8,610	20.3	320 / 67
983	98,280	8,610	20.4	1,261 / 613
997	99,659	8,610	20.5	911 / 213
1009	100,864	8,610	20.6	183 / 485
1014	101,354	8,610	20.7	621 / 901
1024	102,437	8,570	20.8	767 / 1,337
1038	103,771	8,570	20.8	1,426 / 949
1053	105,320	8,570	21.0	1,329 / 355
1065	106,546	3,670	21.0	1,939 / 37
1078	107,782	3,670	21.0	1,971 / 37

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
1087	108,748	3,670	21.1	1,461 / 480
1088	108,793	3,670	21.1	1,461 / 480
1093	109,347	3,670	21.1	1,762 / 618
1100	109,995	3,670	21.1	2,012 / 156
1109	110,855	3,670	21.2	1,509 / 302
1125	112,534	3,580	21.3	1,106 / 718
1150	114,994	3,580	21.5	769 / 198
1170	116,963	3,510	21.9	563 / 267
1181	118,077	3,510	22.4	241 / 414
1193	119,252	3,510	22.9	427 / 478
1201	120,136	3,510	23.3	408 / 421
1208	120,796	3,510	23.5	183 / 605
1213	121,291	3,510	23.8	610 / 281
1220	121,971	3,510	24.1	714 / 44
1227	122,651	3,430	24.4	215 / 158
1234	123,370	3,430	24.9	210 / 254
1237	123,692	3,430	24.9	71 / 71
1237	123,742	3,430	25.8	71 / 71
1245	124,496	3,400	27.0	383 / 92
1250	125,009	3,400	27.2	259 / 288
1256	125,591	3,400	27.4	800 / 800
1269	126,908	1,530	27.7	17 / 813
1274	127,433	1,530	27.8	42 / 512
1282	128,172	1,530	27.9	189 / 393
1288	128,800	1,530	28.0	100 / 337
1288	128,846	1,530	28.3	100 / 337
1294	129,413	1,530	28.5	180 / 75
1299	129,936	1,530	28.9	37 / 275
1305	130,491	1,530	29.6	159 / 155
1311	131,063	1,530	30.2	212 / 231
1316	131,630	1,530	30.6	359 / 247
1322	132,197	1,530	30.9	420 / 133
1330	133,024	1,210	31.6	14 / 457
1337	133,663	1,210	32.3	109 / 153
1345	134,460	1,210	33.1	108 / 208
1350	135,047	1,210	33.8	71 / 235
1354	135,427	1,210	34.5	165 / 26
1355	135,508	1,210	34.4	165 / 26
1362	136,184	1,210	35.5	14 / 549
1369	136,888	1,210	35.8	14 / 721
1373	137,306	1,210	36.2	14 / 524
1377	137,711	1,210	37.0	97 / 518
Island Creek Tributary				
023	2,262	1,420	8.4[1]	187 / 79
028	2,768	1,420	8.7	110 / 158

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
034	3,378	1,420	9.5	112 / 183
039	3,928	1,420	10.2	16 / 209
046	4,621	1,420	11.6	128 / 26
053	5,263	1,270	12.8	85 / 94
058	5,765	1,270	13.4	208 / 55
063	6,347	1,270	13.9	365 / 46
070	6,978	1,270	14.5	103 / 184
076	7,570	1,270	15.6	140 / 67
083	8,273	1,270	16.8	172 / 181
089	8,861	1,270	17.8	15 / 153
094	9,353	1,270	19.2	94 / 126
100	9,995	1,090	20.5	125 / 97
105	10,494	1,090	21.4	113 / 82
113	11,350	1,090	22.7	61 / 184
117	11,729	1,090	23.2	112 / 103
122	12,210	1,090	23.8	120 / 98
127	12,660	1,090	24.4	36 / 172
132	13,216	895	25.1	18 / 249
137	13,652	895	25.5	83 / 205
140	14,020	895	26.0	14 / 182
144	14,370	895	26.4	124 / 65
149	14,861	895	27.2	152 / 38
Juniper Swamp				
000	0	5,410	33.9	800 / 781
005	522	5,170	34.0	735 / 1,651
010	962	5,170	34.1	533 / 1,380
015	1,474	5,170	34.3	469 / 1,167
025	2,540	5,170	34.6	455 / 964
031	3,071	5,170	34.8	36 / 1,588
036	3,584	5,170	35.0	111 / 1,527
046	4,589	5,170	35.3	747 / 978
050	4,966	5,170	35.4	854 / 772
056	5,562	5,170	35.5	605 / 706
059	5,908	5,170	35.6	1,001 / 625
Kellys Creek				
004	375	2,070	24.7[1]	430 / 429
008	844	2,070	24.7[1]	199 / 75
012	1,212	2,070	24.7[1]	122 / 271
016	1,640	2,070	24.7	27 / 337
021	2,078	2,070	25.2	145 / 262
025	2,464	2,070	25.6	19 / 391
028	2,757	2,070	25.9	19 / 321
032	3,180	2,070	26.5	77 / 154
035	3,472	2,070	27.0	19 / 491
038	3,768	2,070	27.2	19 / 392

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
040	3,955	2,070	27.4	19 / 360
042	4,223	1,970	27.6	18 / 348
045	4,544	1,970	27.9	69 / 377
051	5,053	1,970	28.2	251 / 310
054	5,367	1,970	28.4	92 / 265
056	5,615	1,970	28.5	50 / 55
057	5,663	1,970	28.9	50 / 55
059	5,941	1,970	29.1	18 / 260
Lillington Creek				
146	14,589	2,840	13.2[2]	172 / 721
159	15,939	2,840	13.2[2]	260 / 143
168	16,797	2,840	13.2[1]	130 / 315
174	17,401	2,730	13.2[1]	383 / 278
182	18,171	2,730	13.2[1]	168 / 288
186	18,564	2,730	13.2[1]	150 / 150
186	18,639	2,730	13.2[1]	150 / 150
191	19,077	2,730	13.2[1]	329 / 143
200	19,982	2,730	13.2[1]	185 / 227
207	20,734	2,730	13.2[1]	621 / 67
217	21,684	2,730	13.2[1]	322 / 180
224	22,386	2,260	13.2[1]	311 / 76
230	23,018	2,260	13.4	215 / 299
242	24,231	2,260	14.2	203 / 204
245	24,454	2,260	14.3	150 / 150
245	24,489	2,260	14.3	150 / 150
250	24,951	2,260	14.9	318 / 200
256	25,613	2,260	15.4	269 / 193
262	26,216	2,260	15.9	25 / 549
271	27,113	1,980	16.9	65 / 294
279	27,862	1,980	17.9	114 / 165
286	28,626	1,980	19.0	100 / 215
293	29,292	1,980	19.6	24 / 458
300	29,991	1,980	20.3	60 / 60
300	30,026	1,980	21.1	60 / 60
308	30,790	1,530	23.7	150 / 50
314	31,376	1,530	25.7	200 / 150
322	32,241	1,530	27.8	300 / 30
331	33,121	1,530	29.0	300 / 50
Lillington Creek Tributary				
006	619	928	13.2[1]	179 / 33
010	1,026	928	13.2[1]	70 / 150
019	1,911	928	13.9	56 / 107
026	2,615	928	14.6	369 / 41
032	3,237	867	15.3	18 / 116
039	3,886	867	16.0	177 / 21

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
047	4,696	444	16.4	45 / 183
054	5,390	444	16.6	168 / 244
061	6,115	444	16.6	87 / 266
Long Creek				
650	64,976	7,510	12.5	700 / 312
658	65,839	7,510	12.6	700 / 312
665	66,511	7,510	12.6	700 / 758
677	67,661	7,510	12.8	507 / 1,298
686	68,613	7,510	12.8	258 / 1,353
693	69,307	7,510	13.0	132 / 1,503
699	69,881	7,470	13.0	256 / 1,084
704	70,383	7,470	13.1	331 / 1,535
710	71,023	7,470	13.2	106 / 1,738
721	72,140	7,470	13.5	757 / 2,014
732	73,174	7,470	13.7	799 / 259
741	74,090	7,250	14.0	550 / 216
755	75,543	7,250	14.4	455 / 1,154
771	77,062	7,250	14.7	626 / 354
780	77,965	7,250	15.1	326 / 397
792	79,172	7,250	15.6	269 / 352
804	80,365	7,250	16.1	382 / 576
815	81,489	6,870	16.5	290 / 827
825	82,467	6,870	16.8	874 / 804
836	83,633	6,870	17.0	262 / 1,074
847	84,709	6,870	17.4	269 / 1,395
856	85,590	6,760	17.7	626 / 1,094
865	86,504	6,760	18.0	493 / 695
876	87,605	6,760	18.6	454 / 812
889	88,900	6,760	19.0	1,064 / 743
898	89,809	6,760	19.4	1,005 / 819
906	90,612	6,760	19.6	509 / 1,245
919	91,887	6,760	20.1	414 / 1,128
927	92,711	6,490	20.4	436 / 1,018
939	93,866	6,490	21.0	487 / 748
954	95,376	6,490	21.7	1,125 / 621
963	96,301	6,490	22.1	1,031 / 637
974	97,411	6,310	22.6	1,249 / 641
982	98,187	6,310	23.1	646 / 434
990	99,019	6,310	23.4	773 / 124
991	99,071	6,310	23.5	773 / 124
1000	99,957	6,310	23.7	1,182 / 398
1009	100,852	6,310	24.2	1,079 / 132
1016	101,603	6,310	24.5	1,283 / 81
1032	103,172	6,310	25.4	437 / 356
1041	104,140	4,740	25.9	1,143 / 240

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
1052	105,217	4,740	26.2	615 / 877
1068	106,821	4,670	26.8	142 / 733
1074	107,437	4,670	27.2	199 / 408
1078	107,842	4,670	27.5	71 / 70
1079	107,888	4,670	28.1	71 / 70
1088	108,761	4,670	29.0	436 / 600
1096	109,619	4,670	29.2	432 / 933
1104	110,429	4,670	29.4	400 / 750
1113	111,325	4,670	29.6	350 / 750
Long Creek Tributary				
006	644	478	26.2[1]	187 / 69
011	1,069	478	26.5	25 / 96
015	1,519	478	29.5	59 / 32
Merricks Creek				
005	521	5,240	8.8[1]	385 / 1,675
039	3,853	5,240	8.8[1]	40 / 1,296
055	5,499	5,240	8.8[1]	40 / 1,550
070	7,031	5,240	8.8[1]	123 / 1,441
085	8,532	5,240	8.8[1]	230 / 877
125	12,485	5,240	8.8[1]	1,174 / 123
144	14,393	5,240	8.8[1]	622 / 184
166	16,579	5,240	8.8[1]	279 / 544
195	19,499	5,240	8.8[1]	390 / 597
214	21,361	5,240	8.8[1]	745 / 93
225	22,503	5,240	8.8[1]	889 / 40
240	23,974	5,240	8.8[1]	405 / 427
252	25,227	5,240	8.8[1]	591 / 214
265	26,531	5,240	8.9	727 / 29
274	27,408	5,240	9.2	450 / 285
277	27,680	5,240	9.3	600 / 275
277	27,723	5,240	9.4	486 / 156
278	27,762	5,240	9.6	486 / 156
278	27,801	5,240	9.6	486 / 156
281	28,062	5,240	9.7	297 / 126
284	28,389	5,220	9.8	665 / 55
286	28,632	5,220	9.9	640 / 36
290	29,035	5,220	10.0	433 / 36
292	29,230	5,220	10.1	483 / 136
293	29,269	4,660	10.1	502 / 38
Mill Branch (of Buxton Branch)				
037	3,654	705	45.7	20 / 20
039	3,902	705	45.7	20 / 25
042	4,180	575	45.8	20 / 26
046	4,558	575	45.8	20 / 20
048	4,770	575	45.8	20 / 20
051	5,058	575	45.9	20 / 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
053	5,280	575	45.9	25 / 35
055	5,499	575	46.0	25 / 35
058	5,788	575	46.2	33 / 36
061	6,074	575	46.4	30 / 15
063	6,331	575	46.8	25 / 15
Mill Creek				
003	339	1,340	27.2[1]	100 / 300
008	808	1,340	27.2[1]	200 / 200
011	1,132	1,340	27.2	151 / 91
017	1,652	1,340	28.4	147 / 70
020	2,032	1,340	29.1	80 / 142
022	2,247	1,340	29.0	70 / 60
023	2,308	1,340	29.7	70 / 60
025	2,473	1,340	29.9	80 / 172
Mill Creek Tributary				
054	5,410	980	67.9	18 / 18
055	5,464	980	69.7	18 / 18
056	5,618	980	70.7	131 / 105
058	5,753	980	70.7	23 / 23
058	5,838	980	72.1	23 / 23
Mill Pond				
002	240	2,170	17.7[1]	144 / 14
003	349	2,170	17.7[1]	17 / 17
004	429	2,170	17.7[1]	17 / 17
011	1,115	2,170	17.7[1]	161 / 283
018	1,830	2,170	17.7[1]	75 / 235
025	2,545	2,090	17.7[1]	82 / 234
030	3,037	2,090	17.7[1]	114 / 171
035	3,539	2,090	17.7[1]	186 / 103
041	4,123	2,090	17.7[1]	99 / 156
045	4,519	2,090	17.7[1]	189 / 128
048	4,827	2,090	17.7[1]	164 / 138
055	5,543	1,970	17.7[1]	102 / 188
062	6,203	1,970	17.7[1]	104 / 143
068	6,750	1,970	17.7[1]	175 / 59
074	7,378	1,970	17.7[1]	176 / 27
083	8,267	1,591	17.7[1]	297 / 14
088	8,800	1,591	17.7[1]	148 / 122
092	9,200	1,346	17.8	75 / 208
096	9,600	1,346	18.0	263 / 124
100	10,000	1,346	18.2	155 / 166
104	10,400	1,255	18.5	166 / 173
108	10,836	1,255	19.1	11 / 196
113	11,313	1,255	19.9	65 / 245
120	11,951	1,255	20.7	29 / 250
Moores Creek				

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
017	1,698	2,830	27.7	727 / 204
025	2,492	2,830	28.0	353 / 278
030	2,995	2,830	28.4	220 / 396
038	3,822	2,830	28.8	309 / 324
045	4,475	2,830	29.0	911 / 84
051	5,125	2,780	29.2	882 / 81
056	5,598	2,780	29.5	697 / 346
070	7,034	2,780	30.3	665 / 248
074	7,363	2,780	30.5	406 / 458
078	7,789	2,780	30.7	442 / 324
083	8,296	2,780	30.9	38 / 38
084	8,355	2,780	32.4	38 / 38
094	9,438	2,470	32.7	81 / 534
098	9,828	2,470	32.9	269 / 376
106	10,597	2,470	33.2	321 / 348
110	11,029	2,470	33.3	365 / 289
114	11,434	2,470	33.5	38 / 38
115	11,484	2,470	33.8	38 / 38
120	11,996	2,470	34.5	797 / 69
124	12,373	2,470	34.6	574 / 132
129	12,917	2,430	34.8	416 / 426
136	13,601	2,430	35.1	441 / 328
142	14,222	2,420	35.3	473 / 241
147	14,743	2,420	35.5	247 / 320
152	15,200	2,420	35.7	706 / 213
158	15,781	2,420	35.9	463 / 343
167	16,681	2,420	36.4	285 / 346
172	17,242	2,420	36.9	332 / 433
176	17,604	2,350	37.1	275 / 597
184	18,353	1,850	37.4	20 / 645
191	19,123	1,850	38.0	55 / 178
198	19,826	1,850	38.8	39 / 336
202	20,211	1,850	39.1	299 / 61
209	20,890	1,630	39.8	283 / 163
214	21,432	1,630	40.2	52 / 441
220	22,013	1,630	40.6	120 / 215
225	22,475	1,630	41.0	119 / 225
231	23,135	1,630	41.6	102 / 193
236	23,566	1,590	42.1	21 / 318
238	23,814	1,590	42.3	18 / 349
241	24,096	1,590	42.5	198 / 80
Moores Creek (near Atkinson)				
291	29,078	8,233	18.7[1]	670 / 329
299	29,917	8,233	18.7[1]	433 / 559
304	30,361	8,233	18.7[1]	350 / 945

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
309	30,903	8,233	18.7[1]	299 / 546
316	31,578	8,233	18.7[1]	295 / 658
329	32,933	8,233	18.7[1]	987 / 224
336	33,605	8,233	18.7[1]	883 / 247
341	34,104	8,233	18.7[1]	1,128 / 395
345	34,537	8,233	18.7[1]	1,269 / 233
349	34,949	8,233	18.7[1]	1,452 / 298
355	35,534	8,233	18.7[1]	1,296 / 233
362	36,177	8,233	18.7[1]	958 / 153
369	36,936	8,233	18.7[1]	359 / 702
379	37,876	8,233	18.7[1]	436 / 310
386	38,571	8,233	18.7[1]	165 / 236
393	39,270	8,233	18.7[1]	639 / 186
399	39,856	8,233	18.7[1]	1,062 / 295
404	40,393	8,233	18.7[1]	1,553 / 61
412	41,225	8,233	18.7[1]	1,036 / 117
419	41,945	8,233	18.7[1]	673 / 361
424	42,437	8,233	18.7[1]	398 / 815
430	43,000	8,233	18.7[1]	492 / 604
435	43,543	8,233	18.7[1]	329 / 692
442	44,177	8,233	18.7[1]	107 / 1,000
449	44,887	8,233	18.7[1]	400 / 600
457	45,727	8,233	18.7[1]	300 / 528
464	46,386	8,233	18.7[1]	600 / 200
469	46,888	8,233	18.7[1]	800 / 47
475	47,503	8,233	18.8	341 / 382
479	47,884	8,233	19.3	198 / 485
483	48,347	7,246	19.8	423 / 404
Moores Creek Tributary 1				
012	1,225	970	32.9[1]	21 / 193
022	2,176	970	32.9[1]	250 / 59
029	2,883	970	32.9[1]	50 / 163
036	3,599	970	34.4	60 / 170
042	4,203	970	36.0	117 / 125
050	4,977	801	37.8	72 / 155
056	5,563	801	38.8	12 / 147
060	6,048	801	41.0	80 / 33
065	6,525	752	43.5	18 / 151
071	7,098	752	44.9	57 / 63
077	7,654	752	47.1	47 / 27
082	8,249	752	49.5	130 / 28
087	8,725	752	50.2	74 / 50
096	9,646	752	50.9	158 / 15
Moores Creek Tributary 2				
004	442	700	39.8[1]	95 / 113

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
007	730	700	39.8[1]	88 / 79
013	1,267	598	42.0	17 / 192
019	1,877	598	43.9	52 / 87
025	2,491	598	45.4	99 / 64
Moores Creek Tributary 6				
012	1,169	1,240	38.1[1]	253 / 107
019	1,943	1,240	38.1[1]	207 / 199
024	2,419	1,240	38.1[1]	200 / 113
030	2,951	1,240	38.8	22 / 22
030	3,023	1,240	40.0	22 / 22
033	3,291	1,240	40.8	108 / 153
043	4,269	1,020	41.6	115 / 309
050	5,043	1,020	42.2	75 / 206
057	5,653	1,020	42.9	104 / 132
064	6,436	929	43.8	88 / 119
069	6,905	929	44.6	88 / 102
076	7,646	929	46.2	151 / 51
082	8,240	929	47.3	92 / 104
089	8,944	929	48.5	122 / 35
097	9,678	807	50.3	39 / 134
Moores Creek Tributary 7				
002	223	506	41.6[1]	62 / 63
006	571	506	41.6[1]	40 / 117
011	1,064	506	42.1	29 / 106
015	1,461	506	44.2	16 / 104
018	1,816	506	45.2	24 / 106
019	1,886	506	47.8	24 / 106
022	2,202	467	47.9	18 / 119
028	2,826	467	49.5	16 / 84
034	3,395	467	52.4	51 / 65
038	3,850	467	55.1	16 / 69
044	4,387	467	57.5	49 / 75
049	4,938	467	60.4	16 / 49
054	5,364	359	62.9	75 / 72
059	5,946	359	66.4	89 / 16
065	6,535	359	71.0	67 / 55
070	7,026	230	73.9	54 / 22
North Branch				
070	7,028	696	47.7	71 / 75
074	7,386	696	48.6	40 / 55
078	7,806	696	50.1	31 / 87
083	8,326	696	50.7	107 / 103
Northeast Cape Fear River				
3158	315,789	30,700	22.6	1,985 / 398
3170	316,964	30,600	22.8	1,985 / 680
3182	318,245	30,600	22.9	1,371 / 376

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
3195	319,453	30,600	23.0	1,985 / 177
3207	320,739	30,600	23.2	1,841 / 177
3222	322,167	30,600	23.4	1,072 / 307
3235	323,457	30,600	23.6	811 / 637
3244	324,386	30,600	23.7	548 / 810
3255	325,502	30,600	23.9	392 / 800
3275	327,515	30,600	24.2	177 / 1,355
3295	329,453	30,600	24.5	803 / 353
3306	330,629	30,600	24.7	803 / 177
3320	331,998	30,600	24.9	1,287 / 1,155
3331	333,110	30,400	25.1	1,670 / 835
3350	335,027	30,400	25.3	1,990 / 705
3364	336,350	30,400	25.4	238 / 1,032
3384	338,397	30,400	25.6	176 / 2,546
3396	339,558	30,400	25.7	1,119 / 1,807
3408	340,780	30,400	25.7	2,640 / 707
3417	341,708	30,400	25.8	3,006 / 196
3429	342,860	30,400	25.9	4,548 / 213
3445	344,468	30,400	25.9	2,894 / 1,419
3458	345,774	30,400	26.0	3,366 / 176
3475	347,529	30,400	26.0	9 / 176
3491	349,131	30,400	26.1	4,255 / 1,184
3512	351,194	30,400	26.1	2,580 / 4,344
3519	351,947	30,400	26.1	2,791 / 4,001
3528	352,788	30,400	26.1	2,177 / 2,886
3538	353,818	-8,888	26.2	2,280 / 3,179
Pike Creek				
026	2,568	2,240	11.1[1]	422 / 323
037	3,708	2,240	11.1[1]	326 / 87
044	4,405	2,240	11.1[1]	176 / 203
053	5,287	2,240	11.1[1]	108 / 260
065	6,470	2,240	11.1[1]	274 / 44
072	7,218	1,970	11.1[1]	349 / 49
077	7,681	1,970	11.1[1]	183 / 155
084	8,400	1,970	11.1[1]	123 / 232
094	9,438	1,970	11.1[1]	68 / 164
101	10,089	1,970	11.1[1]	78 / 163
107	10,707	1,970	11.1[1]	337 / 40
113	11,269	1,970	11.1[1]	310 / 34
118	11,758	1,800	11.1[1]	179 / 89
126	12,611	1,800	11.3	144 / 133
134	13,362	1,800	12.4	176 / 138
136	13,586	1,800	12.2	94 / 94
137	13,658	1,800	13.3	94 / 94
137	13,676	1,800	13.0	74 / 74

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
138	13,761	1,800	18.4	74 / 74
139	13,897	1,800	18.6	238 / 292
143	14,251	1,800	18.6	251 / 194
147	14,679	1,800	18.6	211 / 192
151	15,138	1,800	18.6	74 / 74
153	15,318	1,420	24.6	74 / 74
158	15,848	1,420	24.7	277 / 139
162	16,167	1,420	24.7	141 / 270
166	16,648	1,420	24.7	83 / 362
170	17,035	1,420	24.7	29 / 290
177	17,674	1,420	24.7	54 / 223
183	18,326	1,420	24.8	216 / 110
186	18,589	1,420	24.8	118 / 246
193	19,337	1,420	24.8	47 / 226
199	19,935	1,420	25.0	112 / 197
206	20,565	1,420	25.1	120 / 190
211	21,074	1,420	25.2	101 / 326
219	21,886	941	25.5	20 / 228
227	22,686	941	26.0	367 / 13
236	23,582	941	27.2	13 / 158
241	24,122	941	29.1	144 / 43
252	25,166	941	31.1	70 / 83
261	26,097	941	34.1	28 / 61
Players Creek				
002	237	1,550	10.1[1]	104 / 199
007	700	1,550	10.1[1]	101 / 245
012	1,155	1,550	10.1[1]	104 / 240
016	1,636	1,550	10.3	30 / 265
021	2,083	1,430	10.8	115 / 114
026	2,552	1,430	11.5	81 / 295
031	3,096	1,430	12.3	56 / 190
035	3,544	1,430	12.8	192 / 129
040	4,011	1,430	13.2	154 / 129
047	4,725	1,370	13.9	539 / 55
054	5,351	1,370	14.2	398 / 119
062	6,181	1,370	14.8	199 / 126
068	6,834	1,370	16.0	122 / 127
074	7,410	1,370	17.1	166 / 92
083	8,251	1,370	18.6	30 / 211
088	8,811	1,370	19.3	46 / 261
095	9,482	1,280	20.1	33 / 236
105	10,454	1,280	21.9	95 / 47
114	11,438	1,280	23.4	234 / 141
122	12,247	1,280	24.0	206 / 199
130	12,985	1,280	24.6	296 / 220

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
Rileys Creek				
118	11,830	4,500	8.2	100 / 100
122	12,163	4,500	9.3[1]	93 / 107
125	12,495	4,500	9.3[1]	157 / 292
129	12,868	4,500	9.6	72 / 415
131	13,127	4,500	9.9	86 / 404
135	13,452	4,280	10.2	71 / 392
138	13,794	4,280	10.7	88 / 454
142	14,150	4,280	11.1	119 / 441
145	14,480	4,280	11.4	217 / 333
149	14,858	4,280	11.7	417 / 180
151	15,113	4,280	11.4	49 / 49
152	15,184	4,280	12.3	49 / 49
156	15,559	4,280	13.4	300 / 254
159	15,939	4,280	13.6	230 / 553
163	16,336	4,180	13.8	106 / 664
167	16,668	4,180	13.9	300 / 400
170	17,024	4,180	14.0	333 / 346
173	17,339	4,180	14.2	271 / 214
177	17,680	4,180	14.5	330 / 432
181	18,117	4,180	14.7	170 / 539
185	18,505	4,180	15.0	124 / 575
188	18,849	4,180	15.2	165 / 538
191	19,117	4,180	15.4	71 / 523
193	19,293	4,180	15.6	45 / 360
193	19,341	4,180	15.6	45 / 360
198	19,767	4,180	16.5	249 / 568
201	20,066	4,180	16.7	286 / 523
205	20,530	4,180	17.0	145 / 538
209	20,912	4,120	17.3	159 / 343
212	21,161	4,120	17.5	328 / 564
214	21,370	4,120	17.6	109 / 676
218	21,765	4,120	17.9	187 / 514
223	22,305	4,120	18.2	172 / 573
226	22,632	4,120	18.4	162 / 441
229	22,923	4,120	18.7	70 / 646
233	23,342	4,120	19.0	110 / 710
238	23,784	4,120	19.4	70 / 591
243	24,288	4,060	19.7	302 / 585
247	24,712	4,060	19.9	452 / 350
252	25,182	4,060	20.2	386 / 223
257	25,670	4,060	20.6	462 / 350
261	26,057	4,060	20.9	388 / 300
266	26,558	4,060	21.2	593 / 175
269	26,944	3,640	21.5	585 / 130

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
273	27,323	3,640	21.7	574 / 68
276	27,604	3,640	21.9	677 / 150
280	27,994	3,640	22.2	189 / 660
283	28,287	3,640	22.3	68 / 828
286	28,571	3,640	22.4	148 / 945
289	28,932	3,640	22.6	216 / 829
293	29,313	3,640	22.8	533 / 220
297	29,665	3,640	23.1	538 / 119
300	30,005	3,640	23.5	204 / 332
304	30,368	3,640	24.0	68 / 425
307	30,664	3,640	24.2	68 / 740
311	31,093	3,640	24.5	577 / 196
315	31,550	2,700	24.7	668 / 109
319	31,909	2,700	24.9	620 / 62
322	32,155	2,700	25.2	525 / 62
325	32,509	2,700	25.6	444 / 62
328	32,793	2,700	26.0	473 / 165
331	33,116	2,700	26.3	539 / 62
334	33,382	2,700	26.5	500 / 62
338	33,755	2,700	26.9	300 / 500
343	34,254	2,700	27.2	300 / 500
Rizzo Creek				
000	1	2,700	27.2	300 / 500
006	553	2,190	27.5	161 / 353
009	911	2,190	27.8	198 / 150
012	1,247	2,190	28.2	217 / 130
016	1,559	2,190	28.5	60 / 385
019	1,926	2,190	28.7	100 / 350
024	2,409	2,190	29.0	150 / 218
Rockfish Creek				
266	26,582	11,430	26.6	1,279 / 68
272	27,222	11,430	26.7	1,455 / 57
286	28,555	11,430	26.8	632 / 1,001
293	29,262	11,430	26.6	114 / 114
293	29,318	11,430	26.9	114 / 114
294	29,398	11,430	26.9	114 / 114
305	30,510	11,430	27.8	920 / 160
325	32,473	11,430	28.0	919 / 729
335	33,518	11,430	28.0	962 / 220
356	35,594	11,430	28.3	214 / 1,428
535	53,513	9,760	34.6	557 / 1,198
557	55,658	9,760	35.2	142 / 1,282
574	57,414	9,700	35.8	919 / 1,459
597	59,668	9,700	36.4	1,300 / 147
616	61,635	9,700	37.0	1,091 / 924

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
635	63,532	9,700	37.5	307 / 1,141
654	65,430	9,640	38.2	141 / 672
671	67,123	9,640	38.8	937 / 542
690	69,026	9,640	39.3	643 / 336
Sandy Run Swamp				
028	2,799	7,380	20.9[1]	984 / 1,208
036	3,575	7,370	20.9[1]	132 / 630
049	4,920	7,370	20.9[1]	174 / 488
057	5,668	7,370	20.9[1]	121 / 623
066	6,571	7,370	20.9[1]	62 / 49
084	8,351	7,290	22.4	594 / 145
095	9,484	7,290	22.9	428 / 628
107	10,658	7,290	23.3	161 / 890
119	11,852	7,190	23.6	515 / 567
127	12,654	7,190	23.7	249 / 1,274
136	13,585	7,190	23.8	621 / 667
149	14,863	7,190	24.0	1,100 / 49
157	15,696	7,190	24.2	513 / 522
166	16,580	7,190	24.4	625 / 247
172	17,177	7,190	24.6	1,304 / 49
185	18,528	3,780	24.8	655 / 372
196	19,640	3,780	25.0	274 / 359
211	21,070	3,780	25.4	221 / 881
218	21,829	3,780	25.5	648 / 489
230	22,966	3,780	25.6	543 / 678
233	23,274	3,780	25.7	299 / 572
233	23,310	3,780	25.8	299 / 572
239	23,855	3,780	25.9	365 / 463
246	24,588	3,780	26.0	713 / 255
255	25,492	3,780	26.1	288 / 277
264	26,435	3,700	26.4	561 / 317
278	27,757	3,700	26.8	522 / 146
285	28,481	3,700	27.0	358 / 271
290	28,963	3,700	27.2	345 / 126
296	29,601	3,700	27.6	217 / 203
303	30,255	3,700	27.8	456 / 181
310	31,017	3,700	28.1	305 / 122
317	31,707	3,490	28.4	836 / 247
327	32,732	3,490	28.6	512 / 475
337	33,708	3,490	28.9	393 / 369
Sawyer Creek				
004	376	1,760	29.3[1]	183 / 50
007	707	1,760	29.3[1]	135 / 50
013	1,341	1,760	29.3[1]	50 / 40
016	1,648	1,760	29.3[1]	98 / 35

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
023	2,341	1,760	29.3[1]	65 / 19
029	2,893	1,760	29.3[1]	43 / 26
033	3,260	1,760	29.3[1]	60 / 20
040	3,988	1,760	29.3[1]	95 / 67
045	4,519	1,760	29.7	70 / 50
051	5,093	1,760	31.0	50 / 50
056	5,564	1,760	32.3	88 / 136
060	6,004	1,760	32.6	127 / 109
066	6,565	1,760	33.0	88 / 63
070	6,971	1,760	33.6	62 / 54
074	7,376	1,760	34.2	155 / 105
077	7,742	1,760	34.5	110 / 104
081	8,146	1,760	34.6	75 / 75
082	8,222	1,760	34.6	75 / 75
086	8,614	1,760	34.8	200 / 311
090	9,020	1,760	35.0	200 / 272
096	9,590	1,760	35.4	200 / 334
100	9,984	1,590	35.8	200 / 220
105	10,465	1,590	36.2	100 / 141
108	10,803	1,590	36.8	100 / 110
113	11,263	1,590	37.7	100 / 200
117	11,718	1,590	38.4	200 / 50
121	12,117	1,590	39.5	200 / 20
125	12,536	1,590	41.1	100 / 50
129	12,899	772	42.1	100 / 50
Shaken Creek				
002	160	7,070	18.2[1]	70 / 70
002	239	7,070	18.2[1]	45 / 45
003	279	7,070	18.2[1]	45 / 45
008	794	7,070	18.2[1]	45 / 50
015	1,548	7,070	18.2[1]	49 / 107
025	2,463	7,070	18.2[1]	174 / 50
030	3,033	7,070	18.2[1]	53 / 136
040	4,047	7,070	18.2[1]	449 / 70
047	4,701	7,070	18.2[1]	271 / 141
057	5,712	7,070	18.2[1]	91 / 603
067	6,671	7,070	18.2[1]	348 / 441
072	7,232	7,070	18.2[1]	47 / 650
081	8,082	7,070	18.2[1]	98 / 610
088	8,784	7,070	18.2[1]	441 / 342
092	9,169	7,070	18.2[1]	348 / 100
098	9,823	7,070	18.2[1]	95 / 100
103	10,251	7,070	18.2[1]	109 / 50
110	10,991	7,070	18.2[1]	80 / 191
120	11,999	7,070	18.2[1]	87 / 50

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
124	12,422	7,070	18.2[1]	70 / 50
135	13,507	7,010	18.2[1]	138 / 80
144	14,367	7,010	18.4	309 / 239
149	14,879	7,010	18.5	716 / 50
159	15,913	7,010	18.8	243 / 217
170	17,006	7,010	19.1	144 / 746
177	17,715	7,010	19.2	125 / 789
188	18,812	7,010	19.5	581 / 50
192	19,241	7,010	19.6	444 / 246
198	19,766	7,010	19.7	500 / 106
205	20,496	7,010	19.8	500 / 189
214	21,406	7,010	19.9	290 / 355
221	22,062	6,890	20.0	174 / 437
228	22,817	6,890	20.2	333 / 509
234	23,360	6,890	20.2	306 / 392
239	23,894	6,890	20.3	300 / 456
243	24,335	6,890	20.4	682 / 230
249	24,857	6,890	20.5	758 / 115
254	25,448	6,890	20.6	847 / 100
262	26,226	6,890	20.7	559 / 240
269	26,945	6,890	20.8	562 / 394
275	27,482	6,890	20.9	635 / 436
280	28,028	6,890	21.0	537 / 454
285	28,458	6,890	21.1	626 / 290
288	28,826	6,890	21.2	186 / 645
289	28,876	6,890	21.2	186 / 645
294	29,448	6,890	21.3	275 / 682
301	30,141	6,890	21.5	164 / 639
307	30,663	6,620	21.6	250 / 684
312	31,186	6,620	21.7	495 / 364
317	31,717	6,620	21.9	382 / 399
323	32,329	6,620	22.0	740 / 90
330	33,035	6,620	22.2	879 / 131
341	34,053	6,620	22.5	1,023 / 100
347	34,664	6,620	22.7	707 / 465
353	35,332	6,620	22.9	930 / 120
366	36,595	6,620	23.2	724 / 1,126
378	37,806	6,620	23.5	100 / 1,199
384	38,450	6,620	23.7	200 / 1,212
396	39,605	6,620	24.2	400 / 658
404	40,449	6,620	24.6	400 / 951
423	42,279	6,620	24.9	440 / 2,397
439	43,933	6,620	25.2	100 / 1,566
452	45,205	6,620	25.5	1,045 / 342
458	45,753	6,620	25.6	1,400 / 37

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
458	45,803	6,620	25.6	1,400 / 37
467	46,664	6,620	25.9	1,093 / 184
482	48,194	6,620	26.3	506 / 597
497	49,661	6,620	26.8	458 / 786
507	50,650	6,620	27.1	1,413 / 120
516	51,565	6,240	27.4	769 / 553
524	52,409	6,240	27.6	300 / 986
532	53,234	6,240	27.8	300 / 929
538	53,836	6,240	27.9	312 / 737
545	54,469	5,990	28.1	211 / 551
552	55,213	5,990	28.5	243 / 122
561	56,067	5,990	29.0	651 / 384
571	57,146	5,990	29.2	400 / 1,686
581	58,126	5,990	29.3	500 / 1,485
589	58,943	5,990	29.4	533 / 1,638
600	59,977	5,990	29.5	833 / 1,009
609	60,867	5,990	29.6	1,247 / 367
612	61,232	5,990	29.6	1,631 / 161
624	62,424	5,990	29.8	944 / 162
631	63,123	5,990	29.9	757 / 446
637	63,734	5,990	30.0	176 / 717
646	64,557	5,990	30.2	288 / 802
656	65,582	5,990	30.5	799 / 283
662	66,246	5,990	30.7	549 / 669
669	66,925	5,990	30.9	550 / 1,051
675	67,459	5,990	31.0	300 / 2,099
684	68,413	5,990	31.2	300 / 2,480
697	69,681	5,410	31.4	224 / 1,518
704	70,356	5,410	31.5	381 / 1,015
711	71,145	5,410	31.6	300 / 1,188
718	71,823	5,410	31.7	147 / 1,206
723	72,340	5,410	31.8	441 / 751
731	73,113	5,410	32.0	152 / 1,321
736	73,571	5,410	32.2	404 / 262
741	74,114	5,410	32.6	442 / 546
748	74,848	5,410	32.9	241 / 617
757	75,650	5,410	33.3	171 / 766
766	76,587	5,410	33.6	740 / 705
779	77,919	712	33.9	685 / 161
789	78,858	712	33.9	518 / 26
Shelter Swamp Creek				
005	475	5,680	24.8[1]	389 / 275
015	1,530	5,680	24.8[1]	441 / 274
023	2,332	5,680	24.8[1]	743 / 682
034	3,387	5,680	24.8[1]	820 / 220

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
043	4,278	5,680	24.8[1]	529 / 420
045	4,496	5,680	24.8[1]	155 / 555
053	5,255	5,630	24.8	259 / 39
064	6,360	5,630	25.2	45 / 391
076	7,591	5,630	25.6	286 / 39
082	8,170	5,630	25.9	61 / 441
090	8,966	5,630	26.1	463 / 386
099	9,885	5,630	26.3	741 / 91
109	10,892	5,630	26.5	506 / 168
120	11,951	5,630	26.9	308 / 476
120	12,001	5,630	26.9	308 / 476
124	12,383	5,630	27.2	410 / 436
130	12,952	5,570	27.4	299 / 533
134	13,390	5,570	27.5	458 / 106
139	13,949	5,570	27.8	845 / 70
144	14,369	5,570	27.9	420 / 97
150	15,001	5,570	28.4	146 / 682
156	15,621	5,570	28.6	248 / 163
162	16,181	5,480	29.1	309 / 758
170	16,982	5,480	29.4	309 / 629
177	17,676	5,480	29.7	750 / 480
184	18,355	5,450	29.9	810 / 448
192	19,185	5,450	30.1	623 / 459
201	20,065	5,450	30.5	154 / 781
210	21,045	5,450	30.9	641 / 274
219	21,867	5,450	31.3	657 / 830
229	22,878	5,350	31.7	572 / 803
243	24,349	5,350	32.3	588 / 530
255	25,462	5,350	32.8	483 / 880
260	26,037	5,350	33.1	304 / 460
270	27,003	5,350	33.8	179 / 815
Sills Creek				
008	790	3,410	29.3[1]	278 / 26
010	1,024	3,410	29.3[1]	26 / 26
015	1,507	3,410	29.3[1]	26 / 46
020	2,006	3,410	29.3[1]	121 / 26
025	2,489	3,410	29.3[1]	112 / 26
028	2,812	3,410	29.3[1]	26 / 78
033	3,284	3,410	29.3[1]	26 / 68
039	3,932	3,410	29.3[1]	139 / 26
045	4,506	3,410	29.3[1]	26 / 96
050	5,012	3,410	29.5	101 / 64
055	5,469	3,410	30.1	46 / 94
060	6,010	3,410	30.9	26 / 98
065	6,471	3,410	31.6	90 / 60

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
068	6,849	3,410	31.8	100 / 300
074	7,398	3,410	32.1	100 / 150
Sills Creek Tributary 2				
038	3,818	671	61.2	79 / 10
042	4,189	671	62.4	44 / 30
Trumpeter Swamp				
003	341	2,650	15.7[1]	198 / 587
004	425	2,650	15.6	160 / 200
005	478	2,650	15.5	160 / 200
010	981	2,650	16.2	1,008 / 360
015	1,461	2,650	16.6	634 / 266
019	1,877	2,650	17.1	1,057 / 60
025	2,538	2,650	17.6	1,131 / 228
030	3,011	2,650	17.7	712 / 724
035	3,490	2,650	17.8	395 / 126
041	4,072	2,650	18.3	208 / 618
046	4,615	2,650	18.6	251 / 587
051	5,073	2,650	18.9	134 / 466
057	5,740	2,650	19.5	269 / 193
065	6,534	2,560	20.3	124 / 403
073	7,277	2,560	20.7	297 / 225
078	7,789	2,560	20.9	443 / 138
085	8,523	2,560	21.3	206 / 342
092	9,152	2,560	21.5	328 / 501
100	10,009	2,560	21.8	263 / 474
108	10,762	2,390	22.0	315 / 336
119	11,922	2,390	22.4	403 / 252
124	12,382	2,390	22.6	366 / 307
134	13,443	2,390	23.1	157 / 395
147	14,669	2,390	23.7	22 / 956
154	15,385	2,390	24.0	259 / 698
163	16,321	2,390	24.5	144 / 406
170	17,023	2,390	24.9	129 / 530
176	17,639	2,390	25.2	164 / 451
182	18,182	2,390	25.4	370 / 400
190	19,037	2,390	25.9	213 / 441
198	19,767	2,390	26.3	258 / 284
207	20,699	2,140	26.9	657 / 19
216	21,609	2,140	27.8	188 / 125
227	22,662	2,140	29.1	233 / 237
236	23,642	2,140	29.9	47 / 546
246	24,642	2,140	30.6	132 / 280
253	25,271	2,140	31.1	188 / 316
258	25,782	2,140	31.5	192 / 271
266	26,617	2,140	32.0	85 / 491

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
272	27,247	2,140	32.4	82 / 509
280	27,954	2,140	32.8	121 / 121
280	28,014	1,610	34.6	121 / 121
288	28,771	1,610	34.8	575 / 189
293	29,291	1,610	34.8	1,207 / 305
297	29,729	1,610	34.9	1,109 / 591
304	30,365	1,610	34.9	253 / 646
311	31,090	1,610	35.2	341 / 600
318	31,798	1,610	35.6	406 / 865
324	32,448	678	36.0	491 / 12
334	33,400	678	38.0	69 / 183
342	34,202	678	40.1	294 / 142
348	34,836	678	41.9	123 / 128
Tuckahoe Branch				
100	10,000	1,215	56.9	130 / 140
106	10,564	1,215	58.0	185 / 46
112	11,235	1,215	59.1	10 / 304
118	11,806	1,068	59.8	126 / 172
Turkey Creek Tributary				
002	173	876	11.5[4]	148 / 20
007	726	876	11.9	20 / 218
014	1,391	876	12.9	37 / 118
022	2,199	876	15.5	97 / 104
027	2,694	876	16.7	20 / 204
034	3,351	876	18.1	173 / 25
041	4,143	876	20.7	52 / 31
045	4,464	876	22.6	37 / 36
045	4,516	876	24.0	37 / 36
049	4,924	670	26.3	20 / 20
054	5,356	670	28.2	20 / 144
Washington Creek				
005	502	1,390	24.9[1]	1,176 / 49
009	937	1,390	24.9[1]	731 / 20
016	1,570	1,390	24.9[1]	336 / 209
023	2,251	1,390	24.9[1]	209 / 21
029	2,917	1,390	24.9[1]	102 / 154
034	3,429	1,390	24.9[1]	35 / 17
036	3,559	1,390	24.9[1]	35 / 17
039	3,928	1,390	24.9[1]	114 / 20
045	4,466	1,390	24.9[1]	56 / 91
054	5,446	1,390	24.9[1]	21 / 77
057	5,739	1,390	24.9[1]	36 / 22
061	6,111	1,390	22.0	35 / 35
064	6,381	1,390	25.6	35 / 35
066	6,643	1,390	25.6	172 / 21
071	7,133	1,390	26.0	99 / 48

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
076	7,649	1,390	26.9	126 / 22
Washington Creek Tributary				
001	59	1,160	26.9[1]	21 / 47
005	462	1,160	28.9	24 / 88
010	969	1,160	30.8	41 / 35
016	1,566	1,160	34.1	12 / 51
021	2,141	1,160	36.5	12 / 71
027	2,716	1,160	38.4	12 / 88
033	3,316	1,160	40.3	24 / 76
040	3,969	1,160	43.6	18 / 37
White Oak Branch				
031	3,123	2,091	40.0	319 / 200
036	3,557	2,091	40.3	173 / 278
038	3,792	2,091	40.4	150 / 186
038	3,839	2,091	41.1	150 / 186
042	4,172	2,091	41.3	290 / 209
047	4,652	2,091	41.5	330 / 214
054	5,400	2,091	41.8	197 / 169
059	5,920	2,091	42.1	271 / 187
065	6,504	2,091	42.5	281 / 115
071	7,065	2,091	42.9	213 / 287
076	7,580	2,091	43.2	250 / 356
082	8,248	2,091	43.6	120 / 328
089	8,903	2,091	44.1	294 / 67
096	9,600	2,091	44.6	302 / 159
103	10,327	2,091	44.9	450 / 58
106	10,622	2,091	45.0	433 / 54
111	11,115	2,091	45.3	361 / 268
119	11,861	2,091	45.9	189 / 90
128	12,764	2,091	47.1	124 / 225
134	13,381	2,091	47.7	379 / 91
141	14,133	2,091	48.0	51 / 513
148	14,808	2,091	48.4	307 / 116
153	15,287	2,091	48.7	475 / 115
157	15,719	2,091	48.9	438 / 47
162	16,163	2,091	49.2	429 / 84
167	16,694	2,091	49.4	274 / 168
171	17,101	2,091	49.8	294 / 51
177	17,675	1,837	50.3	428 / 26
180	18,038	1,837	50.5	333 / 71
184	18,426	1,837	50.8	505 / 40
189	18,915	1,837	51.0	309 / 80
196	19,559	1,458	53.2	264 / 43
198	19,771	1,837	51.6	199 / 165
201	20,119	1,458	53.8	75 / 194

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
204	20,388	1,837	51.9	296 / 173
205	20,518	1,458	54.3	84 / 172
210	20,950	1,837	52.2	179 / 156
211	21,079	1,458	55.0	103 / 106
215	21,492	1,458	56.0	12 / 209
216	21,582	1,458	52.6	68 / 444

[1]Elevation includes backwater effects

[2]Northeast Cape Fear River

[3]Black River

[4]Turkey Creek

5.3 Coastal Analyses

For the areas of Pender 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
Atlantic Ocean	From Coastline on Atlantic Ocean	Just downstream of U.S. Highway 17	*	ADCIRC	1/22/2013	DETAILED STUDY
Atlantic Ocean	From Coastline on Atlantic Ocean	Just downstream of U.S. Highway 17	*	CHAMP / RUNUP 2.0 (2007)	11/13/2013	DETAILED STUDY
Atlantic Ocean	From Coastline on Atlantic Ocean	Just downstream of U.S. Highway 17	*	CHAMP 2.0	11/13/2013	DETAILED STUDY
Atlantic Ocean	From Coastline on Atlantic Ocean	Just downstream of U.S. Highway 17	*	Removal / Retreat	11/13/2013	DETAILED STUDY
Atlantic Ocean	From Coastline on Atlantic Ocean	Just downstream of U.S. Highway 17	*	WHAFIS 4.0	11/13/2013	DETAILED STUDY
Atlantic Ocean	New Hanover/ Pender County boundary	Pender/Brunswick County boundary	*	ADCIRC	1/22/2013	DETAILED STUDY
Atlantic Ocean	New Hanover/ Pender County boundary	Pender/Brunswick County boundary	*	CHAMP / RUNUP 2.0 (2007)	12/3/2013	DETAILED STUDY
Atlantic Ocean	New Hanover/ Pender County boundary	Pender/Brunswick County boundary	*	Removal	12/3/2013	DETAILED STUDY
Atlantic Ocean	New Hanover/ Pender County boundary	Pender/Brunswick County boundary	*	WHAFIS 4.0	12/3/2013	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
Atlantic Ocean	From Coastline on Atlantic Ocean	Just downstream of U.S. Highway 17	*	ADCIRC	1/22/2013
Atlantic Ocean	From Coastline on Atlantic Ocean	Just downstream of U.S. Highway 17	*	CHAMP / RUNUP 2.0 (2007)	11/13/2013
Atlantic Ocean	From Coastline on Atlantic Ocean	Just downstream of U.S. Highway 17	*	CHAMP 2.0	11/13/2013

Table 18 - Summary of Coastal Analyses

Atlantic Ocean	From Coastline on Atlantic Ocean	Just downstream of U.S. Highway 17	*	Removal / Retreat	11/13/2013
Atlantic Ocean	From Coastline on Atlantic Ocean	Just downstream of U.S. Highway 17	*	WHAFIS 4.0	11/13/2013
Atlantic Ocean	New Hanover/ Pender County boundary	Pender/Brunswick County boundary	*	ADCIRC	1/22/2013
Atlantic Ocean	New Hanover/ Pender County boundary	Pender/Brunswick County boundary	*	CHAMP / RUNUP 2.0 (2007)	12/3/2013
Atlantic Ocean	New Hanover/ Pender County boundary	Pender/Brunswick County boundary	*	Removal	12/3/2013
Atlantic Ocean	New Hanover/ Pender County boundary	Pender/Brunswick County boundary	*	WHAFIS 4.0	12/3/2013

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 Pender 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
Atlantic Ocean		**From the New Hanover/ Brunswick County boundary**			**To The Pender/ New Hanover County boundary**		
76	19.7	12.6	*	*	*	10.8	14.5
			*	*	*	10.8 - 12.8	11.2 - 16.9
78	19.7	12.6	*	*	*	11.1	14.8
			*	*	*	11.1 - 12.1	14.8 - 16.1
Topsail Sound		**From New Hanover/ Pender County boundary**			**To Pender/Brunswick County boundary**		
1	19.7	12.6	*	*	*	10.9	14.6
			*	*	*	10.9 - 12.8	14.6 - 16.9
3	18.2	12.0	*	*	*	10.7	14.6
			*	*	*	10.3 - 12.2	14.5 - 16.2
5	18.2	12.0	*	*	*	11.0	14.8
			*	*	*	11.0 - 12.4	14.8 - 16.5
7	16.9	11.0	*	*	*	11.4	15.2
			*	*	*	11.3 - 12.2	15.1 - 16.2
9	16.9	11.0	*	*	*	11.4	15.1
			*	*	*	11.3 - 12.4	15.1 - 16.4

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	16.9	11.0	*	*	*	11.1	14.9
			*	*	*	11.0 - 12.2	14.8 - 16.9
13	16.9	11.0	*	*	*	11.0	14.6
			*	*	*	10.9 - 12.0	14.6 - 16.2
15	16.9	11.0	*	*	*	10.8	14.6
			*	*	*	10.8 - 11.6	14.6 - 15.8
17	16.9	11.0	*	*	*	10.9	14.6
			*	*	*	10.8 - 11.4	14.6 - 15.6
19	18.3	12.6	*	*	*	10.8	14.6
			*	*	*	10.7 - 11.4	14.6 - 15.6
21	18.3	12.6	*	*	*	10.6	14.6
			*	*	*	10.6 - 11.3	14.6 - 15.6
23	18.3	12.6	*	*	*	10.6	14.6
			*	*	*	10.4 - 11.3	14.5 - 15.7
25	18.3	12.6	*	*	*	10.5	14.6
			*	*	*	10.3 - 11.0	14.6 - 15.5
27	17.2	14.7	*	*	*	10.6	14.6
			*	*	*	10.3 - 11.0	14.6 - 15.4
29	17.2	14.7	*	*	*	10.7	14.6
			*	*	*	10.4 - 11.1	14.6 - 15.5
31	17.2	14.7	*	*	*	10.7	14.6
			*	*	*	10.4 - 11.0	14.6 - 15.4
33	17.2	14.7	*	*	*	10.6	14.6
			*	*	*	10.3 - 11.0	14.5 - 15.3
35	18.2	12.2	*	*	*	10.5	14.6
			*	*	*	10.4 - 11.2	14.5 - 15.4
37	18.2	12.2	*	*	*	10.6	14.6
			*	*	*	10.4 - 11.3	14.5 - 15.6
39	18.2	12.2	*	*	*	10.8	14.5
			*	*	*	10.4 - 11.8	14.4 - 16.2

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 Pender 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 Pender 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)
34.38	-78.12	-0.98
34.63	-78.13	-0.83
34.63	-78.00	-0.85
34.63	-77.88	-0.96
34.63	-77.75	-0.99
34.50	-78.13	-0.88
34.50	-78.00	-0.85
34.50	-77.87	-0.92
34.50	-77.75	-0.98
34.50	-77.63	-1.00
34.37	-78.00	-0.94
34.37	-77.88	-0.95
34.38	-77.75	-0.97
34.37	-77.62	-1.00
Average conversion in Pender County from NGVD 29 to NAVD 88 = -0.94 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 Pender 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.

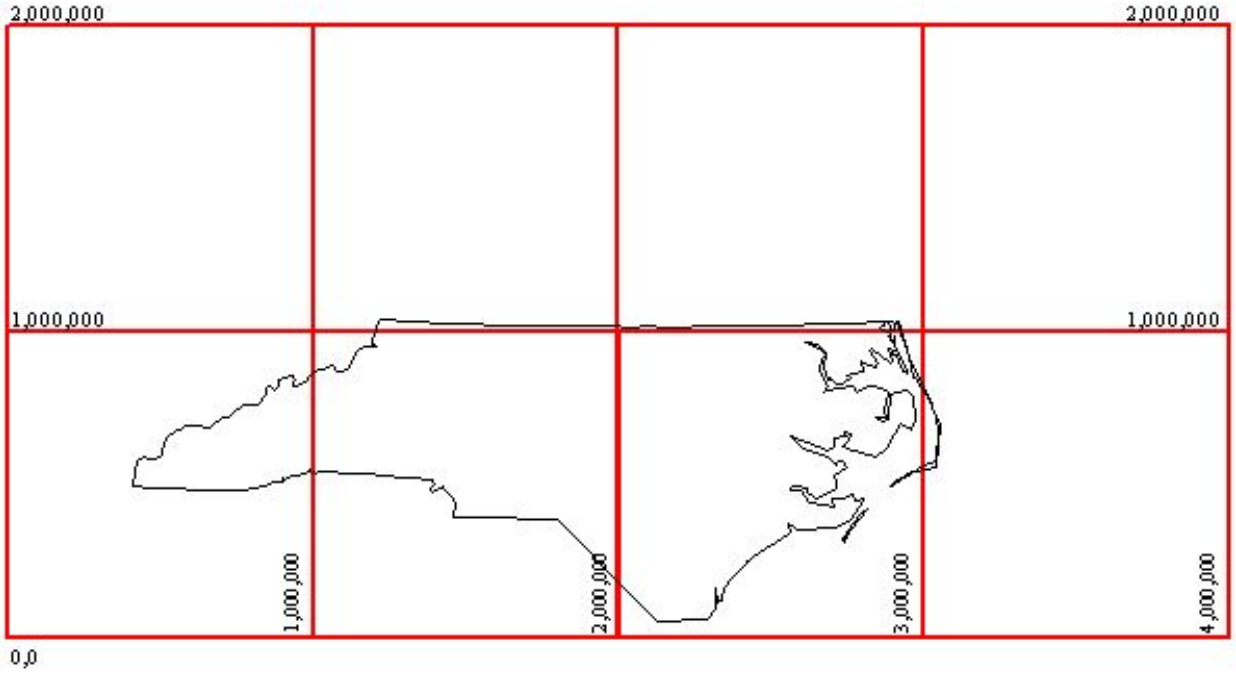

Figure 3 - North Carolina's State Plane Coordinate System

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
Bear Den Branch								
025	2,477	130	605	2.1	37.7[1]	36.1	37.0	1.0
031	3,080	122	506	2.5	37.7[2]	37.4	38.3	0.9
035	3,536	200	784	1.6	38.6	38.6	39.5	0.9
041	4,138	189	1,044	1.2	39.3	39.3	40.2	1.0
046	4,639	164	931	1.3	39.8	39.8	40.7	1.0
052	5,154	186	1,070	1.1	40.3	40.3	41.2	1.0
055	5,492	146	685	1.7	40.6	40.6	41.5	0.9
059	5,937	144	658	1.8	41.4	41.4	42.3	0.9
065	6,479	143	625	1.9	42.2	42.2	43.1	0.9
073	7,298	150	1,043	1.0	46.1	46.1	46.7	0.6
Black River								
828	82,781	3,112	33,031	0.8	19.7[3]	12.5	13.4	0.9
839	83,866	3,100	32,534	0.8	19.7[3]	12.6	13.5	0.9
847	84,697	2,900	32,028	0.8	19.7[2]	12.7	13.6	0.9
858	85,824	2,610	30,394	0.9	19.7[2]	12.8	13.7	0.9
867	86,695	2,575	28,230	1.0	19.7[2]	12.9	13.8	0.9
876	87,589	2,290	24,582	1.1	19.7[2]	13.1	14.0	0.9
883	88,274	2,212	24,410	1.1	19.7[2]	13.2	14.1	0.9
1576	157,623	2,090	25,944	1.0	20.8	20.8	21.8	1.0
1587	158,748	2,075	25,582	1.0	21.0	21.0	22.0	1.0
1605	160,547	2,750	36,947	0.7	21.2	21.2	22.2	1.0
1628	162,798	2,230	29,566	0.9	21.4	21.4	22.4	1.0
1642	164,247	2,565	32,496	0.8	21.5	21.5	22.5	1.0
1657	165,667	2,150	28,609	0.9	21.7	21.7	22.7	1.0
1665	166,464	2,050	27,226	1.0	21.8	21.8	22.8	1.0
1672	167,180	1,750	22,741	1.2	21.8	21.8	22.8	1.0
1684	168,374	2,000	23,676	1.1	22.0	22.0	23.0	1.0
1696	169,624	1,890	20,715	1.3	22.2	22.2	23.2	1.0
1721	172,114	1,775	20,920	1.3	22.6	22.6	23.6	1.0

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
1788	178,788	1,875	22,975	1.2	24.2	24.2	25.2	0.9
1797	179,674	2,050	27,779	1.0	24.4	24.4	25.4	1.0
Bull Branch								
001	119	220	817	1.5	40.5[4]	38.4	39.4	1.0
007	668	163	505	2.4	40.7[4]	40.4	41.3	1.0
010	1,044	174	847	1.5	41.8	41.8	42.8	1.0
015	1,549	229	1,028	1.2	42.6	42.6	43.6	1.0
019	1,888	44	161	7.7	43.2	43.2	43.8	0.6
024	2,431	93	583	2.1	46.9	46.9	47.5	0.6
028	2,786	167	955	1.3	47.2	47.2	48.1	0.9
031	3,124	163	885	1.4	47.5	47.5	48.4	0.9
037	3,651	134	738	1.7	48.0	48.0	49.0	1.0
040	4,001	115	674	1.8	48.4	48.4	49.4	1.0
047	4,731	196	1,233	0.9	51.5	51.5	52.0	0.6
050	5,042	189	1,128	1.0	51.6	51.6	52.2	0.6
053	5,322	179	823	1.4	51.7	51.7	52.4	0.6
056	5,569	233	1,047	1.1	51.9	51.9	52.6	0.7
059	5,940	223	1,011	1.1	52.2	52.2	52.9	0.7
064	6,368	268	1,321	0.9	52.4	52.4	53.1	0.7
067	6,650	218	1,114	1.0	52.5	52.5	53.3	0.8
071	7,121	152	784	1.4	52.9	52.9	53.7	0.8
075	7,539	124	624	1.8	53.4	53.4	54.3	0.9
078	7,786	210	1,097	1.0	53.7	53.7	54.6	0.9
081	8,092	155	767	1.5	53.9	53.9	54.8	0.9
084	8,380	107	556	2.0	54.4	54.4	55.3	0.9
088	8,779	120	583	1.5	55.0	55.0	56.0	0.9
094	9,441	113	523	1.7	55.8	55.8	56.8	0.9
099	9,914	90	456	1.9	56.5	56.5	57.4	0.9
101	10,110	110	404	2.2	56.8	56.8	57.7	0.9
104	10,436	146	832	1.0	60.0	60.0	61.0	1.0
108	10,754	115	579	1.5	60.3	60.3	61.3	1.0
113	11,280	118	563	1.6	61.0	61.0	62.0	1.0
Bulltail Creek								
004	363	220	839	1.4	49.4[1]	47.4	48.1	0.7
008	813	185	664	1.8	49.5[1]	47.9	48.6	0.7
014	1,449	220	722	1.7	49.5[2]	49.4	49.7	0.4
026	2,639	240	866	1.4	51.0	51.0	51.5	0.4
035	3,539	218	989	1.2	52.1	52.1	52.7	0.6
042	4,198	156	740	1.6	52.9	52.9	53.6	0.7
049	4,916	162	722	1.7	54.1	54.1	55.0	0.9
057	5,666	137	674	1.8	55.4	55.4	56.4	0.9
064	6,421	112	612	2.0	56.7	56.7	57.6	0.9
069	6,891	85	523	1.6	57.4	57.4	58.3	0.9
072	7,244	62	345	2.5	57.7	57.7	58.6	0.9
078	7,768	110	537	1.6	58.4	58.4	59.3	0.8

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
087	8,680	150	907	0.9	62.3	62.3	63.0	0.8
095	9,489	170	703	1.2	62.7	62.7	63.6	0.9
102	10,186	134	592	1.4	63.6	63.6	64.6	1.0
109	10,867	130	533	1.6	64.9	64.9	65.9	1.0
113	11,254	96	347	1.7	65.8	65.8	66.7	1.0
Burgaw Creek								
060	5,992	140	1,651	2.6	15.8[2]	10.2	11.2	1.0
064	6,436	440	3,946	1.1	15.8[2]	10.5	11.5	1.0
070	7,002	80	1,150	3.8	15.8[2]	10.6	11.6	1.0
075	7,496	125	1,652	2.6	15.8[2]	10.9	11.9	1.0
080	8,028	80	1,302	3.3	15.8[2]	11.1	12.1	1.0
085	8,499	80	1,341	3.2	15.8[2]	11.3	12.2	1.0
089	8,926	220	2,407	1.8	15.8[2]	11.5	12.5	1.0
092	9,180	220	2,517	1.7	15.8[2]	11.6	12.5	1.0
095	9,486	100	1,600	2.7	15.8[2]	11.6	12.6	1.0
110	10,999	100	1,567	2.8	15.8[2]	12.0	12.9	1.0
115	11,497	110	1,395	3.1	15.8[2]	12.1	13.0	0.9
120	12,002	150	1,781	2.4	15.8[2]	12.3	13.3	1.0
123	12,250	175	2,110	2.1	15.8[2]	12.4	13.4	1.0
125	12,498	220	2,621	1.7	15.8[2]	12.5	13.4	0.9
131	13,102	300	3,168	1.4	15.8[2]	12.6	13.6	1.0
135	13,488	225	2,502	1.7	15.8[2]	12.7	13.7	1.0
147	14,685	270	3,228	1.3	15.8[2]	13.3	14.1	0.9
150	15,015	280	3,447	1.3	15.8[2]	13.4	14.2	0.9
156	15,562	350	4,566	1.0	15.8[2]	13.5	14.4	0.9
160	16,025	525	6,876	0.6	15.8[2]	13.5	14.5	1.0
165	16,493	700	7,678	0.6	15.8[2]	13.6	14.5	1.0
171	17,126	850	9,005	0.5	15.8[2]	13.6	14.6	1.0
177	17,687	933	10,720	0.4	15.8[2]	13.6	14.6	1.0
182	18,157	800	7,729	0.5	15.8[2]	13.6	14.6	1.0
187	18,659	700	7,804	0.5	15.8[2]	13.7	14.7	1.0
191	19,139	560	6,141	0.7	15.8[2]	13.7	14.7	1.0
196	19,644	630	7,061	0.6	15.8[2]	13.8	14.8	1.0
201	20,069	530	5,809	0.7	15.8[2]	13.8	14.8	1.0
207	20,661	525	5,696	0.7	15.8[2]	13.9	14.9	1.0
212	21,166	650	6,397	0.6	15.8[2]	13.9	14.9	1.0
217	21,669	600	5,380	0.8	15.8[2]	14.0	15.0	1.0
221	22,104	480	4,707	0.9	15.8[2]	14.1	15.0	1.0
227	22,689	300	2,704	1.5	15.8[2]	14.2	15.2	1.0
236	23,649	450	4,572	0.9	15.8[2]	14.5	15.4	1.0
241	24,130	520	4,672	0.9	15.8[2]	14.5	15.5	1.0
246	24,649	610	5,045	0.8	15.8[2]	14.6	15.6	1.0
252	25,237	540	4,595	0.9	15.8[2]	14.8	15.8	1.0
257	25,651	560	4,690	0.9	15.8[2]	15.0	15.9	1.0
262	26,159	740	5,734	0.7	15.8[2]	15.2	16.1	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
265	26,459	720	5,769	0.7	15.8[2]	15.2	16.2	0.9
271	27,135	750	5,637	0.7	15.8[2]	15.5	16.4	0.9
277	27,658	630	4,362	0.9	15.8[2]	15.6	16.6	0.9
283	28,305	529	3,646	1.1	16.1	16.1	17.0	1.0
287	28,654	570	4,134	1.0	16.3	16.3	17.3	1.0
292	29,160	480	3,684	1.1	16.6	16.6	17.6	1.0
297	29,671	510	3,832	1.1	17.0	17.0	18.0	1.0
301	30,150	600	4,491	0.9	17.3	17.3	18.3	1.0
306	30,632	480	3,518	1.1	17.6	17.6	18.6	1.0
311	31,148	430	3,274	1.1	18.0	18.0	19.0	1.0
316	31,617	520	4,052	0.9	18.4	18.4	19.3	0.9
322	32,162	520	3,688	1.0	18.7	18.7	19.6	0.9
326	32,611	570	4,033	0.9	19.0	19.0	19.9	0.9
329	32,923	660	4,512	0.8	19.2	19.2	20.1	0.9
336	33,568	600	4,287	0.9	19.5	19.5	20.4	0.9
343	34,273	630	4,398	0.9	19.8	19.8	20.7	0.9
347	34,665	550	3,793	1.0	20.0	20.0	20.9	0.9
352	35,163	254	1,924	1.9	20.1	20.1	21.1	0.9
359	35,889	608	5,013	0.7	21.5	21.5	22.4	0.9
366	36,632	840	5,784	0.6	21.6	21.6	22.6	0.9
376	37,562	680	4,626	0.8	21.8	21.8	22.8	0.9
383	38,343	680	3,988	0.9	22.1	22.1	23.1	1.0
393	39,259	640	4,877	0.8	22.6	22.6	23.4	0.8
402	40,161	600	4,137	0.9	22.9	22.9	23.7	0.8
411	41,143	550	3,792	1.0	23.4	23.4	24.1	0.7
422	42,191	930	6,156	0.6	23.6	23.6	24.4	0.8
443	44,343	1,831	10,234	0.3	25.7	25.7	26.7	0.9
450	44,977	1,968	10,435	0.3	25.8	25.8	26.7	0.9
464	46,374	2,102	8,359	0.4	26.0	26.0	26.8	0.8
475	47,547	1,702	6,837	0.5	26.4	26.4	27.1	0.7
487	48,660	1,195	4,265	0.7	27.2	27.2	27.5	0.4
498	49,762	1,361	4,887	0.6	28.0	28.0	28.2	0.2
507	50,691	1,215	4,526	0.7	28.5	28.5	28.7	0.2
516	51,633	1,109	3,786	0.8	29.1	29.1	29.3	0.2
526	52,625	1,286	4,171	0.7	30.0	30.0	30.1	0.1
533	53,262	1,029	4,515	0.7	30.4	30.4	30.6	0.2
551	55,082	494	2,191	0.8	31.4	31.4	31.5	0.2
556	55,627	682	2,431	0.7	31.6	31.6	31.8	0.2
561	56,126	524	1,787	0.9	31.8	31.8	32.1	0.3
566	56,629	279	1,067	1.6	32.1	32.1	32.6	0.4
572	57,174	279	1,039	1.6	32.8	32.8	33.5	0.7
577	57,671	279	905	1.8	34.2	34.2	34.7	0.5
583	58,255	351	1,083	1.5	35.3	35.3	36.0	0.7
587	58,695	178	663	2.1	36.0	36.0	36.9	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
597	59,750	215	1,002	1.3	37.9	37.9	38.8	1.0
601	60,147	200	645	2.0	38.7	38.7	39.4	0.7
606	60,623	200	670	2.0	40.1	40.1	40.5	0.4
612	61,154	110	497	2.6	41.2	41.2	41.6	0.4
622	62,170	140	429	3.1	42.2	42.2	43.0	0.8
631	63,148	345	1,079	1.2	47.7	47.7	48.7	1.0
637	63,672	383	932	1.2	48.1	48.1	48.8	0.7
642	64,153	417	1,156	1.1	48.7	48.7	49.2	0.5
646	64,638	350	1,111	0.8	49.1	49.1	49.5	0.4
652	65,155	365	808	1.1	49.2	49.2	49.7	0.6
657	65,651	286	654	1.4	49.7	49.7	50.1	0.4
667	66,665	454	984	0.9	50.8	50.8	51.3	0.6
671	67,127	454	1,191	0.7	50.9	50.9	51.7	0.8
680	67,953	454	907	1.0	51.2	51.2	52.2	1.0
Buxton Branch								
004	432	870	2,808	0.6	27.7[1]	23.0	23.6	0.6
012	1,155	550	1,429	1.2	27.7[1]	23.7	24.3	0.6
019	1,896	285	1,167	1.4	27.7[2]	24.9	25.4	0.5
025	2,451	295	711	2.4	27.7[2]	26.0	26.4	0.4
029	2,919	390	1,234	1.4	27.7[2]	26.8	27.2	0.4
040	4,005	90	442	3.1	28.5	28.5	28.7	0.2
044	4,424	81	374	3.7	29.0	29.0	29.4	0.4
050	4,982	140	588	2.3	30.6	30.6	31.0	0.4
056	5,648	205	927	1.5	31.3	31.3	32.2	0.8
064	6,362	215	943	1.4	32.7	32.7	33.6	0.9
070	6,995	245	1,129	1.2	33.7	33.7	34.7	0.9
077	7,664	226	908	1.5	34.3	34.3	35.3	1.0
083	8,260	129	577	1.3	35.3	35.3	36.3	1.0
086	8,645	98	388	1.8	36.0	36.0	37.0	1.0
090	8,997	70	303	2.3	37.1	37.1	38.0	0.9
094	9,365	82	233	3.0	38.9	38.9	39.7	0.8
098	9,758	96	476	1.5	40.7	40.7	41.4	0.7
101	10,095	98	458	1.6	41.2	41.2	42.0	0.8
105	10,480	85	425	1.7	42.0	42.0	42.8	0.8
108	10,803	82	397	1.8	42.7	42.7	43.5	0.8
112	11,210	68	325	1.7	43.4	43.4	44.5	1.0
118	11,808	66	340	1.6	45.3	45.3	45.9	0.6
121	12,064	53	247	2.3	45.8	45.8	46.4	0.7
123	12,252	68	280	2.0	46.3	46.3	47.1	0.8
125	12,537	80	283	2.0	47.2	47.2	48.1	0.9
Cape Fear River								
2098	209,758	5,970	68,080	1.9	12.6	12.6	13.1	0.5
2146	214,635	7,402	100,789	1.3	14.6	14.6	15.2	0.7
2173	217,280	9,750	145,485	0.9	15.4	15.4	16.1	0.7
2203	220,350	11,018	163,374	0.8	15.6	15.6	16.4	0.8

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
2250	225,030	13,000	194,696	0.7	15.9	15.9	16.6	0.8
2277	227,726	12,450	189,274	0.7	16.2	16.2	17.0	0.8
2307	230,716	13,350	207,215	0.6	16.4	16.4	17.3	0.8
2364	236,426	14,300	210,693	0.6	16.8	16.8	17.7	0.9
2398	239,795	14,650	228,202	0.6	17.0	17.0	17.9	0.9
2447	244,703	9,650	146,302	0.8	17.4	17.4	18.4	1.0
2474	247,353	9,400	138,300	0.9	17.7	17.7	18.7	1.0
2503	250,344	11,019	162,227	0.8	18.2	18.2	19.1	0.9
2532	253,224	11,450	163,472	0.8	18.5	18.5	19.4	0.9
2575	257,474	14,409	201,467	0.6	18.8	18.8	19.7	0.9
2622	262,212	16,560	224,668	0.6	19.0	19.0	19.9	0.9
2687	268,665	18,550	236,563	0.5	19.3	19.3	20.1	0.9
2732	273,180	19,610	259,889	0.5	19.4	19.4	20.3	0.9
2764	276,361	19,200	238,808	0.5	19.6	19.6	20.4	0.8
2792	279,155	19,050	209,406	0.6	19.8	19.8	20.7	0.8
2825	282,482	17,350	144,986	0.8	20.2	20.2	21.0	0.8
2858	285,774	16,750	157,070	0.8	20.7	20.7	21.5	0.8
2914	291,382	17,000	179,538	0.7	21.2	21.2	22.0	0.8
2951	295,119	15,350	149,759	0.8	21.6	21.6	22.4	0.8
2983	298,261	14,230	135,647	0.9	21.9	21.9	22.7	0.8
3018	301,816	12,670	111,764	1.1	22.3	22.3	23.2	0.9
3038	303,846	11,910	116,387	1.1	22.6	22.6	23.6	1.0
Colvins Creek								
293	29,268	198	1,258	1.8	36.1	36.1	36.9	0.8
302	30,219	150	839	2.7	36.6	36.6	37.5	0.9
309	30,904	205	1,031	2.2	37.2	37.2	38.2	0.9
313	31,332	300	1,546	1.5	37.6	37.6	38.6	0.9
318	31,831	210	1,117	2.1	37.9	37.9	38.8	0.9
328	32,847	80	587	2.8	38.7	38.7	39.6	0.9
333	33,323	80	581	2.8	39.0	39.0	39.8	0.8
338	33,796	80	546	3.0	39.2	39.2	40.0	0.8
344	34,350	80	514	3.2	39.6	39.6	40.4	0.8
349	34,861	80	429	3.8	40.0	40.0	40.8	0.7
353	35,330	80	440	3.7	40.7	40.7	41.3	0.6
358	35,799	81	436	3.8	41.2	41.2	41.9	0.6
363	36,265	80	435	3.8	41.8	41.8	42.6	0.8
368	36,799	80	434	3.5	42.5	42.5	43.3	0.8
373	37,278	81	473	3.2	43.0	43.0	43.8	0.8
378	37,777	105	611	2.5	43.4	43.4	44.3	0.9
383	38,323	94	509	3.0	43.8	43.8	44.7	0.9
390	38,970	110	571	2.7	44.4	44.4	45.4	1.0
395	39,470	113	525	2.9	45.0	45.0	45.9	1.0
400	39,986	180	784	2.0	45.7	45.7	46.6	0.9
410	41,006	200	1,038	1.5	49.1	49.1	49.8	0.7
416	41,562	260	1,208	1.3	49.6	49.6	50.4	0.8

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
420	42,041	310	1,312	1.0	50.2	50.2	51.0	0.9
425	42,541	290	1,265	1.0	50.6	50.6	51.6	1.0
430	43,041	245	941	1.4	51.4	51.4	52.4	1.0
435	43,513	232	483	2.7	53.3	53.3	54.0	0.6
440	44,042	395	1,314	1.0	55.2	55.2	56.2	1.0
445	44,541	280	1,267	1.0	55.9	55.9	56.8	0.9
451	45,065	235	981	1.3	56.5	56.5	57.4	0.9
455	45,472	205	962	1.4	57.2	57.2	58.1	0.9
460	46,041	131	680	1.9	58.4	58.4	59.2	0.8
465	46,505	150	761	1.7	59.3	59.3	60.2	1.0
471	47,079	269	1,565	0.6	60.1	60.1	61.1	1.0
Crooked Run								
002	231	292	1,400	1.0	49.8[2]	49.2	50.2	1.0
005	511	190	895	1.5	49.8[2]	49.4	50.4	1.0
010	1,000	195	995	1.3	50.0	50.0	51.0	1.0
015	1,500	196	1,003	1.3	50.4	50.4	51.4	1.0
020	2,000	173	783	1.7	51.0	51.0	52.0	1.0
024	2,366	191	774	1.7	51.6	51.6	52.5	1.0
031	3,127	268	1,444	0.9	53.3	53.3	54.0	0.7
035	3,500	287	1,533	0.9	53.4	53.4	54.1	0.7
040	4,000	163	806	1.6	53.6	53.6	54.4	0.7
044	4,406	276	1,212	1.1	54.0	54.0	54.8	0.8
049	4,900	227	1,081	1.2	54.5	54.5	55.2	0.6
055	5,500	205	1,232	0.9	55.0	55.0	55.7	0.7
060	6,000	175	1,037	1.1	55.2	55.2	56.0	0.8
065	6,500	229	1,093	1.0	55.6	55.6	56.4	0.8
070	7,000	242	1,069	1.0	56.0	56.0	56.9	0.9
073	7,280	177	641	1.7	56.4	56.4	57.3	0.9
075	7,500	208	999	1.1	56.9	56.9	57.8	1.0
085	8,500	333	1,820	0.4	59.5	59.5	59.9	0.4
090	9,000	272	994	0.8	59.5	59.5	59.9	0.4
096	9,556	152	370	2.2	59.7	59.7	60.2	0.5
100	10,000	119	324	2.5	60.5	60.5	61.4	0.9
105	10,500	127	294	2.7	62.1	62.1	63.1	1.0
112	11,165	210	470	1.7	63.7	63.7	64.6	0.9
Doctors Creek								
124	12,430	2,059	7,903	0.5	49.9	49.9	50.9	1.0
128	12,784	630	2,815	2.0	41.3	41.3	42.3	1.0
132	13,220	1,172	5,015	0.8	50.2	50.2	51.2	1.0
134	13,431	540	2,873	2.0	42.3	42.3	43.3	1.0
140	14,028	500	3,151	1.8	43.1	43.1	44.0	1.0
155	15,453	900	4,970	1.1	44.1	44.1	45.0	0.9
168	16,771	600	3,684	1.5	44.9	44.9	45.8	0.9
179	17,877	975	6,041	0.9	45.5	45.5	46.4	0.9
181	18,082	900	5,094	1.1	45.6	45.6	46.5	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
190	19,036	1,100	5,895	0.9	46.0	46.0	46.9	1.0
197	19,706	1,140	6,213	0.9	46.2	46.2	47.2	1.0
208	20,806	1,325	5,425	1.0	46.6	46.6	47.6	1.0
216	21,595	1,220	6,125	0.9	47.2	47.2	48.2	1.0
225	22,521	1,110	6,449	0.8	47.8	47.8	48.8	1.0
227	22,700	1,095	6,404	0.8	47.9	47.9	48.9	1.0
Dry Branch								
005	493	215	841	1.3	43.9[2]	43.1	43.6	0.5
010	1,000	175	930	1.2	43.9[2]	43.7	44.2	0.5
015	1,541	205	843	1.3	44.2	44.2	44.7	0.5
018	1,792	126	555	2.0	44.4	44.4	44.9	0.5
028	2,758	262	1,795	0.6	49.5	49.5	50.0	0.5
Guffords Branch								
003	346	145	481	1.8	9.9[5]	6.9	7.9	1.0
010	950	115	347	2.4	10.3[5]	8.6	9.5	0.9
016	1,598	100	506	1.7	12.0	12.0	12.7	0.7
020	2,023	94	455	1.8	12.5	12.5	13.5	1.0
024	2,402	124	567	1.5	13.3	13.3	14.3	1.0
027	2,737	124	431	1.7	14.1	14.1	15.0	0.9
032	3,184	114	389	1.9	15.4	15.4	16.3	0.8
037	3,661	100	401	1.9	17.1	17.1	17.9	0.8
041	4,094	110	484	1.5	18.2	18.2	19.1	0.9
045	4,505	100	419	1.4	19.0	19.0	19.9	0.9
052	5,215	85	380	1.6	21.5	21.5	22.3	0.8
057	5,717	113	408	1.4	22.1	22.1	23.1	1.0
061	6,080	87	364	1.6	23.0	23.0	24.0	1.0
064	6,366	*	*	*	23.9	23.9	*	*
Horse Branch Creek								
005	500	278	1,493	1.5	36.5[2]	34.8	35.7	1.0
010	1,000	329	1,693	1.3	36.5[2]	35.2	36.1	1.0
015	1,500	288	1,559	1.4	36.5[2]	35.5	36.5	1.0
020	2,000	475	2,675	0.8	36.5[2]	35.8	36.8	1.0
025	2,500	427	2,043	1.0	36.5[2]	36.0	37.0	1.0
030	3,000	421	2,058	1.0	36.5[2]	36.4	37.3	1.0
036	3,550	279	2,022	1.1	36.6	36.6	37.6	1.0
045	4,500	235	1,154	1.9	37.4	37.4	38.4	1.0
050	5,000	409	1,559	1.4	38.1	38.1	39.1	1.0
055	5,500	342	1,627	1.3	38.6	38.6	39.6	1.0
059	5,914	347	1,369	1.6	38.9	38.9	39.9	1.0
066	6,594	251	1,391	1.5	39.7	39.7	40.6	1.0
070	7,000	233	1,098	1.8	40.0	40.0	41.0	1.0
075	7,500	236	1,593	1.3	40.6	40.6	41.5	1.0
080	8,000	273	1,862	1.1	40.8	40.8	41.8	1.0
085	8,500	252	1,529	1.3	41.1	41.1	42.1	1.0
090	9,000	289	1,837	1.1	41.5	41.5	42.4	1.0

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
095	9,500	374	2,262	0.9	41.7	41.7	42.7	1.0
099	9,945	284	1,747	1.2	42.0	42.0	43.0	1.0
105	10,476	260	1,528	1.3	42.4	42.4	43.3	1.0
109	10,949	280	1,383	1.5	42.8	42.8	43.8	1.0
115	11,500	366	2,149	0.9	43.2	43.2	44.2	1.0
120	12,000	351	2,143	0.9	43.4	43.4	44.4	1.0
125	12,496	307	1,641	1.1	43.7	43.7	44.7	1.0
135	13,500	294	1,698	1.0	44.3	44.3	45.3	1.0
140	14,000	268	1,714	1.0	44.6	44.6	45.6	1.0
146	14,634	292	1,520	1.2	44.9	44.9	45.9	1.0
150	15,000	289	1,339	1.3	45.0	45.0	46.0	1.0
155	15,500	290	1,392	1.3	45.5	45.5	46.4	1.0
160	16,000	309	1,746	1.0	45.8	45.8	46.8	1.0
164	16,375	287	1,411	1.2	46.0	46.0	47.0	1.0
167	16,681	358	1,965	0.9	46.3	46.3	47.3	1.0
175	17,500	389	1,698	0.9	46.7	46.7	47.7	1.0
180	18,047	247	1,279	1.2	47.1	47.1	48.0	1.0
185	18,500	255	1,346	1.1	47.3	47.3	48.3	1.0
195	19,500	207	1,044	1.2	48.5	48.5	49.1	0.6
200	20,000	180	915	1.4	48.8	48.8	49.5	0.7
205	20,500	146	671	1.5	49.2	49.2	49.9	0.8
210	21,000	105	496	1.8	49.6	49.6	50.4	0.8
215	21,500	96	455	2.0	50.0	50.0	50.9	1.0
220	22,000	76	374	2.5	50.5	50.5	51.4	0.9
223	22,302	44	332	2.8	50.8	50.8	51.7	0.9
235	23,490	365	3,385	0.3	58.2	58.2	58.4	0.2
240	24,000	321	3,537	0.3	58.2	58.2	58.4	0.2
245	24,500	267	2,589	0.4	58.2	58.2	58.4	0.2
252	25,195	127	1,084	0.4	58.2	58.2	58.4	0.2
260	26,012	85	416	1.0	58.2	58.2	58.4	0.2
265	26,500	94	398	1.0	58.3	58.3	58.5	0.2
Island Creek								
013	1,303	800	1,991	3.5	8.4[6]	8.4	2.3	-6.1
075	7,481	950	4,456	2.4	8.4[6]	8.4	4.6	-3.8
124	12,424	800	4,195	2.5	8.4[2]	8.4	6.2	-2.2
165	16,472	750	3,545	2.7	8.4	8.4	7.5	-0.9
186	18,640	620	3,673	2.2	8.4	8.4	7.9	-0.5
201	20,113	546	3,478	1.8	8.4	8.4	8.2	-0.2
211	21,086	550	3,320	1.2	8.4	8.4	8.3	-0.1
215	21,530	294	1,725	3.4	8.4	8.4	8.6	0.2
227	22,691	430	2,688	2.2	8.4	8.4	9.3	0.9
242	24,215	399	2,430	2.5	9.1	9.1	10.0	0.9
Jones Creek								
007	727	60	366	4.3	38.3[2]	38.2	38.6	0.4
015	1,500	84	441	3.6	39.6	39.6	40.0	0.4

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
019	1,942	69	347	4.5	40.4	40.4	41.0	0.6
030	3,000	99	412	3.8	43.2	43.2	44.2	1.0
034	3,434	159	814	1.9	44.3	44.3	45.2	0.9
039	3,921	162	855	1.8	44.8	44.8	45.8	1.0
045	4,491	112	566	2.8	45.6	45.6	46.5	0.9
050	5,000	129	678	2.3	46.5	46.5	47.4	0.9
055	5,500	108	594	2.7	47.2	47.2	48.0	0.9
059	5,856	129	732	2.2	47.6	47.6	48.5	0.9
063	6,288	132	710	2.2	48.0	48.0	48.9	1.0
070	7,000	95	524	2.9	49.0	49.0	49.9	0.9
080	8,024	484	5,105	0.2	59.1	59.1	59.1	0.0
086	8,553	313	3,020	0.4	59.1	59.1	59.1	0.0
090	8,958	305	2,662	0.5	59.1	59.1	59.1	0.0
093	9,263	400	813	1.6	59.1	59.1	59.1	0.0
094	9,394	481	4,294	0.3	59.1	59.1	59.2	0.0
096	9,594	291	2,530	0.5	59.1	59.1	59.2	0.0
101	10,051	355	2,856	0.4	59.1	59.1	59.2	0.0
104	10,445	298	1,959	0.7	59.2	59.2	59.2	0.0
111	11,064	107	581	2.0	59.2	59.2	59.2	0.0
115	11,457	135	763	1.5	59.4	59.4	59.5	0.2
120	12,045	153	735	1.6	59.8	59.8	60.4	0.6
125	12,501	178	822	1.4	60.2	60.2	61.2	0.9
130	13,003	156	634	1.8	61.4	61.4	62.3	1.0
138	13,801	168	827	1.4	63.8	63.8	64.7	0.9
142	14,239	196	1,082	1.1	64.3	64.3	65.2	0.9
147	14,669	177	932	1.2	64.7	64.7	65.7	1.0
151	15,051	204	1,028	1.1	65.1	65.1	66.1	1.0
154	15,429	133	646	1.4	65.6	65.6	66.5	1.0
157	15,714	113	614	1.5	66.1	66.1	67.1	1.0
Lewis Creek								
013	1,305	82	682	2.9	22.6[6]	14.6	14.7	0.1
026	2,596	155	1,128	1.8	22.6[6]	15.6	16.0	0.4
033	3,304	100	676	2.9	22.8[2]	15.9	16.7	0.8
039	3,898	122	855	2.3	22.8[2]	17.6	18.0	0.4
045	4,517	190	1,439	1.4	22.8[2]	18.2	18.6	0.4
050	5,001	140	1,198	1.6	22.8[2]	18.4	18.9	0.5
055	5,469	160	958	2.1	22.8[2]	18.8	19.3	0.5
063	6,344	205	1,063	1.9	22.8[2]	19.9	20.5	0.5
072	7,201	220	1,169	1.7	22.8[2]	20.7	21.4	0.7
078	7,810	185	1,052	1.9	22.8[2]	21.4	22.1	0.7
083	8,256	185	1,148	1.7	22.8[2]	22.0	22.7	0.7
087	8,727	190	1,010	1.9	22.8[2]	22.4	23.2	0.8
094	9,351	190	1,120	1.7	23.3	23.3	24.1	0.8
100	10,014	175	937	2.0	24.1	24.1	24.9	0.8
110	11,041	260	1,643	1.1	26.6	26.6	27.4	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
117	11,738	237	1,525	1.2	27.0	27.0	28.0	1.0
123	12,342	280	1,611	1.1	27.5	27.5	28.5	0.9
129	12,882	263	1,542	1.2	28.0	28.0	29.0	1.0
135	13,541	238	1,308	1.4	28.8	28.8	29.8	1.0
141	14,095	171	863	1.9	29.9	29.9	30.8	0.9
146	14,567	200	1,032	1.6	31.0	31.0	31.9	0.9
153	15,329	244	1,550	1.1	31.5	31.5	32.5	1.0
160	16,025	325	1,866	0.9	31.9	31.9	32.9	1.0
168	16,830	215	618	2.7	32.3	32.3	33.3	0.9
173	17,319	320	1,537	1.1	34.0	34.0	34.6	0.6
185	18,481	280	3,000	0.6	40.4	40.4	41.3	0.9
189	18,855	185	1,948	0.8	40.4	40.4	41.3	0.9
Long Creek								
190	19,010	2,614	21,268	0.5	8.3	8.3	7.8	-0.5
195	19,497	2,373	19,474	0.5	8.3	8.3	7.9	-0.5
199	19,879	2,790	20,892	0.5	8.3	8.3	7.9	-0.4
205	20,548	2,498	18,557	0.5	8.3	8.3	7.9	-0.4
210	20,992	2,722	21,014	0.5	8.4	8.4	8.0	-0.4
218	21,812	2,949	22,162	0.5	8.4	8.4	8.0	-0.4
225	22,487	2,992	22,224	0.5	8.4	8.4	8.1	-0.3
231	23,061	2,774	21,893	0.5	8.4	8.4	8.1	-0.3
235	23,486	2,740	22,253	0.5	8.4	8.4	8.1	-0.3
240	24,034	2,458	20,467	0.5	8.4	8.4	8.2	-0.3
246	24,615	2,510	21,952	0.5	8.4	8.4	8.2	-0.3
250	24,972	2,193	20,258	1.3	8.5	8.5	8.2	-0.3
258	25,787	1,888	17,191	1.4	8.5	8.5	8.2	-0.3
265	26,529	1,893	17,584	0.6	8.5	8.5	8.2	-0.2
270	27,013	1,897	17,099	0.6	8.5	8.5	8.3	-0.2
287	28,702	1,768	16,731	0.6	8.5	8.5	8.3	-0.2
289	28,897	1,837	16,331	0.6	8.5	8.5	8.3	-0.2
296	29,585	1,835	16,364	0.6	8.6	8.6	8.4	-0.2
301	30,142	1,771	15,247	0.7	8.6	8.6	8.4	-0.1
312	31,174	1,739	15,431	0.6	8.6	8.6	8.5	-0.1
316	31,572	2,112	18,011	0.6	8.6	8.6	8.6	-0.1
326	32,592	1,932	16,899	0.6	8.7	8.7	8.6	-0.1
332	33,170	1,833	16,863	0.6	8.7	8.7	8.6	0.0
344	34,415	1,821	16,868	0.6	8.7	8.7	8.7	0.0
349	34,902	2,333	20,132	0.5	8.7	8.7	8.7	0.0
355	35,521	2,411	21,694	0.5	8.7	8.7	8.8	0.0
359	35,947	2,611	22,693	0.4	8.8	8.8	8.8	0.0
365	36,546	2,049	18,222	0.5	8.8	8.8	8.8	0.0
373	37,344	2,080	18,300	0.5	8.8	8.8	8.9	0.1
380	37,995	2,185	19,639	0.5	8.8	8.8	8.9	0.1
385	38,516	2,423	20,020	0.5	8.8	8.8	9.0	0.1
390	39,016	2,321	20,634	0.5	8.9	8.9	9.0	0.1

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
395	39,518	2,177	19,421	0.5	8.9	8.9	9.0	0.1
400	40,008	2,162	17,923	0.5	8.9	8.9	9.0	0.2
405	40,462	2,348	18,810	0.5	8.9	8.9	9.1	0.2
410	41,024	2,259	18,378	0.5	8.9	8.9	9.1	0.2
421	42,055	2,125	18,247	0.5	9.0	9.0	9.2	0.2
430	43,024	1,983	17,744	0.6	9.0	9.0	9.3	0.3
445	44,458	1,813	15,707	0.6	9.1	9.1	9.4	0.3
450	44,978	1,911	16,891	0.6	9.2	9.2	9.5	0.3
468	46,811	1,943	17,759	0.5	9.3	9.3	9.7	0.4
480	48,036	2,121	19,544	0.5	9.3	9.3	9.8	0.4
485	48,509	2,328	20,824	0.5	9.4	9.4	9.8	0.5
490	48,999	2,206	20,177	0.5	9.4	9.4	9.8	0.5
500	49,981	1,772	16,295	0.6	9.4	9.4	9.9	0.5
506	50,597	1,968	18,704	1.5	9.4	9.4	9.9	0.5
515	51,491	1,653	14,420	0.7	9.5	9.5	10.0	0.5
521	52,071	1,558	14,269	0.7	9.5	9.5	10.0	0.5
529	52,925	1,361	13,082	0.7	9.6	9.6	10.1	0.5
539	53,929	1,738	16,062	0.5	9.6	9.6	10.2	0.5
561	56,150	1,341	12,700	0.6	9.8	9.8	10.3	0.6
575	57,511	1,048	10,637	0.7	9.8	9.8	10.5	0.6
580	58,042	1,475	14,017	1.6	9.9	9.9	10.5	0.6
585	58,502	1,336	12,698	0.6	9.9	9.9	10.6	0.6
589	58,936	1,103	10,703	0.7	10.0	10.0	10.6	0.6
595	59,488	1,307	11,785	0.6	10.0	10.0	10.7	0.7
638	63,789	1,012	11,833	0.6	12.4	12.4	13.2	0.8
1121	112,063	1,200	7,865	0.6	29.8	29.8	30.6	0.8
1140	114,000	747	5,903	0.8	30.3	30.3	31.1	0.8
1153	115,287	760	5,402	0.8	30.6	30.6	31.5	0.9
1170	117,035	766	5,049	0.8	30.9	30.9	31.9	1.0
1180	118,000	758	5,008	0.8	31.1	31.1	32.1	1.0
1187	118,723	695	4,657	0.8	31.3	31.3	32.3	1.0
1200	120,019	651	4,413	0.7	32.2	32.2	33.0	0.8
1207	120,670	411	2,781	1.2	32.3	32.3	33.1	0.8
1214	121,384	420	2,934	1.1	32.5	32.5	33.4	0.9
1220	122,000	450	2,666	1.2	32.8	32.8	33.7	1.0
1229	122,947	375	2,171	1.4	33.4	33.4	34.4	1.0
1238	123,763	545	3,711	0.8	34.0	34.0	34.9	1.0
1242	124,221	586	3,565	0.9	34.1	34.1	35.1	1.0
1246	124,581	449	2,999	1.0	34.3	34.3	35.3	1.0
1254	125,386	359	2,341	1.3	34.8	34.8	35.8	1.0
1262	126,154	512	3,546	0.9	35.2	35.2	36.2	1.0
1274	127,394	351	1,926	1.0	36.6	36.6	37.1	0.6
1281	128,059	316	2,061	0.9	36.7	36.7	37.3	0.6
1289	128,934	313	1,862	1.0	36.9	36.9	37.6	0.7

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
1299	129,893	210	1,059	1.7	37.4	37.4	38.2	0.8
1309	130,876	285	1,562	1.2	38.1	38.1	39.1	1.0
1316	131,633	235	1,026	1.8	38.6	38.6	39.6	1.0
1321	132,073	165	944	1.8	39.0	39.0	40.0	1.0
1328	132,803	137	815	2.0	40.0	40.0	40.8	0.8
1334	133,422	130	637	2.6	40.6	40.6	41.5	0.8
1337	133,718	190	964	1.7	40.9	40.9	41.9	1.0
1345	134,493	112	1,013	1.6	41.4	41.4	42.4	1.0
1350	135,000	110	555	2.2	41.8	41.8	42.7	0.9
1353	135,274	125	589	2.0	42.1	42.1	43.0	0.9
1356	135,605	145	654	1.8	42.6	42.6	43.4	0.8
1361	136,052	150	678	1.8	43.0	43.0	43.8	0.8
1364	136,415	150	545	2.2	43.3	43.3	44.1	0.8
Mill Branch (of Buxton Branch)								
002	170	163	262	2.9	28.3[7]	26.8	27.0	0.3
007	696	90	418	1.8	30.8	30.8	31.5	0.7
009	935	118	496	1.5	31.4	31.4	32.2	0.8
011	1,115	107	448	1.7	31.8	31.8	32.8	0.9
012	1,242	71	320	2.4	32.4	32.4	33.3	0.9
013	1,349	75	209	3.4	33.2	33.2	34.0	0.8
015	1,513	122	447	1.6	34.2	34.2	35.2	1.0
016	1,633	135	473	1.5	34.6	34.6	35.6	1.0
019	1,853	87	389	1.8	35.2	35.2	36.2	1.0
020	2,042	87	378	1.9	35.6	35.6	36.6	1.0
022	2,246	50	239	3.0	35.9	35.9	36.9	1.0
025	2,506	43	207	3.4	36.5	36.5	37.5	1.0
028	2,788	43	219	3.2	37.3	37.3	38.1	0.8
031	3,118	43	217	3.2	37.9	37.9	38.7	0.8
Mill Branch (of Moores Creek)								
007	737	159	752	2.2	20.1[8]	16.1	17.0	0.9
012	1,161	156	755	2.2	21.0[8]	17.3	18.2	0.9
015	1,515	124	579	2.8	21.0[2]	18.3	19.2	0.9
021	2,115	185	778	2.1	21.0[2]	20.1	21.1	1.0
024	2,441	158	806	2.0	21.0[2]	20.9	21.9	1.0
029	2,948	255	1,498	1.1	21.4	21.4	22.4	1.0
035	3,455	194	1,142	1.4	21.8	21.8	22.8	1.0
040	4,000	328	1,747	0.9	22.3	22.3	23.3	1.0
044	4,381	257	1,254	1.3	22.6	22.6	23.6	1.0
048	4,760	179	891	1.8	23.1	23.1	24.1	1.0
058	5,822	165	868	1.9	24.6	24.6	25.6	1.0
063	6,293	150	853	1.8	24.9	24.9	25.9	1.0
068	6,783	150	888	1.8	25.2	25.2	26.1	1.0
072	7,162	95	343	4.5	26.0	26.0	26.7	0.7
075	7,508	56	341	4.6	27.4	27.4	28.0	0.6
080	7,990	53	396	3.9	28.2	28.2	29.1	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
088	8,815	54	468	3.0	29.5	29.5	30.2	0.8
094	9,375	59	404	3.4	30.1	30.1	30.9	0.8
099	9,871	62	345	4.0	31.2	31.2	31.9	0.7
102	10,182	58	320	4.3	32.2	32.2	32.7	0.5
106	10,578	101	367	3.8	33.8	33.8	34.3	0.5
110	10,982	231	916	1.5	35.1	35.1	36.0	0.9
113	11,296	185	826	1.7	35.7	35.7	36.6	0.9
119	11,943	172	790	1.5	37.2	37.2	38.1	0.9
123	12,293	239	1,188	1.0	37.7	37.7	38.7	1.0
125	12,486	143	460	2.6	38.4	38.4	39.3	0.9
128	12,752	201	845	1.4	39.6	39.6	40.6	1.0
131	13,069	247	1,034	1.2	40.2	40.2	41.2	1.0
135	13,469	199	848	1.4	40.9	40.9	41.9	1.0
140	14,000	242	1,022	1.2	42.0	42.0	43.0	1.0
146	14,620	179	684	1.8	43.4	43.4	44.4	1.0
151	15,099	139	421	2.3	45.3	45.3	46.1	0.8
156	15,566	148	610	1.6	46.5	46.5	47.4	0.8
159	15,940	125	602	1.6	47.1	47.1	48.0	0.9
165	16,463	133	606	1.6	47.9	47.9	48.9	1.0
170	17,000	73	315	2.4	48.8	48.8	49.8	1.0
182	18,158	144	740	1.0	52.5	52.5	53.2	0.7
185	18,500	165	667	1.2	52.8	52.8	53.6	0.7
190	19,000	106	434	1.8	54.1	54.1	54.9	0.9
196	19,596	97	281	2.2	56.1	56.1	57.0	0.8
199	19,858	71	228	2.7	58.2	58.2	58.8	0.6
201	20,086	122	401	1.5	59.3	59.3	60.3	1.0
Moores Creek (near Atkinson)								
012	1,153	2,406	16,408	0.5	18.6[9]	7.3	8.2	0.9
048	4,799	1,550	10,587	0.8	18.6[9]	7.5	8.4	0.9
065	6,541	1,100	7,956	1.0	18.7[9]	7.6	8.5	0.8
100	9,982	1,375	9,353	0.9	18.7[2]	8.0	8.7	0.8
119	11,910	900	6,896	1.2	18.7[2]	8.1	8.8	0.7
135	13,502	950	7,208	1.1	18.7[2]	8.3	9.0	0.7
159	15,928	1,308	10,411	0.8	18.7[2]	8.8	9.4	0.6
174	17,384	900	7,247	1.1	18.7[2]	9.0	9.6	0.6
198	19,800	800	6,631	1.2	18.7[2]	9.2	10.0	0.7
208	20,762	773	6,780	1.2	18.7[2]	9.4	10.2	0.8
232	23,243	482	4,224	2.0	18.7[2]	10.8	11.4	0.6
271	27,054	435	5,103	1.6	18.7[2]	12.5	13.4	1.0
286	28,609	335	3,690	2.2	18.7[2]	13.1	14.1	1.0
487	48,741	833	8,083	0.9	19.9	19.9	20.6	0.7
493	49,318	502	4,800	1.5	20.1	20.1	20.8	0.7
511	51,115	512	5,292	1.3	21.0	21.0	21.9	0.9
520	52,017	727	7,343	0.9	21.2	21.2	22.1	0.9
530	53,005	783	7,010	1.0	21.4	21.4	22.3	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
540	54,027	825	6,558	1.0	21.6	21.6	22.6	0.9
549	54,912	700	6,058	1.1	21.9	21.9	22.8	0.9
560	56,008	605	5,351	1.3	22.3	22.3	23.2	0.9
569	56,870	740	6,498	1.0	22.6	22.6	23.5	0.9
580	58,000	725	6,095	1.1	22.9	22.9	23.9	1.0
590	59,000	490	4,108	1.6	23.4	23.4	24.4	0.9
597	59,695	927	7,696	0.9	23.8	23.8	24.7	1.0
602	60,243	876	5,910	1.2	24.0	24.0	25.0	1.0
607	60,705	872	5,582	1.2	24.3	24.3	25.2	1.0
621	62,052	487	4,402	1.5	26.9	26.9	27.2	0.3
629	62,935	841	7,389	0.9	27.1	27.1	27.6	0.5
640	64,000	694	6,208	1.1	27.4	27.4	27.9	0.6
648	64,845	1,021	8,462	0.8	27.6	27.6	28.1	0.6
660	65,986	643	4,851	1.3	28.0	28.0	28.7	0.6
670	67,000	797	6,612	0.9	28.3	28.3	29.0	0.7
678	67,750	567	5,234	1.2	28.6	28.6	29.3	0.7
683	68,331	857	6,998	0.9	28.8	28.8	29.5	0.8
690	68,988	775	6,442	1.0	29.0	29.0	29.8	0.8
700	70,000	1,037	7,694	0.8	29.2	29.2	30.0	0.8
710	71,028	925	7,300	0.8	29.4	29.4	30.2	0.8
719	71,852	711	5,411	1.1	29.7	29.7	30.6	0.8
730	73,000	636	4,954	1.2	30.2	30.2	31.1	0.9
740	74,000	846	6,139	1.0	30.7	30.7	31.6	0.9
748	74,806	894	6,889	0.9	31.0	31.0	31.9	0.9
759	75,928	952	7,050	0.9	31.3	31.3	32.3	0.9
766	76,611	1,098	7,551	0.8	31.5	31.5	32.5	0.9
791	79,079	1,350	6,513	0.9	33.0	33.0	34.0	0.9
799	79,927	1,435	10,311	0.6	33.2	33.2	34.2	1.0
809	80,890	1,314	8,492	0.7	33.4	33.4	34.3	1.0
820	82,001	877	5,282	1.1	33.7	33.7	34.7	1.0
829	82,891	659	4,536	1.3	34.2	34.2	35.2	1.0
839	83,853	799	5,184	1.1	34.8	34.8	35.8	1.0
846	84,555	785	5,578	1.0	35.2	35.2	36.2	1.0
853	85,265	712	4,969	1.2	35.5	35.5	36.5	1.0
864	86,417	960	6,052	1.0	36.1	36.1	37.1	1.0
872	87,223	902	6,051	1.0	36.4	36.4	37.4	1.0
880	87,950	859	5,341	1.1	36.8	36.8	37.7	1.0
884	88,437	800	4,784	1.2	37.1	37.1	38.0	1.0
890	89,000	864	5,372	1.1	37.4	37.4	38.4	1.0
897	89,696	838	5,777	0.9	37.8	37.8	38.8	1.0
903	90,251	791	5,197	1.0	38.0	38.0	39.0	1.0
909	90,935	1,075	7,482	0.7	38.3	38.3	39.3	1.0
920	92,000	935	6,822	0.8	38.5	38.5	39.5	1.0
928	92,811	670	3,772	1.4	39.1	39.1	40.0	1.0

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
938	93,847	1,089	8,042	0.7	39.4	39.4	40.4	1.0
950	94,987	683	4,414	0.8	39.7	39.7	40.6	1.0
956	95,608	780	5,324	0.7	39.8	39.8	40.8	1.0
970	97,000	557	3,680	1.0	40.5	40.5	41.4	0.9
980	98,000	654	4,495	0.8	40.8	40.8	41.7	0.9
990	99,022	675	4,477	0.8	41.0	41.0	42.0	0.9
1000	100,000	472	2,943	1.2	41.4	41.4	42.3	0.9
1010	101,023	565	3,512	1.0	41.8	41.8	42.7	1.0
1020	102,000	560	3,447	1.0	42.2	42.2	43.1	0.9
1024	102,411	842	5,048	0.7	42.3	42.3	43.3	1.0
1030	103,046	472	2,794	1.2	42.6	42.6	43.5	1.0
1034	103,420	365	2,306	1.5	42.9	42.9	43.9	1.0
1039	103,904	455	2,808	1.2	43.3	43.3	44.3	1.0
1043	104,276	774	4,311	0.8	43.5	43.5	44.5	1.0
1048	104,768	776	3,809	0.9	43.7	43.7	44.7	1.0
1060	105,963	497	3,264	0.9	44.8	44.8	45.6	0.8
1070	107,000	645	3,990	0.8	45.1	45.1	45.9	0.8
1077	107,663	416	2,909	1.0	45.3	45.3	46.1	0.9
1091	109,140	560	3,144	1.0	45.7	45.7	46.6	0.9
1097	109,727	404	2,484	1.2	45.9	45.9	46.8	0.9
1104	110,391	449	2,751	1.1	46.2	46.2	47.1	0.9
1109	110,853	315	1,722	1.6	46.4	46.4	47.3	0.9
1114	111,425	539	2,622	1.1	46.7	46.7	47.6	1.0
1119	111,913	814	3,149	0.9	46.9	46.9	47.8	1.0
1124	112,434	486	2,111	1.3	47.1	47.1	48.0	1.0
1130	113,000	424	2,416	1.2	47.4	47.4	48.3	1.0
1135	113,450	440	2,422	1.2	47.6	47.6	48.5	1.0
1139	113,864	492	2,346	1.2	47.8	47.8	48.8	1.0
1143	114,253	323	1,717	1.4	48.3	48.3	49.3	1.0
1147	114,663	385	2,144	1.2	48.7	48.7	49.7	1.0
1154	115,397	400	2,578	1.0	49.1	49.1	50.1	1.0
1158	115,770	364	2,255	1.1	49.3	49.3	50.3	1.0
1164	116,409	361	2,009	1.0	49.6	49.6	50.6	1.0
1170	117,004	290	1,777	1.1	50.0	50.0	50.9	1.0
1175	117,511	212	1,450	1.4	50.3	50.3	51.2	1.0
1178	117,842	321	1,931	1.0	50.5	50.5	51.5	1.0
1183	118,286	254	1,394	1.4	50.8	50.8	51.8	1.0
1186	118,635	278	1,388	1.4	51.1	51.1	52.1	1.0
1190	118,980	251	1,419	1.4	51.4	51.4	52.4	1.0
1195	119,497	326	1,879	1.1	51.8	51.8	52.8	1.0
1201	120,133	332	1,756	1.0	52.2	52.2	53.2	1.0
1205	120,452	322	1,439	1.3	52.4	52.4	53.4	1.0
1216	121,633	258	1,779	1.0	56.0	56.0	56.7	0.6
1222	122,150	284	2,014	0.8	56.1	56.1	56.8	0.7

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
1229	122,919	286	1,556	1.1	56.4	56.4	57.2	0.8
1236	123,595	246	1,508	1.1	56.7	56.7	57.5	0.8
1240	124,000	242	1,503	0.9	56.9	56.9	57.7	0.8
1246	124,609	209	1,563	0.9	57.1	57.1	57.9	0.8
1251	125,101	221	1,172	1.2	57.3	57.3	58.2	0.9
1257	125,744	178	977	1.4	57.8	57.8	58.7	0.9
1261	126,115	178	982	1.1	58.1	58.1	59.0	0.9
1266	126,579	146	787	1.4	58.4	58.4	59.4	0.9
Mulberry Branch								
003	336	321	783	0.6	12.4[10]	2.9	3.9	1.0
010	1,032	170	459	1.1	12.5[10]	3.7	4.7	1.0
018	1,794	100	250	2.0	12.5[10]	6.4	6.9	0.6
021	2,136	75	184	2.7	12.5[2]	9.0	9.2	0.2
024	2,432	77	280	1.8	12.5[2]	10.5	11.0	0.5
027	2,735	95	253	1.9	12.5[2]	11.7	12.2	0.5
032	3,191	61	200	2.4	14.0	14.0	14.7	0.8
035	3,529	66	361	1.0	16.4	16.4	17.3	0.9
039	3,884	59	254	1.5	16.7	16.7	17.7	1.0
042	4,246	49	166	2.3	17.9	17.9	18.7	0.9
045	4,478	39	142	2.7	19.0	19.0	19.8	0.8
047	4,729	42	149	2.6	20.6	20.6	21.3	0.7
050	4,972	44	150	2.5	21.8	21.8	22.7	0.9
052	5,235	37	147	2.6	23.1	23.1	24.1	1.0
054	5,397	44	169	2.3	24.2	24.2	24.9	0.7
056	5,578	52	210	1.8	24.9	24.9	25.6	0.7
North Branch								
003	327	126	721	1.4	40.4[2]	35.8	36.8	1.0
005	526	140	770	1.4	40.4[2]	36.0	37.0	1.0
011	1,123	178	866	1.2	40.4[2]	36.5	37.4	1.0
016	1,598	174	712	1.5	40.4[2]	37.0	37.9	0.9
020	2,015	153	567	1.8	40.4[2]	37.8	38.6	0.8
024	2,436	148	656	1.6	40.4[2]	38.7	39.5	0.8
028	2,836	133	637	1.3	40.4[2]	39.2	40.1	0.9
032	3,197	92	429	2.0	40.4[2]	39.7	40.6	0.8
036	3,587	111	509	1.7	40.9	40.9	41.6	0.7
040	4,031	132	586	1.4	41.7	41.7	42.6	0.8
044	4,405	150	618	1.4	42.5	42.5	43.3	0.8
048	4,811	163	698	1.2	43.3	43.3	44.0	0.7
052	5,238	200	966	0.9	43.6	43.6	44.4	0.7
056	5,587	97	335	2.5	44.1	44.1	44.8	0.7
059	5,905	112	467	1.5	45.1	45.1	45.9	0.8
063	6,286	80	370	1.9	45.4	45.4	46.4	1.0
068	6,831	105	535	1.3	47.6	47.6	48.0	0.4
Northeast Cape Fear River								
1140	114,000	591	16,682	2.6	8.0	8.0	6.2	-1.8

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
1155	115,500	509	13,241	3.3	8.0	8.0	6.2	-1.8
1165	116,479	420	13,734	3.1	8.0	8.0	6.3	-1.7
1195	119,507	419	12,849	3.4	8.0	8.0	6.4	-1.6
1210	121,001	341	9,837	4.4	8.0	8.0	6.4	-1.6
1219	121,894	565	9,982	4.3	8.0	8.0	6.6	-1.4
1225	122,463	641	9,206	4.7	8.0	8.0	6.8	-1.2
1230	123,046	629	9,797	4.4	8.0	8.0	7.0	-1.0
1255	125,515	482	11,528	3.7	8.0	8.0	7.4	-0.6
1275	127,500	521	12,981	3.3	8.0	8.0	7.6	-0.4
1289	128,931	512	12,576	3.4	8.0	8.0	7.7	-0.3
1306	130,555	508	12,158	3.5	8.0	8.0	7.8	-0.2
1321	132,082	512	12,326	3.5	8.0	8.0	7.9	-0.1
1335	133,500	486	11,592	3.7	8.0	8.0	8.0	0.0
1349	134,943	536	12,783	3.3	8.0	8.0	8.2	0.2
1359	135,889	580	13,443	3.2	8.0	8.0	8.2	0.2
1382	138,248	510	11,224	3.8	8.0	8.0	8.4	0.4
1395	139,505	543	10,619	4.0	8.1	8.1	8.4	0.4
1424	142,415	810	16,547	2.6	8.3	8.3	8.8	0.5
1450	145,009	1,280	15,719	2.7	8.3	8.3	8.9	0.6
1479	147,909	2,350	28,748	1.5	8.6	8.6	9.3	0.7
1506	150,596	2,050	26,902	1.6	8.7	8.7	9.4	0.8
1531	153,067	3,230	36,777	1.2	8.8	8.8	9.6	0.8
1562	156,232	2,227	28,020	1.5	8.8	8.8	9.7	0.9
1590	159,000	2,517	31,465	1.3	8.9	8.9	9.8	0.9
1619	161,895	2,014	24,912	1.7	9.0	9.0	9.8	0.8
1641	164,059	1,860	21,995	1.9	9.1	9.1	9.9	0.8
1661	166,129	2,104	22,336	1.8	9.2	9.2	10.1	0.9
1685	168,457	1,961	17,354	2.4	9.4	9.4	10.2	0.8
1708	170,810	1,491	19,603	2.1	9.9	9.9	10.7	0.8
1725	172,486	1,348	18,599	2.2	10.1	10.1	10.9	0.8
1742	174,213	1,410	19,233	2.1	10.2	10.2	11.0	0.8
1763	176,301	1,660	19,189	2.1	10.4	10.4	11.2	0.8
1779	177,942	1,535	20,384	2.0	10.6	10.6	11.4	0.8
1817	181,701	1,890	25,448	1.6	11.0	11.0	11.9	0.9
1831	183,099	2,040	25,090	1.6	11.1	11.1	12.0	0.9
1850	184,986	2,160	26,586	1.5	11.4	11.4	12.3	0.9
1901	190,139	4,140	48,446	0.8	12.0	12.0	12.9	0.9
1923	192,340	4,006	48,840	0.8	12.1	12.1	13.1	1.0
1959	195,911	4,250	53,769	0.8	12.3	12.3	13.3	1.0
1981	198,078	4,300	53,009	0.8	12.5	12.5	13.4	0.9
2005	200,550	4,900	59,877	0.7	12.6	12.6	13.5	0.9
2043	204,293	4,370	55,524	0.7	12.8	12.8	13.7	0.9
2056	205,633	3,980	50,907	0.8	12.9	12.9	13.8	1.0
2119	211,938	4,886	61,963	0.7	13.2	13.2	14.1	1.0

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
2154	215,424	3,570	45,421	0.9	13.3	13.3	14.3	1.0
2174	217,400	1,600	21,141	1.9	13.6	13.6	14.5	1.0
2194	219,368	1,640	22,478	1.8	14.1	14.1	15.1	1.0
2215	221,504	1,750	21,779	1.9	14.8	14.8	15.7	0.9
2236	223,586	1,700	26,106	1.6	15.4	15.4	16.3	0.9
2257	225,694	2,020	30,239	1.4	15.7	15.7	16.6	0.9
2277	227,732	2,775	40,065	1.0	15.9	15.9	16.9	1.0
2299	229,903	3,420	48,289	0.8	16.1	16.1	17.1	1.0
2318	231,773	2,950	42,969	0.9	16.2	16.2	17.2	1.0
2338	233,839	3,403	48,317	0.8	16.4	16.4	17.4	1.0
2359	235,913	2,835	40,832	1.0	16.5	16.5	17.5	1.0
2383	238,309	3,575	51,109	0.8	16.8	16.8	17.8	1.0
2422	242,202	4,650	69,946	0.6	17.0	17.0	18.0	1.0
2455	245,481	4,440	65,922	0.6	17.1	17.1	18.1	1.0
2491	249,074	3,000	46,754	0.8	17.3	17.3	18.3	1.0
2515	251,525	3,190	48,242	0.8	17.5	17.5	18.5	1.0
2530	252,959	4,400	62,090	0.6	17.6	17.6	18.6	1.0
2613	261,349	3,200	45,820	0.7	17.8	17.8	18.8	1.0
2636	263,635	2,700	40,707	0.8	18.2	18.2	19.1	1.0
2655	265,500	3,350	43,377	0.8	18.4	18.4	19.3	1.0
2676	267,569	3,075	36,529	0.9	18.6	18.6	19.5	0.9
2699	269,915	2,260	27,548	1.2	18.9	18.9	19.8	0.9
2727	272,750	1,130	16,045	2.1	19.3	19.3	20.2	0.9
2744	274,391	1,875	25,560	1.3	19.7	19.7	20.6	1.0
2756	275,603	1,865	21,250	1.6	19.9	19.9	20.8	0.9
2779	277,903	1,880	21,319	1.6	20.3	20.3	21.2	0.9
2800	280,008	2,210	27,787	1.2	20.6	20.6	21.5	0.9
2847	284,682	3,150	40,661	0.8	21.1	21.1	22.0	0.9
2883	288,276	3,142	39,182	0.8	21.4	21.4	22.3	0.9
2925	292,455	3,950	53,153	0.6	21.7	21.7	22.6	0.9
2949	294,863	4,450	60,189	0.6	21.8	21.8	22.7	0.9
2983	298,317	5,500	60,736	0.6	21.9	21.9	22.8	0.9
3045	304,480	4,355	63,201	0.5	22.0	22.0	22.9	0.9
3065	306,453	3,580	46,664	0.7	22.0	22.0	23.0	0.9
3081	308,131	4,320	56,101	0.6	22.2	22.2	23.1	0.9
3109	310,897	3,195	38,743	0.8	22.3	22.3	23.2	0.9
3127	312,658	2,790	31,280	1.0	22.5	22.5	23.4	0.9
3144	314,431	2,720	31,768	1.0	22.6	22.6	23.6	1.0
Osgood Canal								
003	282	94	369	2.8	31.7[2]	30.9	31.8	1.0
008	837	98	464	2.2	31.9	31.9	32.8	0.9
013	1,256	88	503	2.1	32.8	32.8	33.5	0.7
017	1,674	105	453	2.3	33.4	33.4	34.1	0.7
022	2,179	76	279	3.7	34.3	34.3	35.2	0.9
026	2,598	63	342	3.0	35.4	35.4	36.3	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
030	3,047	99	566	1.8	36.7	36.7	37.7	1.0
040	4,000	162	856	1.2	39.1	39.1	39.6	0.5
045	4,500	118	669	1.5	39.3	39.3	39.8	0.6
050	4,966	105	590	1.7	39.9	39.9	40.7	0.8
056	5,585	130	851	1.2	42.6	42.6	43.4	0.8
061	6,141	165	732	1.4	42.8	42.8	43.6	0.8
067	6,658	160	754	1.3	43.3	43.3	44.0	0.7
070	7,000	114	354	1.8	43.4	43.4	44.1	0.8
075	7,500	80	359	1.8	44.0	44.0	44.9	0.9
079	7,918	50	246	2.6	44.6	44.6	45.3	0.7
084	8,408	34	166	3.8	45.2	45.2	46.1	0.9
091	9,115	37	130	3.6	46.4	46.4	47.4	0.9
Rileys Creek								
008	752	119	1,215	4.0	9.3[2]	2.3	3.3	1.0
015	1,482	119	1,121	4.4	9.3[2]	3.0	3.8	0.8
021	2,073	119	1,064	4.6	9.3[2]	3.6	4.3	0.8
025	2,515	119	1,036	4.8	9.3[2]	4.0	4.7	0.7
035	3,481	142	1,703	3.0	9.3[2]	5.0	5.7	0.7
040	4,029	142	1,534	3.2	9.3[2]	5.2	5.9	0.7
050	4,971	142	1,400	3.6	9.3[2]	5.6	6.3	0.7
055	5,500	200	1,713	3.4	9.3[2]	5.7	6.6	0.8
065	6,462	200	1,760	3.3	9.3[2]	6.1	7.0	0.9
074	7,447	400	2,973	2.8	9.3[2]	6.4	7.4	1.0
085	8,488	400	2,872	2.8	9.3[2]	6.8	7.7	0.9
090	8,976	400	2,713	2.9	9.3[2]	6.9	7.9	0.9
095	9,503	200	1,672	3.2	9.3[2]	7.1	8.0	1.0
100	9,986	200	1,681	3.3	9.3[2]	7.3	8.2	1.0
105	10,507	200	1,650	3.3	9.3[2]	7.5	8.4	1.0
110	10,988	200	1,643	3.3	9.3[2]	7.7	8.7	0.9
114	11,444	200	1,580	3.5	9.3[2]	7.9	8.9	1.0
118	11,830	200	1,471	3.7	9.3[2]	8.2	9.1	0.9
Rockfish Creek								
781	781	2,371	13,864	0.9	26.2[2]	19.1	20.0	0.9
038	3,789	489	3,539	3.4	26.2[2]	19.9	20.8	0.9
061	6,079	1,226	6,714	1.8	26.2[2]	21.8	22.8	0.9
101	10,068	1,301	8,780	1.4	26.2[2]	23.2	24.2	1.0
130	12,961	1,429	8,796	1.4	26.2[2]	25.0	25.8	0.8
155	15,515	1,541	10,118	1.2	26.2[2]	25.3	26.2	0.8
199	19,919	1,889	17,771	0.7	26.2[2]	25.8	26.7	0.9
235	23,505	1,038	7,667	1.6	26.2[2]	26.1	27.0	0.9
266	26,582	1,347	15,255	0.8	26.6	26.6	27.6	1.0
356	35,592	1,642	9,918	1.1	28.8	28.8	29.5	0.7
358	35,794	1,160	8,041	1.4	28.8	28.8	29.5	0.7
361	36,054	750	6,304	1.8	29.0	29.0	29.6	0.7
363	36,286	735	6,926	1.6	29.0	29.0	29.9	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
366	36,609	680	6,270	1.8	29.0	29.0	29.9	0.9
369	36,884	815	7,037	1.6	29.1	29.1	30.0	0.9
378	37,753	885	8,563	1.3	29.2	29.2	30.1	0.9
386	38,552	815	10,375	1.0	29.4	29.4	30.4	0.9
396	39,574	850	7,020	1.4	29.4	29.4	30.4	1.0
404	40,395	995	6,981	1.5	29.6	29.6	30.6	1.0
415	41,517	633	6,777	1.5	30.0	30.0	31.0	1.0
425	42,468	630	6,084	1.7	30.2	30.2	31.2	1.0
434	43,448	655	5,832	1.8	30.6	30.6	31.5	0.9
445	44,480	710	5,753	1.8	31.0	31.0	32.0	0.9
456	45,631	798	7,689	1.3	31.4	31.4	32.4	1.0
463	46,322	1,193	6,294	1.6	31.7	31.7	32.6	0.9
464	46,425	1,193	7,399	1.4	31.8	31.8	32.8	1.0
468	46,815	1,100	8,559	1.2	31.8	31.8	32.8	1.0
469	46,927	1,085	8,572	1.2	31.9	31.9	32.8	1.0
480	47,952	1,100	6,085	1.7	32.2	32.2	33.2	1.0
491	49,067	1,450	11,417	0.9	32.7	32.7	33.7	1.0
499	49,914	760	6,275	1.6	32.9	32.9	33.8	1.0
508	50,847	1,090	10,818	0.9	33.3	33.3	34.2	0.9
515	51,536	1,175	7,174	1.4	33.5	33.5	34.4	0.9
517	52,545	1,959	10,659	0.9	34.0	34.0	35.0	1.0
Sills Creek								
084	8,420	303	1,936	1.7	32.4	32.4	33.4	1.0
087	8,728	240	1,359	2.4	33.0	33.0	33.8	0.8
095	9,500	360	2,497	1.3	35.1	35.1	36.1	1.0
100	10,000	311	2,240	1.5	35.4	35.4	36.4	1.0
105	10,500	534	3,119	1.1	35.8	35.8	36.8	1.0
110	11,000	378	2,519	1.3	36.0	36.0	37.0	1.0
115	11,502	399	2,415	1.3	36.4	36.4	37.4	1.0
120	12,002	463	2,373	1.3	36.9	36.9	37.9	1.0
126	12,585	690	3,996	0.8	37.4	37.4	38.3	1.0
130	13,002	629	2,373	1.3	37.6	37.6	38.6	1.0
134	13,382	544	2,631	1.2	38.1	38.1	39.1	0.9
142	14,152	522	2,755	1.2	38.8	38.8	39.7	0.9
145	14,502	622	2,866	1.1	39.1	39.1	40.0	0.8
150	15,002	718	3,175	1.0	39.5	39.5	40.4	0.9
155	15,502	628	4,024	0.8	40.0	40.0	40.8	0.8
160	16,002	618	3,866	0.8	40.1	40.1	40.9	0.8
165	16,502	499	3,088	1.0	40.3	40.3	41.1	0.8
170	17,002	633	3,498	0.9	40.5	40.5	41.4	0.9
175	17,502	477	2,567	1.2	40.8	40.8	41.7	0.9
180	18,002	576	3,022	1.0	41.2	41.2	42.1	0.9
185	18,502	924	4,600	0.6	41.4	41.4	42.4	0.9
190	19,002	875	3,939	0.8	41.6	41.6	42.6	1.0
195	19,502	678	2,700	1.1	42.0	42.0	42.9	1.0

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
200	20,002	630	2,024	1.4	42.7	42.7	43.7	0.9
205	20,502	556	2,669	1.1	43.5	43.5	44.4	0.9
210	21,002	570	1,833	1.6	44.1	44.1	45.0	0.9
217	21,694	538	2,722	1.1	45.0	45.0	45.9	0.9
223	22,271	811	3,958	0.7	45.3	45.3	46.3	1.0
229	22,927	607	3,223	0.9	45.7	45.7	46.6	0.9
233	23,313	464	2,300	1.2	46.0	46.0	47.0	0.9
240	24,002	554	2,808	1.0	46.6	46.6	47.5	0.9
245	24,502	511	2,608	1.0	47.0	47.0	47.9	0.9
250	25,002	579	3,020	0.9	47.3	47.3	48.3	0.9
255	25,502	657	2,998	0.9	47.6	47.6	48.5	0.9
263	26,315	430	2,242	1.1	47.9	47.9	48.8	0.9
270	27,002	634	3,430	0.7	48.2	48.2	49.1	0.9
274	27,440	669	3,216	0.8	48.4	48.4	49.3	0.9
280	28,002	545	2,780	0.9	48.7	48.7	49.6	0.9
285	28,502	565	2,796	0.9	48.9	48.9	49.8	0.9
290	28,976	598	3,133	0.8	49.1	49.1	50.0	0.8
295	29,502	540	2,711	0.9	49.4	49.4	50.2	0.8
305	30,502	480	2,520	1.0	49.7	49.7	50.7	1.0
311	31,071	385	2,241	0.8	49.9	49.9	50.9	1.0
315	31,502	380	2,035	0.9	50.1	50.1	51.0	1.0
324	32,400	306	1,931	0.9	50.5	50.5	51.4	0.9
328	32,761	265	1,619	1.1	50.7	50.7	51.6	0.9
334	33,433	344	1,938	0.9	51.0	51.0	51.9	0.9
339	33,895	298	1,580	1.1	51.2	51.2	52.1	0.9
345	34,502	280	1,377	1.2	51.6	51.6	52.5	1.0
350	35,002	256	1,279	1.3	52.0	52.0	52.9	1.0
355	35,502	188	899	1.8	52.4	52.4	53.4	0.9
360	36,002	239	1,194	1.4	53.0	53.0	54.0	1.0
365	36,502	230	1,149	1.4	53.4	53.4	54.4	1.0
368	36,820	281	1,377	1.2	53.7	53.7	54.7	1.0
374	37,376	302	1,562	1.0	54.1	54.1	55.1	1.0
380	38,002	387	2,017	0.8	54.4	54.4	55.4	1.0
385	38,502	314	1,557	1.1	54.7	54.7	55.7	1.0
389	38,851	211	1,067	1.5	55.0	55.0	56.0	1.0
393	39,293	180	950	1.4	55.5	55.5	56.4	1.0
398	39,818	285	1,379	1.0	55.9	55.9	56.8	1.0
404	40,424	182	772	1.0	56.2	56.2	57.2	1.0
415	41,489	44	187	4.0	57.0	57.0	57.8	0.9
Sills Creek Tributary 1								
002	196	113	362	1.3	51.3[2]	49.5	50.4	0.9
004	352	75	167	2.9	51.3[2]	50.2	50.9	0.7
008	824	53	200	2.4	53.3	53.3	54.0	0.7
012	1,200	71	269	1.8	54.3	54.3	55.3	1.0
016	1,600	64	267	1.6	55.3	55.3	56.2	1.0

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
024	2,357	36	145	2.6	57.1	57.1	58.0	0.9
025	2,486	34	156	2.5	57.5	57.5	58.4	0.9
027	2,659	21	87	4.4	58.1	58.1	58.8	0.7
028	2,781	21	98	3.9	59.0	59.0	59.6	0.6
030	2,987	28	125	3.1	59.9	59.9	60.4	0.5
033	3,302	21	106	3.6	60.9	60.9	61.4	0.5
036	3,566	29	98	3.9	61.8	61.8	62.6	0.8
037	3,744	24	83	4.4	62.5	62.5	63.4	0.9
044	4,400	497	545	0.7	63.9	63.9	64.4	0.5
063	6,255	562	330	0.9	65.2	65.2	65.4	0.2
Sills Creek Tributary 2								
003	307	159	590	1.7	56.0[2]	55.2	56.2	0.9
005	479	174	670	1.5	56.0[2]	55.7	56.7	1.0
009	946	143	640	1.6	56.8	56.8	57.7	1.0
015	1,480	141	675	1.5	57.8	57.8	58.8	1.0
020	2,043	142	705	1.4	58.8	58.8	59.7	0.9
026	2,628	212	1,040	1.0	59.4	59.4	60.3	0.9
030	2,989	194	933	1.1	59.6	59.6	60.6	0.9
034	3,377	154	608	1.1	59.9	59.9	60.9	1.0
Taylor Branch								
011	1,118	170	568	1.3	38.1[1]	35.5	36.3	0.8
016	1,614	115	305	2.4	38.1[1]	37.6	38.4	0.9
021	2,101	295	1,579	0.5	40.9	40.9	40.9	0.0
024	2,400	220	1,017	0.7	40.9	40.9	40.9	0.0
029	2,886	286	1,108	0.7	42.0	42.0	42.0	0.0
034	3,414	242	778	0.8	42.7	42.7	42.7	0.0
041	4,081	331	2,281	0.3	50.6	50.6	50.6	0.0
045	4,511	264	1,685	0.4	50.6	50.6	50.6	0.0
049	4,892	144	868	0.7	50.6	50.6	50.6	0.0
052	5,182	150	690	0.9	50.6	50.6	50.6	0.0
054	5,360	130	276	2.3	50.8	50.8	50.8	0.0
055	5,518	112	388	1.7	51.3	51.3	51.9	0.6
060	6,046	130	674	0.8	55.3	55.3	56.0	0.7
Tuckahoe Branch								
004	352	165	887	2.2	39.7[2]	39.5	40.1	0.5
010	1,019	182	1,174	1.7	40.9	40.9	41.7	0.8
015	1,541	260	1,542	1.3	41.4	41.4	42.3	0.9
021	2,121	175	936	2.1	42.2	42.2	43.0	0.8
025	2,530	236	1,295	1.5	43.1	43.1	44.0	0.8
030	2,992	225	1,102	1.8	44.1	44.1	45.0	0.9
034	3,427	290	1,498	1.0	44.9	44.9	45.9	1.0
038	3,759	224	1,172	1.3	45.3	45.3	46.2	0.9
042	4,152	296	1,443	1.0	45.7	45.7	46.7	1.0
048	4,784	315	1,319	1.1	46.4	46.4	47.4	1.0
055	5,516	227	751	1.8	48.0	48.0	48.9	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
061	6,060	309	1,176	1.2	49.4	49.4	50.3	1.0
066	6,634	247	1,001	1.4	50.4	50.4	51.3	1.0
072	7,162	256	1,017	1.4	51.4	51.4	52.3	1.0
077	7,692	268	987	1.3	52.4	52.4	53.3	1.0
082	8,213	252	999	1.3	53.3	53.3	54.2	1.0
086	8,611	241	903	1.4	54.0	54.0	54.9	1.0
093	9,267	267	1,197	1.0	56.1	56.1	56.8	0.7
Turkey Creek								
196	19,644	351	2,165	3.3	8.0[2]	7.4	6.9	-0.5
205	20,461	350	2,115	3.6	8.0[2]	7.6	7.4	-0.2
220	21,976	502	3,064	2.2	8.8	8.8	9.4	0.6
235	23,500	379	2,331	3.2	9.4	9.4	10.0	0.6
245	24,510	358	1,969	3.0	10.1	10.1	11.0	0.9
265	26,481	319	1,542	2.8	11.7	11.7	12.7	1.0
275	27,496	357	1,751	2.4	12.6	12.6	13.5	0.9
286	28,599	245	1,142	2.4	14.2	14.2	15.2	1.0
301	30,062	214	753	3.4	16.5	16.5	17.4	0.9
316	31,563	213	909	2.8	18.7	18.7	19.7	1.0
325	32,538	207	830	2.5	20.0	20.0	20.9	0.9
336	33,641	113	359	4.4	21.8	21.8	22.8	1.0
White Oak Branch								
015	1,487	394	2,380	1.4	39.5[1]	38.3	39.3	1.0
021	2,059	348	2,266	1.5	39.5[1]	39.2	40.1	1.0
025	2,508	540	3,438	1.0	39.6	39.6	40.6	1.0
029	2,878	500	2,962	0.9	39.8	39.8	40.8	1.0

[1]Moores Creek (near Atkinson)

[2]Elevation includes backwater effects

[3]Cape Fear River

[4]Doctors Creek

[5]Rileys Creek

[6]Northeast Cape Fear River

[7]Buxton Branch

[8]Moores Creek

[9]Black River

[10]Long Creek

* Values not computed for this station

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)		
Atlantic Ocean	1	X	*	AE 8 VE 3-11	PFD	SWEL
	2	*	*	VE 3-11	WHAFIS	SWEL
	3	*	*	VE 0-12	WHAFIS	SWEL
	4	X	*	AE 5 VE 2-11	PFD	SWEL
	5	X	*	AE 6 VE 2-11	PFD	SWEL
	6	X	*	AE 3-5 VE 5-11	WHAFIS	SWEL
	7	X	*	AE 1-5 VE 4-11	WHAFIS	SWEL
	8	X	*	AE 3-6 VE 4-11	WHAFIS	SWEL

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)		
	9	X	*	AE 2 VE 11	WHAFIS	SWEL
	76	X	*	AE 6 VE 11	PFD	SWEL
	77	X	*	AE 8 VE 11	PFD	SWEL
	78	*	*	VE 11	WHAFIS	SWEL
	10	X	*	AE 6 VE 2-11	PFD	SWEL
	11	X	*	AE 0-6 VE 1-11	PFD	SWEL
	12	*	*	AE 0-5 VE 3-11	WHAFIS	SWEL
	13	*	*	AE 1-5 VE 3-11	WHAFIS	SWEL
	14	X	*	AE 6 VE 11	PFD	SWEL
	15	X	*	AE 1-6 VE 1-11	PFD	SWEL
	16	X	*	AE 1-6 VE 2-11	PFD	SWEL
	17	X	*	AE 2-5 VE 3-11	WHAFIS	SWEL
	18	X	*	AE 1-6 VE 3-11	WHAFIS	SWEL
	19	X	*	AE 1-5 VE 1-11	PFD	SWEL
	20	X	*	AE 2-6 VE 1-11	PFD	SWEL
	21	X	*	AE 0-8 VE 1-11	PFD	SWEL
	22	X	*	AE 6 VE 2-11	PFD	SWEL
	23	X	*	AE 7 VE 3-11	PFD	SWEL
	24	X	*	AE 0-5 VE 2-11	PFD	SWEL
	25	X	*	AE 0-5 VE 1-11	PFD	SWEL
	26	X	*	AE 1-6 VE 1-11	PFD	SWEL

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)		
	27	X	*	AE 7 VE 11	PFD	SWEL
	28	X	*	AE 7 VE 11	PFD	SWEL
	29	X	*	AE 6 VE 11	PFD	SWEL
	30	X	*	AE 0-7 VE 11	PFD	SWEL
	31	X	*	AE 6 VE 0-10	PFD	SWEL
	32	X	*	AE 0-7 VE 11	PFD	SWEL
	33	X	*	AE 1-6 VE 1-11	PFD	SWEL
	34	X	*	AE 0-7 VE 11	PFD	SWEL
	35	X	*	AE 0-5 VE 2-11	PFD	SWEL
	36	X	*	AE 0-5 VE 1-11	PFD	SWEL
	37	X	*	AE 6 VE 2-11	PFD	SWEL
	38	X	*	AE 0-6 VE 2-11	PFD	SWEL
	39	X	*	AE 2-10 VE 2-11	PFD	SWEL

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 Pender 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 2/16/2007 North Carolina Statewide FIRM, which includes Pender County, are presented in Table 22, "Community Map History."

Information pertaining to revised and unrevised flood hazards for each jurisdiction within Pender 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 Pender County.

Table 24 - Map Revision History

Community	Initial Identification Date	Initial FIRM Effective Date	FIS Revision Date
PENDER COUNTY	10/29/2007	2/15/1985	02/16/2007
TOWN OF ATKINSON	2/16/2007	2/16/2007	02/16/2007
TOWN OF BURGAW	1/19/2000	1/19/2000	02/16/2007
TOWN OF SURF CITY	5/24/1974	5/2/1977	02/16/2007
TOWN OF TOPSAIL BEACH	6/7/1974	9/30/1977	02/16/2007
TOWN OF WALLACE	6/14/1974	4/2/1986	02/16/2006
TOWN OF WATHA	10/29/1976	2/15/1985	02/16/2007
VILLAGE OF SAINT HELENA	10/29/1976	2/15/1985	02/16/2007

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 Pender 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
PENDER COUNTY	2/16/2007	NCFMP	NCFMP	286-000022	3/1/2013
PENDER COUNTY	2/16/2007	NCFMP	NCFMP	286-000022	2/5/2014
PENDER COUNTY	2/16/2007	NCFMP	NCFMP	286-0000-23	8/8/8888
TOWN OF ATKINSON	2/16/2007	NCFMP	NCFMP	286-000022	3/1/2013
TOWN OF ATKINSON	2/16/2007	NCFMP	NCFMP	286-000022	2/5/2014
TOWN OF ATKINSON	2/16/2007	NCFMP	NCFMP	286-0000-23	8/8/8888
TOWN OF BURGAW	2/16/2007	NCFMP	NCFMP	286-000022	3/1/2013
TOWN OF BURGAW	2/16/2007	NCFMP	NCFMP	286-000022	2/5/2014
TOWN OF BURGAW	2/16/2007	NCFMP	NCFMP	286-0000-23	8/8/8888
TOWN OF SURF CITY	2/16/2007	NCFMP	NCFMP	286-000022	3/1/2013
TOWN OF SURF CITY	2/16/2007	NCFMP	NCFMP	286-000022	2/5/2014
TOWN OF SURF CITY	2/16/2007	NCFMP	NCFMP	286-0000-23	8/8/8888
TOWN OF TOPSAIL BEACH	2/16/2007	NCFMP	NCFMP	286-000022	3/1/2013
TOWN OF TOPSAIL BEACH	2/16/2007	NCFMP	NCFMP	286-000022	2/5/2014
TOWN OF TOPSAIL BEACH	2/16/2007	NCFMP	NCFMP	286-0000-23	8/8/8888
TOWN OF WALLACE	2/16/2007	NCFMP	NCFMP	286-000022	3/1/2013
TOWN OF WALLACE	2/16/2007	NCFMP	NCFMP	286-000022	2/5/2014
TOWN OF WALLACE	2/16/2007	NCFMP	NCFMP	286-0000-23	8/8/8888
TOWN OF WATHA	2/16/2007	NCFMP	NCFMP	286-000022	3/1/2013
TOWN OF WATHA	2/16/2007	NCFMP	NCFMP	286-000022	2/5/2014
TOWN OF WATHA	2/16/2007	NCFMP	NCFMP	286-0000-23	8/8/8888
VILLAGE OF SAINT HELENA	2/16/2007	NCFMP	NCFMP	286-000022	3/1/2013
VILLAGE OF SAINT HELENA	2/16/2007	NCFMP	NCFMP	286-000022	2/5/2014
VILLAGE OF SAINT HELENA	2/16/2007	NCFMP	NCFMP	286-0000-23	8/8/8888

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 Pender County were produced by NCFMP under contract with the State of North Carolina and issued on effective 4/30/2014. 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

Table 26, “Consultation Coordination Officer’s Meetings” is not applicable in Pender 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 Pender County are shown in Table 27, "Scoping Meetings." Meetings held for the map maintenance revision are also included below for Pender County.

Table 27 — Scoping Meetings

Community	Riverbasin	Initial Scoping Date	Attended By	Final Scoping Date	Attended By
PENDER COUNTY	CAPE FEAR	12/7/2000	Representatives of Pender County and Incorporated Communities, FEMA, NCDEM, NC CGIA, and Dewberry	3/8/2001	Representatives of Pender County and Incorporated Communities, FEMA, NCDEM, NC CGIA, and Dewberry
TOWN OF ATKINSON	CAPE FEAR	12/6/2000	Representatives of Pender County and Incorporated Communities, FEMA, NCDEM, NC CGIA, and Dewberry	3/8/2001	Representatives of Pender County and Incorporated Communities, FEMA, NCDEM, NC CGIA, and Dewberry
TOWN OF BURGAW	CAPE FEAR	12/7/2000	Representatives of Pender County and Incorporated Communities, FEMA, NCDEM, NC CGIA, and Dewberry	3/8/2001	Representatives of Pender County and Incorporated Communities, FEMA, NCDEM, NC CGIA, and Dewberry
TOWN OF BURGAW ETJ	CAPE FEAR	12/7/2000	Representatives of Pender County and Incorporated Communities, FEMA, NCDEM, NC CGIA, and Dewberry	3/8/2001	Representatives of Pender County and Incorporated Communities, FEMA, NCDEM, NC CGIA, and Dewberry
TOWN OF SURF CITY	CAPE FEAR	12/7/2000	Representatives of Pender County and Incorporated Communities, FEMA, NCDEM, NC CGIA, and Dewberry	3/8/2001	Representatives of Pender County and Incorporated Communities, FEMA, NCDEM, NC CGIA, and Dewberry
TOWN OF TOPSAIL BEACH	CAPE FEAR	12/7/2000	Representatives of Pender County and Incorporated Communities, FEMA, NCDEM, NC CGIA, and Dewberry	3/8/2001	Representatives of Pender County and Incorporated Communities, FEMA, NCDEM, NC CGIA, and Dewberry
VILLAGE OF SAINT HELENA	CAPE FEAR	12/7/2000	Representatives of Pender County and Incorporated Communities, FEMA, NCDEM, NC CGIA, and Dewberry	3/8/2001	Representatives of Pender County and Incorporated Communities, FEMA, NCDEM, NC CGIA, and Dewberry

Preliminary Meetings are held in each county to disseminate and review the FIS Report and FIRM panels. This meeting is required by FEMA. Public Participation Meetings are not required by FEMA, but provide an opportunity to review and discuss the FIS Report and FIRM panels for each jurisdiction in a public setting. The dates for the preliminary and public participation meetings are shown in Table 28, "Preliminary and Public Participation Meetings."

Table 28 — Preliminary and Public Participation Meetings

Community	For FIS Dated	Meeting Location	Preliminary Meeting Date	Attended By	Public Meeting Date	Attended By
TOWN OF BURGAW	2/16/2007	Town of Burgaw	7/25/2005	Officials from Pender county, NCDEM, Dewberry and Watershed Concepts	8/16/2005	The Public
TOWN OF BURGAW	2/16/2007	Town of Burgaw	7/25/2005	Officials from Pender county, NCDEM, Dewberry and Watershed Concepts	9/7/2005	The Public
TOWN OF BURGAW ETJ	2/16/2007	Town of Burgaw	7/25/2005	Officials from Pender county, NCDEM, Dewberry and Watershed Concepts	8/16/2005	The Public
TOWN OF BURGAW ETJ	2/16/2007	Town of Burgaw	7/25/2005	Officials from Pender county, NCDEM, Dewberry and Watershed Concepts	9/7/2005	The Public

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 Pender 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
Town of Wallace	Wallace Town Hall, 311 East Murphey Street	Wallace	NC	28466
Pender County	Pender County Planning Department, 805 South Walker Street	Burgaw	NC	28425
Town of Watha	Watha Town Hall, 425 Watha Road	Watha	NC	28478
Town of Atkinson	Atkinson Town Hall, 200 North Town Hall Avenue	Atkinson	NC	28421
Town of Burgaw	Burgaw City Hall, 109 North Walker Street	Burgaw	NC	28425
Village of Saint Helena	Saint Helena Village Hall, 305 East Main St	Saint Helena	NC	28425
Town of Surf City	Surf City Building Inspection Department, 214 North New River Drive	Surf City	NC	28445
Town of Topsail Beach	Topsail Beach Building Inspection Department, 820 South Anderson Boulevard	Topsail Beach	NC	28445

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 28, “Additional Information” is not applicable in Pender 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