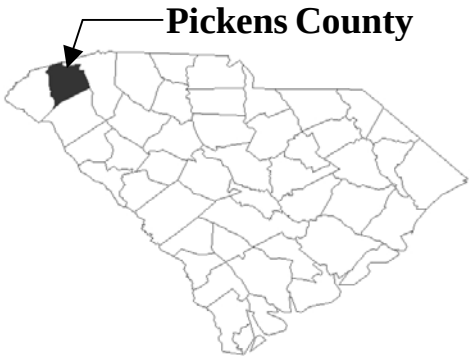
FLOOD INSURANCE STUDY

VOLUME 1 OF 2

PICKENS COUNTY, SOUTH CAROLINA

AND INCORPORATED AREAS



Community Name	Community Number
CENTRAL, TOWN OF	450235
CLEMSON, CITY OF	450238
EASLEY, CITY OF	450167
LIBERTY, CITY OF	450168
NORRIS, TOWN OF	450199
PICKENS COUNTY (UNINCORPORATED AREAS)	450166
PICKENS, CITY OF	450169
SIX MILE, TOWN OF	450178

This Preliminary FIS report only includes revised Floodway Data, Limited Detailed Flood Hazard Data and Flood Profiles. The unrevised Floodway Data, Limited Detailed Flood Hazard Data and Flood Profiles will appear in the final FIS report.

REVISED:

PRELIMINARY
DECEMBER 18, 2015

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
45077CV001B

NOTICE TO

FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) 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.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial Countywide FIS Effective Date: April 16, 2008

Revised Countywide FIS Effective Date: [TBD] – to add and change Base Flood Elevations and Special Flood Hazard Areas; to change zone designations; to update corporate limits and roads and road names; and to reflect updated topographic information.

This Preliminary FIS report only includes revised Floodway Data, Limited Detailed Flood Hazard Data and Flood Profiles. The unrevised Floodway Data, Limited Detailed Flood Hazard Data and Flood Profiles will appear in the final FIS report.

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FLOOD INSURANCE STUDY
PICKENS COUNTY, SOUTH CAROLINA AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This countywide Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Pickens County, South Carolina, including the Cities of Clemson, Easley, Liberty, and Pickens and the Towns of Central, Norris, and Six Mile; and the unincorporated areas of Pickens County (referred to collectively herein as Pickens County). The FIS aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

Please note that the Cities of Clemson and Easley are geographically located in Pickens and Anderson Counties. The Cities of Clemson and Easley are included in their entirety in this FIS report.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

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

For the Pickens County Unincorporated Areas FIS, January 19, 1982, the hydrologic and hydraulic analyses for this study were performed by the United States (U.S.) Army Corps of Engineers (USACE), Savannah District, for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. IAA-H-10-77, Project Order No. 24. This work, which was completed in February 1979, covered all significant flooding sources affecting Pickens County, with the exception of Middle Branch and Brushy Creek, which were studied as part of the FIS for the Town of Easley (FEMA, 1982[b]). The final coordination meeting was held on August 18, 1981, and was attended by representatives of FEMA, the study contractor, and the county.

For the City of Clemson FIS, February 1988, the hydrologic and hydraulic analyses for this study were performed by the U.S. Geological Survey (USGS) (the Study Contractor) for FEMA, under Inter-Agency Agreement No. EMW-85-E-1823, Project Order No. 4. This study was completed in February 1986.

For the City of Clemson FIS, March 2, 1993, the hydrologic and hydraulic analyses for this study were performed by Neel-Schaffer, Inc., as part of the Limited Map Maintenance Program, under Contract No. EMW-90-C-3129. FEMA reviewed and accepted these data for purposes of this revision.

For the City of Easley, formerly Town of Easley, FIS, January 19, 1982, the hydrologic and hydraulic analyses for this study were performed by the USACE, Savannah District, for FEMA, under Inter-Agency Agreement No. IAA-H-1077, Project Order No. 24. This work, which was completed in April 1979, covered all significant flooding sources affecting the City of Easley.

For the April 16, 2008, countywide FIS, the hydrologic and hydraulic analyses were performed by Watershed Concepts (the Study Contractor) for the State of South Carolina (Cooperating Technical Partner), under the South Carolina Flood Map Modernization Initiative Project No. P24- N085-MJ. This study was completed in December 2005.

For the [TBD], countywide FIS, the hydrologic and hydraulic analyses were prepared by AECOM for the South Carolina Department of Natural Resources (SCDNR) under Mapping Activity Statement FY12.22. The work in Pickens County was performed as a part of the larger Seneca Watershed study and is based on the Discovery Report for Seneca Watershed dated January 18, 2013 (FEMA, 2013). However, it should be noted some of the existing Zone A areas were updated and the reach lengths noted in the Discovery Report may have changed to take into account backwater conditions and streamline refinement. In Pickens County, hydrology and hydraulics were performed for approximately 9.3 miles on portions of Twelvemile Creek and Eighteen Mile Creek. The extents of these analyses can be found in Table 1, “Detailed Study Scope for Pickens County,” in Section 2.1, “Study Scope,” of this FIS Report. Additionally, the 1-percent annual chance floodplain boundaries for Lake Jocasse and Lake Keowee were updated based on more up-to-date topographic data. This work was completed in March 2015.

Base map information shown on the April 16, 2008, and the [TBD], FIRMs was provided in digital format by Pickens County, South Carolina.

The coordinate system used for the production of this FIRM is South Carolina State Plane (FIPSZONE 3900), North American Datum of 1983 (NAD 83). Corner coordinates shown on the FIRM are in latitude and longitude referenced to the South Carolina State Plane (FIPSZONE 3900) projection, NAD 83. Differences in the datum and spheroid used in the production of FIRMs for

adjacent counties may result in slight positional differences in map features at the county boundaries. These differences do not affect the accuracy of information shown on the FIRM.

1.3 Coordination

For the Pickens County Unincorporated Areas FIS, January 19, 1982, the South Carolina Appalachia Council of Governments (a State-authorized agency), county officials, and local residents were notified of the initiation of the study and were requested to furnish flood hazard data. Information was also requested from the U.S. Soil Conservation Service (SCS) and USGS. Streams requiring detailed and approximate study were identified at an initial coordination meeting attended by representatives of the SCS, USACE, FEMA, State of South Carolina, and Pickens County in September 1976. Results of the hydrologic analyses were coordinated with the SCS.

For the City of Clemson FIS, February 1988, a community meeting was held on December 10, 1984, to determine the areas of the community to be studied. Attending the meeting were representatives of FEMA, the Study Contractor, and community representatives. On February 26, 1987, the results of this FIS were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

For the City of Easley FIS, January 19, 1982, streams requiring detailed study were identified at a meeting attended by representatives of the study contractor, FEMA, and the Town of Easley in September 1976. Results of the hydrologic analyses were coordinated with the USACE, South Atlantic Division. The final coordination meeting was held on August 18, 1981, and was attended by representatives of FEMA, the study contractor, and the town.

For the April 16, 2008, countywide FIS, an initial Consultation Coordination Officer (CCO) meeting was held with representatives of SCDNR, FEMA, Pickens County, and the Study Contractor on November 3, 2004. Coordination with county officials and Federal, State, and regional agencies produced a variety of information pertaining to floodplain regulations, available community maps, flood history, and other hydrologic data.

On March 1, 2006, the results of the April 16, 2008, countywide FIS were reviewed and accepted at a final CCO meeting attended by representatives of the SCDNR, Study Contractor, FEMA, and the communities.

For the [TBD], countywide FIS, an initial Discovery meeting for the Seneca Watershed study was held on July 11, 2012, and attended by representatives from Anderson, Oconee, and Pickens Counties and the City of Clemson; as well as representatives from FEMA, SCDNR, USGS, USACE, the National Weather Service – Southeast River Forecast Center and the study contractors. The

Discovery Report, Seneca, 03060101, dated January 18, 2013, describes and summarizes the Discovery tasks that were conducted for the Seneca Watershed (FEMA, 2013).

The results of the [TBD], countywide FIS were reviewed at the final CCO meeting, referred to as the Preliminary DFIRM Community Coordination (PDCC) meeting, held on [TBD], wherein the results of this FIS were reviewed and accepted. Those who attended this meeting included [attendee list to be inserted after preliminary stage of study]. All comments and issues raised at that meeting have been addressed.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Pickens County, South Carolina and includes part of the Seneca Watershed, Hydrologic Unit Code 03060101.

The Seneca River is formed at the confluence of the Keowee River and the Little River in northern South Carolina, just downstream of Lake Keowee and flows into Lake Hartwell. Seneca River joins the Tugaloo River just downstream of Lake Hartwell to form the Savannah River. The Seneca watershed is located in the Blue Ridge and Piedmont physiographic regions along the Northwest border of South Carolina and North Carolina. Parts of the watershed are located in Anderson, Oconee and Pickens Counties in South Carolina and a small portion of the watershed is located in Jackson and Transylvania Counties in North Carolina. The watershed is largely rural with a small portion of urban area along Hembree Creek. In Pickens County, the Seneca Watershed cover approximately 335 square miles (sq. mi.) of the county (approximately 33 percent) and includes portions of the Cities of Clemson, Easley, and Pickens; and the Towns of Central, Liberty, Norris, and Six Mile (FEMA, 2013).

For the Pickens County Unincorporated Areas FIS, January 19, 1982, Town Creek, Twelvemile Creek, and Wolf Creek were studied in detail. Data for Middle Branch and Brushy Creek were taken from the Town of Easley Flood Insurance Study (FEMA, 1982[b]).

For the City of Clemson FIS, February 1988, flooding caused by overflow of Eighteenmile Creek, Twelvemile Creek Tributary, and Tributaries No. 1 and No. 2 were studied in detail.

For the City of Clemson FIS revision, March 2, 1993, streams studied by detailed methods were Tributary No. 1 and Tributary A. The study limits extend from U.S. Highway 123 upstream of Prince Ranier Drive along Tributary No. 1, and from the mouth upstream to Shaftsbury Road along Tributary A.

For the City of Easley FIS, January 19, 1982, floods caused by the overflow of Brushy Creek were studied in detail from approximately 600 feet upstream of the downstream corporate limits to approximately 100 feet upstream of the corporate limits at Pearson Road. Middle Branch was studied in detail from South Carolina Highway 148, southeast of the town, upstream to U.S. Highway 123. However, after completion of the detailed analysis of Middle Branch, it was decided to convert the reach from approximately 75 feet downstream of Laurel Road to U.S. Highway 123 to approximate study.

For the April 16, 2008, countywide FIS, the streams studied by detailed methods were Brushy Creek, Eighteenmile Creek, Eighteenmile Creek Tributaries 16 and 17, Middle Branch, and Middle Branch Tributaries 6A and 6B. A summary of limits of the detailed studied streams studied partially in detail is shown in Table 1, "Detailed Study Scope for Pickens County."

For the [TBD], countywide FIS, the streams studied by detailed methods as a part of the Seneca Watershed study were Twelvemile Creek and Eighteen Mile Creek. A summary of the limits of detailed studied streams are shown in detail in Table 1, "Detailed Study Scope for Pickens County."

Table 1 – Detailed Study Scope for Pickens County

Stream Name	Downstream Limit	Upstream Limit
	[TBD], Detailed Study Scope	
Twelvemile Creek	At approximately Belle Shoals Road	Approximately 145 feet upstream of Log House Road
Eighteenmile Creek	Approximately 2500 feet downstream of State Highway 28	Approximately 3740 feet upstream of Central Road
	April 16, 2008, Detailed Study Scope	
Brushy Creek	Approximately 500 feet downstream of Peoples Drive	Approximately 550 feet upstream of Anzio Street
Eighteenmile Creek	Approximately 230 feet downstream of Old Stagecoach Road	Approximately 0.39 mile upstream of Ross Avenue
Middle Branch	Pickens and Anderson County line	Approximately 170 feet upstream of Calhoun Memorial Highway

Occasionally streams names change from previous studies. The following tabulation shows streams that have a different name from a previous study.

Community	Old Stream Name	New Stream Name
City of Clemson	Tributary No. 1	Eighteenmile Creek Tributary 1
City of Clemson	Tributary No. 2	Eighteenmile Creek Tributary 2
City of Clemson	Tributary A	Eighteenmile Creek Tributary A

Numerous flooding sources in the county were studied by limited detail methods in the April 16, 2008, and [TBD], countywide study. Limited detail analyses were used to study those areas outside of municipalities or with minimal development. Base Flood Elevations (BFE's) have been placed on the FIRM panel for flooding sources studied by limited detail methods. The scope and methods of study were proposed to, and agreed upon, by FEMA and Pickens County.

2.2 Community Description

Pickens County is located in northwestern South Carolina, in the Piedmont region of the Blue Ridge Mountains. The county is bordered on the west by Oconee County along a series of privately and federally funded lakes and Keowee River. Lake Jocassee and Lake Keowee were developed by Duke Power Company; Hartwell Lake was developed by the USACE. On the north, the county is bordered by Transylvania County, North Carolina, and, along South Saluda River, by Greenville County; on the east, by Greenville County along the Saluda River; and, on the southeast, by Anderson County. The City of Greenville lies approximately 6 miles east of the Pickens-Greenville County limits. The City of Anderson lies approximately 18 miles southeast of the Pickens-Anderson County limits. The incorporated areas in the county include the Towns of Central, Norris, and Six Mile, and the Cities of Clemson, Easley, Liberty, and Pickens.

Pickens County is located in the middle of what was previously scenic Cherokee Indian country. In 1800, a portion of the Indian country was separated into an area that contained the present Anderson, Oconee, and Pickens Counties. After the Civil War, as settlers moved into the area and established farms and communities, the land was further divided, and a portion of it became known as Pickens County.

Data released by the U.S. Bureau for the 2010 U.S. Census reported the total population of Pickens County to be approximately 119,224 (U.S. Census Bureau, 2010[a]). This in an increase in population in the county from approximately 110,757 reported at the 2000 U.S. Census (FEMA, 2008).

Town Creek, a tributary of Twelvemile Creek, lies north of the Town of Pickens and drains an area of approximately 16.9 square miles. Wolf Creek, also a tributary of Twelvemile Creek, lies to the south of the Town of Pickens and drains

an area of approximately 14.4 square miles above South Carolina Highway 8. Twelvemile Creek, which lies to the west of the City of Pickens, is the principal stream in the study area and drains an area of 80.3 square miles above U.S. Highway 267.

Middle Branch, a tributary of Big Brushy Creek, originates in the City of Easley just north of the Southern Railway tracks near the eastern edge of the city. The stream generally flows southerly. Brushy Creek, a tributary of Big Brushy Creek, originates in Easley just south of the Southern Railway tracks near the center of the city. The stream generally flows southeasterly.

Soils in Pickens County are predominately well-drained sandy loams and clay loams. These soils belong to six basic associations:

Edneyville-Porters-Hayesville
Ashe-Saluda-Stony
Pacolet-Grover-Hiwassee
Cecil-Hiwassee-Madison
Cecil-Madison-Pacot
Toccoa-Chewacla

Income within the county is mainly derived from textile manufacturing and agriculture. In the lower portion of the county, the economy depends heavily on employment by Clemson University. Principal enterprises of the county are livestock, forest products, grains, soybeans, and poultry.

The climate in the central part of Pickens County is influenced by the Blue Ridge Mountains to the north. The average high temperature is approximately 72°F, with average lows of approximately 48°F. The summers are moderated by the elevation of the area, which averages approximately 1100 feet. The average annual temperature is 60°F. The average annual precipitation for the area is approximately 53.4 inches (U.S. Climate Data, 2010). Precipitation is fairly consistent throughout the year, with the months of December through March experiencing the most (U.S. Climate Data, 2010).

Most development is occurring in central and southern Pickens County. Floodplain areas are predominantly undeveloped.

City of Clemson

The City of Clemson is located in the southernmost section of Pickens County with a small area extending into Anderson County. Both counties are located in northwestern South Carolina. Clemson is bordered on all sides by the unincorporated areas of Pickens County except on the southeast where the city is bounded by the unincorporated areas of Anderson County and the Town of Pendleton. The major highways serving the City of Clemson are U.S. Routes 76

and 123, and State Routes 28, 93, and 133. The Norfolk Southern Railway also serves Clemson.

Data released by the U.S. Bureau for the 2010 U.S. Census reported the total population of the City of Clemson to be approximately 13,905 (U.S. Census Bureau, 2010[b]). This in an increase in population in the county from approximately 11,939 reported at the 2000 U.S. Census (FEMA, 2008).

The economy for the City of Clemson depends heavily on Clemson University.

City of Easley

Easley is located in the northwestern section of South Carolina at the foothills of the Blue Ridge Mountains, in southeast Pickens County. U.S. Highway 123 and South Carolina Highways 8, 93, and 135 traverse the town; in addition, the Southern Railway runs through the center of the town. The City of Clemson lies approximately 18 miles southwest of the City Easley, and the City of Greenville lies approximately 6 miles to the east. Unincorporated areas of Pickens County surround the town.

The City of Easley was named in honor of General William King Easley, a scholar, who served with distinction during the Civil War. General Easley was responsible for changing the routing of the Atlanta and Charlotte Air Line Railroad (Southern Railway) so it ran through Pickens County in lieu of Anderson County. However, Robert Elliott Holcombe is considered to be the "father" of the City of Easley and the person chiefly responsible for its founding. Several months after the railroad was completed, Holcombe was authorized to build a railroad depot on his land at his own expense; he also built a dwelling and a storeroom. Holcombe also hired a surveyor to lay out, within a 1-square-mile area, a number of residential and business lots and several streets.

When the State legislature convened in December 1873, the citizens residing within the surveyed area applied for a charter for the town, naming it after General William King Easley. The charter was granted in January 1874; it embraced an area of 1 square mile, with the railroad depot located in the center of the city. Easley began its first real growth when the Easley Oil Mill was chartered in 1889. It was the first corporation organized in Pickens County. In 1899, Easley's first textile mill went into operation. Today there are nine textile mills in operation in the Easley area.

In recent years, many industries have chosen to locate plants in the Easley area because of the availability of excellent industrial sites, ample labor resources, and major land transportation and shipping arteries. Easley's major industries consist of textile mills, a textile machinery manufacturer, and a custom plastics manufacturer. Easley's major development has taken place in the central portion of the town, whereas flood plains remain predominately undeveloped.

Data released by the U.S. Bureau for the 2010 U.S. Census reported the total population of the City of Easley to be approximately 19,993 (U.S. Census Bureau, 2010[c]). This in an increase in population in the county from approximately 17,754 reported at the 2000 U.S. Census (FEMA, 2008). The City of Easley remains the largest community in Pickens County.

Brushy Creek, a tributary of Big Brushy Creek, originates within Easley just south of the Southern Railway tracks near the center of the city. The stream flows generally southeasterly and meanders in and out of the corporate limits several times. Within the study area, the creek drains an area of approximately 1.4 square miles. Middle Branch, also a tributary of Big Brushy Creek, originates within Easley just north of the Southern Railway tracks near the eastern edge of the City. The stream flows generally southerly and runs approximately parallel to Brushy Creek. Within the study area, the creek drains an area of approximately 2.9 square miles.

2.3 Principal Flood Problems

2013 left its mark on Pickens County and other parts of South Carolina, undermining dozens of roads and flooding neighborhoods from the mountains to the coast. However, due to the preceding drought, the heavy rains did not cause widespread damage. In 2013, parts of Pickens County received more than 60 inches of rain. In July 2013, torrential rains in Pickens County caused $200,000 worth of damage at the South Carolina Botanical Gardens at Clemson University. Approximately 8 inches of rain feel in about four hours on July 14, 2013, destroying trials and washing away plants. The storm washed away over 1,000 varieties of native plants in the Natural Heritage Garden. The rains also washed out several roads and caused sinkholes to form. A section of U.S. 178 was closed due to mud slides (Associated Press, 2013).

A review of the South Carolina Hazard Mitigation Plan (HMP) summarizes the notable flood events that took place across the state which included flash flooding due to summer storms, as well as flood events due to heavy rains. The HMP notes that from 2009 to 2011 there was one flood event but does not report any dollar amount for recorded property damage in Pickens County (The State of South Carolina, 2013). A review of the Pickens County Hazard Mitigation plan notes a flood event for the City of Easley on February 5, 2010, however no additional details are available (Pickens County, 2011).

As compiled from the previous FIS reports for jurisdictions within Pickens County, the history of flooding on the streams within the detailed study areas indicates that most flooding occurs during the spring. According to area residents, this is the season with the most violent weather.

Pickens County Unincorporated Areas

In Pickens County Unincorporated Areas minor spring flooding usually occurs once or twice a year on Twelvemile Creek, Town Creek, and Wolf Creek. However, flood damage is generally negligible because flooding is confined to low-lying pasturelands and woodlands that lie adjacent to the creeks. The floodwaters generally recede within 24 to 48 hours.

The USACE surveyed City of Easley, Pickens County, and Federal officials concerning historical flooding on Middle Branch and Brushy Creek in the vicinity of Easley. This survey revealed that only minor flooding has occurred, such as in the summer of 1976, when an intense summer storm caused a flood of unknown frequency that did no serious damage. Such intense storms may occur at any time, although most occur during the summer.

City of Clemson

A USGS gaging station was operated on Twelvemile Creek at State Route 137 near the Town of Liberty, South Carolina, from 1955 through 1964. A flood of 5,360 cubic feet per second (cfs) at an elevation of 834.41 feet National Geodetic Vertical Datum of 1929 (NGVD29) or 834.20 feet North American Vertical Datum of 1988 (NAVD88) was experienced on December 12, 1961. At the time this flood had a recurrence interval of 8 years.

City of Easley

According to interviews with town officials, minor flooding occurred on Middle Branch and Brushy Creek when the streams briefly overtopped their banks within the town during the summer of 1976. Flooding resulted from an intense summer storm whose flood frequency is not known. During the flood, fallen trees, brush, and other debris located in the streams restricted flood flows, thus increasing the depth of the flows. There were no reported flood damages to any homes in the areas.

A survey of town, county, and Federal officials concerning historical flooding in the town revealed that only minor flooding has occurred in Easley. Intense storms, like the one that caused the 1976 flood, may occur during any season of the year, although the majority occurs during the summer.

2.4 Flood Protection Measures

Pickens County Unincorporated Areas

Four SCS dams and reservoirs within the Pickens County portion of the Twelvemile Creek watershed serve as flood protection devices for the downstream areas. These structures are Dam No. 22, on Twelvemile Creek (flood

storage 1800 acre-feet); Dam No. 54A, on Wolf Creek (flood storage 2900 acre-feet); Dam No. 5, on a tributary of Twelvemile Creek (flood storage 399 acre-feet); and Dam No. 8, on a tributary of Twelvemile Creek (flood storage 207 acre-feet). In addition, the Town of Pickens has constructed a water-supply dam on Twelvemile Creek. However, this structure does not provide flood protection for the town or the county. The floodflow reductions that result from these dams and reservoirs were considered in this study.

North of Town Creek, in the upper part of the study area, a private levee protects the Singer Plant (Piedmont Die Casting Division) from potential flooding. The levee provides protection against the 1-percent annual chance flood.

Officials of the City of Easley have undertaken flood protection measures to reduce potential flood damages on Middle Branch by removing natural obstructions that impede flood flows. These obstructions include fallen trees, brush, and debris. Channel re-alignments have recently been made in the reach of Middle Branch between Crestview Road and U.S. Highway 123. This realignment carries Middle Branch west of Glenwood Lagoon, a sewage treatment facility for the town. A grass-covered embankment separates the creek from the lagoon and is capable of containing 0.2-percent annual chance flood-flows. The South Carolina Highway Department has enlarged drainage structures at various stream locations to decrease obstructions to flood flows.

City of Clemson

Two dikes located in Pickens County that contain Lake Hartwell are the only flood protection measures affecting the City of Clemson. These two dikes, referred to as the Clemson University Diversion Dams, provide flood protection from the 1-percent annual chance flood. According to a certification letter from the USACE dated December 21, 2005, the top of flood pool elevation for Hartwell Lake is 665.00 feet mean sea level (msl) and both dams are constructed to a top elevation of 680.00 feet msl.

City of Easley

City officials use the Pickens County, South Carolina and Incorporated Areas FIRMs for the City of Easley as a guide for issuing building permits. In addition, they have undertaken additional flood protection measures to reduce potential flood damages on Middle Branch by removing natural obstructions which impede flood flows. These obstructions include fallen trees, brush, and debris. Channel realignments have recently been made in the reach of Middle Branch between Crestview Road and U.S. Highway 123. These realignments carry Middle Branch west of Glenwood Lagoon, a sewage treatment facility for the town. A grass-covered embankment separates the creek from the lagoon and is capable of containing 0.2-percent annual chance flood flows. The South Carolina Highway Department has enlarged drainage structures at various stream locations in order

to decrease obstructions to flood flows. The city plans to continue its ongoing flood control improvements on other flood hazard streams.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods 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 once on the average during any 10-, 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-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent 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) in any 50-year period is approximately 40 percent (4 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.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting Pickens County.

Pickens County Unincorporated Areas FIS - January 19, 1982

Analyses of historic records are of little value in flood-frequency studies of ungaged watersheds. To overcome this problem in the determination of flows for the streams studied in detail, an application of synthetic storm precipitation to the USACE, Hydrologic Engineering Center (HEC) HEC-1 computer model, calibrated for the conditions of interest, was made (USACE, 1973[a]).

The procedure used to develop discharge-frequency estimates at the various sites on the streams in the study area consisted of computing the estimated peak runoff that would result from storms (rainfall) of a given recurrence interval. Data from the U.S. Weather Bureau Technical Paper No. 40 were utilized to generate the 10-, 2-, 1-, and 0.2-percent hypothetical 6-hour storms (U.S. Department of Commerce, 1961). The 500-year storm was determined by extrapolation of the rainfall-frequency curve developed from Technical Paper No. 40 and Engineering Manual 1110- 2-1411 (USACE, 1965).

The SCS method (U.S. Department of Agriculture [USDA], 1971) for computing precipitation loss rates for alternative watershed conditions was utilized in conjunction with the HEC-1 generalized rainfall runoff model to estimate the peak runoff that would result from various frequency storms (USACE, 1973[a]).

Loss rates determined by the SCS methods are characterized by curve numbers, which are a function of land use and soil characteristics. The subbasin response to precipitation excess is characterized by a unit hydrograph that is directly determined from basin "lag." Lagtime is computed as a function of the curve number, mean land surface slope within the subbasin, and the subbasin hydraulic length. The equation for lagtime is:

$$L = \frac{\ell^{0.8}(S+1)^{0.7}}{1900(y)^{0.5}}$$

Where:
L = Lag (in hours)
ℓ = Hydraulic length of watershed (in feet)
y = Average watershed land slope (in percent)
$S = \frac{1000}{CN'} - 10$
CN' = Hydrologic soil cover complex number

Engineering and hydrologic data on the four SCS flood-control reservoirs (Nos. 5, 8, 22, and 54A) were provided by the SCS. Flows were routed through the dams by the Modified Puls Method using the HEC-1 Hydrograph Routing Program. Sufficient data were available on Dam Nos. 22 and 54A to verify the SCS design storms for the respective structures and route them through the dams.

Discharge data for Middle Branch and Brushy Creek were taken from the FIS for Easley (FEMA, 1982[b]).

Peak discharge-drainage area relationships for Middle Branch, as well as Brushy, Town, Twelvemile, and Wolf Creeks are shown in Table 2, "Summary of Discharges."

City of Clemson FIS – February 1988

Discharges were computed using equations developed for rural streams by Whetstone (USGS, 1982) and adjusted for urbanization using equations developed by Sauer and others (USGS, 1983). Drainage area, streambed slope, imperviousness, storage, channel length, and basin development parameters were determined from topographic maps (USGS, 1980) and field inspection.

City of Clemson FIS Revision – March 2, 1993

The hydrologic analyses utilized rural peak discharge equations (USGS, 1982). Rural peak discharges were computed for the 10-, 2-, and 1-percent annual chance floods. The 0.2-percent annual chance peak discharge was determined by extending the flow frequency curve. The computed rural peak discharges were

adjusted to reflect urbanization (USGS, 1983).

City of Easley FIS - January 19, 1982

Analysis of historic records is of little value in flood-frequency studies for ungaged watersheds. To overcome this problem in determination of flows for the ungaged streams in Easley, a regional flood-frequency analysis (FEMA, 1982[b]; South Carolina State Development Board, Date Unknown; USGS, 1976[b]; WRC, 1976) was used to determine the discharge for the 10-, 2-, 1-, and 0.2-percent annual chance floods.

Streamflow records from a number of streams in the Piedmont Province with drainage areas smaller than 100 square miles were assembled. Care was taken to select streams as nearly similar in hydrologic characteristics as possible, such as similar vegetation cover, land use, topographic conditions, and geologic characteristics. The stations selected had similar rainfall and evapotranspiration regimes. It was felt that combining data from a number of watersheds would help reduce the uncertainty arising from short records if the records were sufficiently independent. Discharge-frequency relationships for these streams were established using the July 1972 versions of the USACE, HEC, computer program, HEC Program No. 723-X6-L2350, (USACE, 1972), and data from the following USGS stream gages:

Gage Station No.	Location	Drainage Area (Square Miles)	Number of Years of Record
2156300	Lawson's Fork Creek at Spartanburg, SC	65.2	10
2138500	Linville River at Branch, NC	67.2	37
2164000	Reedy River near Greenville, SC	48.6	34
2152100	First Broad River near Casar, NC	59.5	13
2142900	Long Creek near Paw Creek, NC	16.1	8
2157000	North Tyger River near Fairmont, SC	44.0	26
2152610	Sugar Branch near Boiling Springs, NC	1.49	5
2159600	Dutchman Creek near Pauline, SC	8.97	10
2146700	McMullen Creek at Sharon View Road near Charlotte, NC	6.98	12
2191970	Macks Creek Tributary No. 2 near Lexington, GA	1.77	15

April 16, 2008, Countywide Analyses

The hydrologic approaches used for the April 16, 2008, countywide FIS used the USGS regression equations for South Carolina (USGS, 1992; 1999; 2001).

There were three active or discontinued USGS stream gages on streams that flow through Pickens County. Flood frequency analyses were performed for the active gages on Saluda River (02162500) and Twelvemile Creek (02186000) using guidelines described in Bulletin 17B (WRC, 1981). Weighted discharge estimates were used in these analyses computed according to the methods described in USGS WRIR 02-4140 (USGS, 1999). Recurrence interval discharges published in WRIR 02-4140 (USGS, 1999) were used for the discontinued gage on Seneca River (02185500).

Gage Station No.	Location	Drainage Area (Square Miles)	Number of Years of Record
02162500	Saluda River near Greenville, SC	295	1942 - 2004
02185500	Seneca River near Newry, SC	455	1940 - 1961
02186000	Twelve Mile Creek near Liberty, SC	106	1955 - 2004

Several of the studied streams in Pickens County contained sufficient urban development to use a method to account for the effect of urbanization on peak discharges. The urban regression equations described in USGS Scientific Investigations Report 2004-5030 (USGS, 2001), results in discharge estimates for a significant number of streams in urbanized areas that are less than discharge estimates computed for rural areas with an equivalent drainage area. Further investigation indicated that the regression equations and methods described in USGS Water Resources Investigations Report 92-4040 (USGS, 1992) provided more reasonable results for urban streams in Pickens County.

[TBD], Countywide Analyses

The [TBD], countywide FIS, is the first-time watershed wide hydrologic analyses for Seneca Watershed have been conducted; there are no existing watershed-wide hydrologic analyses available. However, for counties within the Seneca Watershed, covered by the current scope, countywide and precountywide hydrologic analyses exist. In the September 29, 2011, FIS for Anderson County, South Carolina and Incorporated Areas (FEMA, 2011), the discharges were determined using rural and urban regression equations developed by the USGS, rainfall runoff models (HEC-1 and HEC-723-X6-L2350 and records from USGS stream gages. In September 11, 2009, FIS for Oconee County, South Carolina and Incorporated Areas (FEMA, 2009), the discharges were determined using rural and urban regression equations developed by the USGS and records from USGS stream gages. In April 16, 2008, FIS for Pickens County, South Carolina and Incorporated Areas (FEMA, 2008), the discharges were determined using

rural and urban regression equations developed by the USGS, rainfall runoff models (HEC-1 and HEC-723-X6-L2350) and records from USGS stream gages.

Discharges for the 10-, 2-, 1-, and 0.2-percent annual chance recurrence intervals for all streams studied by detailed and limited detailed methods were determined using USGS regression analyses. The calculations used the most recent edition of equations for both rural (USGS, 2009) and urban (USGS, 2004) streams.

The rural regression equations used in this study are presented below.

Magnitude and Frequency of Rural Floods in the Southeastern United States, 2006: Volume 3, South Carolina

$$Q_{50\%} = 10^{[0.0220(PCT_1)+0.0204(PCT_2)+0.0141(PCT_3)+0.0178(PCT_4)+0.0196(PCT_5)]} DA^{[0.649+0.00130(PCT_2)+0.00109(PCT_3)]} \quad (7)$$

$$Q_{20\%} = 10^{[0.0247(PCT_1)+0.0232(PCT_2)+0.0165(PCT_3)+0.0209(PCT_4)+0.0230(PCT_5)]} DA^{[0.627+0.00122(PCT_2)+0.00117(PCT_3)]} \quad (8)$$

$$Q_{10\%} = 10^{[0.0260(PCT_1)+0.0246(PCT_2)+0.0177(PCT_3)+0.0224(PCT_4)+0.0247(PCT_5)]} DA^{[0.617+0.00119(PCT_2)+0.00123(PCT_3)]} \quad (9)$$

$$Q_{4\%} = 10^{[0.0273(PCT_1)+0.0260(PCT_2)+0.0189(PCT_3)+0.0239(PCT_4)+0.0265(PCT_5)]} DA^{[0.606+0.00118(PCT_2)+0.00130(PCT_3)]} \quad (10)$$

$$Q_{2\%} = 10^{[0.0282(PCT_1)+0.0268(PCT_2)+0.0196(PCT_3)+0.0249(PCT_4)+0.0276(PCT_5)]} DA^{[0.600+0.00118(PCT_2)+0.00135(PCT_3)]} \quad (11)$$

$$Q_{1\%} = 10^{[0.0289(PCT_1)+0.0276(PCT_2)+0.0202(PCT_3)+0.0258(PCT_4)+0.0286(PCT_5)]} DA^{[0.594+0.00119(PCT_2)+0.00139(PCT_3)]} \quad (12)$$

$$Q_{0.5\%} = 10^{[0.0295(PCT_1)+0.0282(PCT_2)+0.0208(PCT_3)+0.0265(PCT_4)+0.0295(PCT_5)]} DA^{[0.589+0.00120(PCT_2)+0.00144(PCT_3)]} \quad (13)$$

$$Q_{0.2\%} = 10^{[0.0303(PCT_1)+0.0290(PCT_2)+0.0214(PCT_3)+0.0274(PCT_4)+0.0306(PCT_5)]} DA^{[0.583+0.00121(PCT_2)+0.00149(PCT_3)]} \quad (14)$$

Where:

$Q_{50\%}$, $Q_{20\%}$, . . .,$Q_{0.2\%}$ are the flows for floods with percent chance of exceedance of 50 percent, 20 percent, . . . , and 0.2 percent, in cubic feet per second;

PCT1, PCT2, PCT3, PCT4, and PCT5 are the basin percentages in hydrologic regions 1(Piedmont), 2(Blue Ridge), 3(Sand hills), 4(Coastal), and 5(Undefined) in percent; and DA is the drainage area, in square miles.

South Carolina's urban regression equations were used for basins that had more than 10 percent impervious area. These alternative USGS urban regression equations are valid for basins with a main channel length from 0.51 mile to 11.2 miles and impervious area from 10 to 40 percent. The equations used are shown as follows.

Urban flood recurrence interval (years)	Alternative urban regional regression equation
2	$41.6L^{1.47}\ 10^{0.0213IA}$
5	$58.8L^{1.50}\ 10^{0.0198IA}$
10	$69.9L^{1.51}\ 10^{0.0192IA}$
25	$82.3L^{1.53}\ 10^{0.0187IA}$
50	$90.3L^{1.55}\ 10^{0.0185IA}$
100	$97.2L^{1.56}\ 10^{0.0185IA}$
200	$103L^{1.58}\ 10^{0.0185IA}$
500	$111L^{1.60}\ 10^{0.0187IA}$

Where:

L = main channel length (miles) and IA = impervious area (percent)

Gage station 02187000 located at Seneca River near Anderson, SC was not considered for gage analysis as the flows were not required for Seneca River and the mapping will be done based on regulated stillwater elevation. The gage station 02186699 located at Eighteenmile Creek above Pendleton, SC was not considered for gage analysis as the performed PeakFQ-Flood Frequency Analysis gave under estimated flows. In addition, the gage station 02186699 was not considered in the USGS report (USGS, 2006) where the variance prediction values required for the gage analyses were not reported.

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 2, “Summary of Discharges”.

Table 2 – Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-percent	2-percent	1-percent	0.2-percent
Brushy Creek					
About 1,690 feet downstream of Peoples Drive	2.34	832	1,255	1,459	1,930
About 960 feet upstream of Peoples Drive	2.08	804	1,209	1,404	1,851
About 220 feet downstream of Pearson Road	1.60	787	1,170	1,351	1,756
About 170 feet downstream of Williams Avenue	1.15	745	1,096	1,259	1,611
About 780 feet upstream of Calhoun Memorial Highway	0.69	627	915	1,046	1,322
Eighteenmile Creek					
Just downstream of Excelsior Mill Road	46.75	4,268	6,635	7,618	10,080
Just downstream of North Mechanic Street	46.03	4,228	6,574	7,548	9,990
Approximately 0.1 mile upstream of North Mechanic Street	43.12	4,061	6,322	7,262	9,617
Just downstream of Central Road	42.19	4,007	6,239	7,168	9,495
Approximately 0.5 mile upstream of Central Road	41.2	3,948	6,151	7,068	9,365
Eighteenmile Creek Tributary A					
At Mouth	0.20	225	380	450	615
At Shaftsbury Road	0.14	190	315	375	530
Eighteenmile Creek Tributary 1					
At U.S. Highway 123	0.77	475	790	935	1,300
About 200 feet downstream of Ashley Road	0.69	475	785	925	1,270
Just downstream of Ashley Road	0.65	460	760	900	1,235
Just upstream of Ashley Road	0.45	360	595	700	965
About 1,000 feet downstream of Prince Ranier Drive	0.34	310	510	600	815
At Prince Ranier Drive	0.21	225	380	450	620

Table 2 – Summary of Discharges (continued)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-percent	2-percent	1-percent	0.2-percent
Eighteenmile Creek Tributary 2					
About 1,100 feet upstream of confluence of Eighteenmile Creek	2.8	N/A	N/A	2,130	N/A
Just downstream of Clarendon Drive	0.8	N/A	N/A	1,080	N/A
Eighteenmile Creek Tributary 16					
At confluence with Eighteenmile Creek	0.11	29	50	61	91
Eighteenmile Creek Tributary 17					
About 100 feet upstream of confluence with Eighteenmile Creek	0.03	129	204	240	325
Middle Branch					
At Pickens and Anderson County boundary	4.16	1,020	1,549	1,810	2,426
About 780 feet upstream of Sheffield Road	3.12	930	1,406	1,639	2,180
About 420 feet downstream of Crestview Road	1.97	808	1,211	1,405	1,844
About 1,280 feet downstream of Laurel Road	1.34	688	1,030	1,192	1,555
Middle Branch Tributary 6A					
At Pickens and Anderson County boundary	0.95	253	412	486	675
About 120 feet upstream of confluence of Middle Branch Tributary 6B	0.51	170	279	330	462
Middle Branch Tributary 6B					
At confluence with Middle Branch Tributary 6A	0.41	224	358	425	586

N/A = Not Applicable

Table 2 – Summary of Discharges (continued)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-percent	2-percent	1-percent	0.2-percent
Town Creek					
At Mouth	16.92	2,187	3,250	3,750	4,750
At U.S. Highway 178	13.68	1,938	2,879	3,322	4,208
At South Carolina Highway 8	11.26	1,734	2,577	2,973	3,766
Twelvemile Creek					
Approximately 1.2 miles downstream of Allgood Bridge Road	76.46	5,871	9,048	10,379	13,670
Approximately 0.5 mile downstream of Allgood Bridge Road	60.37	5,081	7,861	9,036	11,933
Approximately 1 mile downstream of Walhalla Highway	53.25	4,705	7,294	8,394	11,101
Just downstream of Walhalla Highway	52.24	4,650	7,212	8,300	10,979
Approximately 0.5 mile upstream of Walhalla Highway	37.07	3,764	5,872	6,780	9,005
Approximately 0.1 mile downstream of Shady Grove Road	36.26	3,713	5,792	6,691	8,889
Approximately 0.3 mile upstream of Reece Mill Road	34.16	3,578	5,589	6,459	8,587
Approximately 0.2 mile upstream of Red Hill Road	15.3	2,143	3,395	3,930	5,267
Approximately 0.5 mile upstream of Gravley Road	13.57	1,987	3,155	3,656	4,906
Approximately 0.3 mile downstream of Moorfield Memorial Highway	12.47	1,886	2,997	3,476	4,669
Just downstream of MOorfield Memorial Highway	9.08	1,543	2,466	2,866	3,863
Approximately 1.3 miles upstream of Moorfield Memorial Highway	7.93	1,415	2,267	2,638	3,562
Approximately 1.7 miles upstream of Moorfield Memorial Highway	6.95	1,300	2,088	2,433	3,289
Approximately 0.7 mile downstream of Ponderosa Road	6.01	1,184	1,905	2,223	3,010

Table 2 – Summary of Discharges (continued)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-percent	2-percent	1-percent	0.2-percent
Twelvemile Creek (continued)					
Just downstream of Ponderosa Road	3.59	872	1,416	1,652	2,248
Approximately 0.4 mile downstream of Log House Road	2.09	622	1,020	1,194	1,635
Just downstream of Log House Road	1.37	477	787	924	1,272
Twelvemile Creek Tributary					
Just upstream of Old Central Road	1.3	N/A	N/A	1,210	N/A
About 2,000 feet upstream of Old Central Road	1.0	N/A	N/A	1,020	N/A
Wolf Creek					
Downstream of Dam No. 54A	14.43	105[1]	162[1]	186[1]	1,845[1]
Upstream of Dam No. 54A	14.43	1,864	2,874	3,297	5,064
At U.S. Highway 178	13.10	1,890	2,809	3,241	4,105
Downstream of South Carolina Highway 90	8.14	1,442	2,142	2,472	3,131
At Pickens Railroad	6.10	1,223	1,817	2,096	2,655

N/A = Not Applicable

[1] Decrease in Discharge to Controlled Flow from Dam No. 54A

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of 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 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 this FIS in conjunction with the data shown on the FIRM.

Cross sections for the flooding sources studied by detailed methods were obtained from field surveys. All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry.

Channel roughness factors (Manning's “n”) used in the hydraulic computations were determined on the basis of field inspections of the channels and floodplain areas and are listed below.

Pickens County Unincorporated Areas FIS - January 19, 1982

The hydraulic analysis for Middle Branch and Brushy Creek was taken from the Flood Insurance Study for Easley (FEMA, 1982[b]).

Water-surface elevations (WSELs) of floods of the selected recurrence intervals were computed using the USACE, HEC, computer program, HEC-2 (USACE, 1976).

Cross section data for streams in the study area were obtained from topographic maps (USGS, 1957; 1961) and field surveys. All bridges and culverts were surveyed to obtain elevation data and structural geometry, to model conveyance, and to compute the significant backwater effects of such structures (USACE, 1959; 1974[a]; 1974[b]).

Roughness factors (Manning's “n”) for the computations were assigned on the basis of field inspection of the channel and flood plain of all streams studied in detail. These values were 0.080 for the overbanks and ranged from 0.012 to 0.040 for the channels.

Starting WSELs for the streams studied in detail were determined by the slope-area method.

City of Clemson FIS - February 1988

Cross sections were field surveyed and synthesized where hydraulically necessary using adjacent surveyed cross sections and topographic maps. Structural geometry for bridges and culverts was also obtained from field survey.

Channel and floodplain roughness factors (Manning's “n”) used in the hydraulic computations were chosen using engineering judgment based on field observations of the cross-sectional areas. Roughness values ranged from 0.043 to 0.070 for the channels and from 0.035 to 0.200 for the overbank areas.

WSELs were computed by WSPRO, a step-backwater computer program (U.S. Department of Transportation, 1986). WSELs upstream of culverts were computed by USGS programs (USGS, 1976[a]). These programs were used to route flow through culverts and to route flow over highway embankments.

The slope-conveyance method was used to determine the starting WSEL for all streams studied in detail. The analysis for Eighteenmile Creek was started about one mile downstream of the corporate limits to include the effect of a large fill

area.

Rather than using a computed 1-percent annual chance flood elevation, the flood elevation for Lake Hartwell was estimated to be 670 feet (NAVD88), below which the USACE easement regulations prohibit building of any sort. By comparison, the top of the power pool for Lake Hartwell is at 660 feet (NAVD88), the maximum flood control pool is at 665 feet (NAVD88), and the elevation of maximum surcharge is at 674 feet (NAVD88).

City of Clemson FIS Revision - February 3, 1993

WSELs of floods of selected intervals were computed through use of the USACE, HEC, HEC-2 step-backwater computer program (USACE, 1989). Cross-section data were obtained from field surveys.

Roughness coefficients (Manning's “n”) for Tributary No. 1 and Tributary A were determined from field reconnaissance. Values ranged from 0.013 to 0.07 in the channel and from 0.07 to 0.20 in the overbank areas.

City of Easley FIS - January 19, 1982

WSELs of floods of the selected recurrence intervals were computed utilizing the USACE, HEC, HEC-2 computer program (USACE, 1976).

Cross sections for the backwater analyses were field surveyed at structures and at selected intervals to model conveyance of the valleys, bridges, and culverts to compute the significant backwater effects of such structures. All bridges and culverts were surveyed to obtain elevation data and structural geometry (USGS, 1961; USACE, 1959 and 1976).

Roughness factors (Manning's “n”) used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and flood plain areas. Roughness values for Brushy Creek and Middle Branch were 0.080 for overbank areas and ranged from 0.025 to 0.040 for channels. The “n” values were used for all ranges of floods.

April 16, 2008, Countywide Analyeses

The hydraulic model used was the USACE, HEC, Hydraulic Engineering Center River Analysis System (HEC-RAS), version 3.1.2 (USACE, 2004).

Starting conditions for the hydraulic models were set to normal depth using starting slopes calculated from stream invert elevation values taken from the orthophoto-derived planimetric data or, where applicable, derived from the WSELs of existing effective flood elevations. Roughness factors (Manning's “n”) used in the hydraulic computations were based on field observations and are

shown in Table 3, “Summary of Roughness Coefficients.”

[TBD], Countywide Analyses

The [TBD], countywide FIS, is the first-time watershed-wide hydraulic analyses for Seneca Watershed have been conducted; there are no existing watershed-wide hydraulic analyses available. However, for counties within this Watershed Study covered by current scope of study, countywide and pre-countywide hydraulic analyses exist. Anderson County, South Carolina and Incorporated Areas FIS (FEMA, 2011), Oconee County, South Carolina and Incorporated Areas FIS (FEMA, 2009) and Pickens County, South Carolina and Incorporated FIS (FEMA, 2008) are available for reference.

Cross section geometries were obtained from Light Detection and Ranging (LiDAR) data provided by SCDNR and field surveyed for Enhanced Study streams. For Six and Twenty Creek and West Twenty Six Mile Creek, all structure openings were field measured.

Water surface elevations of the 10-, 2-, 1- and 0.2-percent annual chance flood events were computed using USACE computer program, HEC-RAS, version 4.1 (USACE, 2010). The hydraulic models were developed using recently acquired LiDAR land data, field measurements of hydraulic structure information, and updated hydrologic data.

Starting conditions for the hydraulic models were set to normal depth using starting slopes calculated from energy slope, or derived from the water surface elevations of existing effective hydraulic models.

For the streams studied by detail methods, roughness coefficients (Manning’s “n”) were chosen based on field survey photos and aerial imagery. The channel and overbank “n” values for the streams studied by detailed methods are shown in Table 3, “Summary of Roughness Coefficients.”

Table 3 – Summary of Roughness Coefficients

Stream	Channel "n"	Overbank "n"
Brushy Creek	0.042 – 0.043	0.060 – 0.150
Eighteenmile Creek	0.035 – 0 055	0.045 – 0.140
Eighteenmile Creek Tributary 16	0.048	0.060 – 0.150
Eighteenmile Creek Tributary 17	0.048	0.070 – 0.135
Middle Branch	0.041 – 0.046	0.060 – 0.160
Middle Branch Tributary 6A	0.045 – 0.046	0.065 – 0.150
Middle Branch Tributary 6B	0.045 – 0.046	0.050 – 0.150
Twelvemile Creek	0.035 – 0 055	0.045 – 0.140

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the FIRM (Exhibit 2).

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

3.3 Vertical Datum

All FIS reports and FIRMs 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. Until recently, the standard vertical datum in use for newly created or revised FIS reports and FIRMs was the NGVD29. With the finalization of NAVD 88, many FIS reports and FIRMs are being prepared using NAVD88 as the referenced vertical datum.

Flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. It is important to note that adjacent counties may be referenced to NGVD29. This may result in differences in base flood elevations across county lines.

Table 4, "Datum Shift Conversion factors for Pickens County, South Carolina," shows the values of the datum shift for the area of Pickens County, South Carolina.

Table 4 – Datum Shift Conversion factors for Pickens County, South Carolina

Quad Name	Corner	Latitude	Longitude	Conversion from NGVD29 to NAVD 88
Reid	SE	35.000	-82.875	-0.125
Eastatoe Gap	SE	35.000	-82.750	-0.177
Table Rock	SE	35.000	-82.625	-0.223
Cleveland	SE	35.000	-82.500	-0.249
Salem	SE	34.875	-82.875	-0.187
Sunset	SE	34.875	-82.750	-0.203
Pickens	SE	34.875	-82.625	-0.207
Dacusville	SE	34.875	-82.500	-0.269
Old Pickens	SE	34.750	-82.875	-0.187

Table 4 – Datum Shift Conversion factors for Pickens County, South Carolina (continued)

Quad Name	Corner	Latitude	Longitude	Conversion from NGVD29 to NAVD 88
Six Mile	SE	34.750	-82.750	-0.187
Liberty	SE	34.750	-82.625	-0.269
Seneca	SE	34.625	-82.875	-0.279
Average				-0.214

For supplementary information regarding conversion between the NGVD and NAVD, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS 12
National Geodetic Survey
SSMC-3 #9202
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3242

Temporary vertical monuments 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, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

To obtain current elevation, description, and/or location information for benchmarks shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor each FIS provides 1- percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2- percent annual chance flood elevations; delineations of the 1- and 0.2- percent annual chance floodplains; and a 1- percent annual chance floodway. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, and Floodway Data tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2- percent annual chance floodplain boundaries have been delineated using the flood elevations determined at each cross section.

For the [TBD], countywide FIS, LiDAR was provided by SCDNR and was used to develop the Digital Terrain Model for the hydraulic analysis and floodplain mapping for the study streams. The LiDAR was collected for SCDNR in 2011 (SCDNR, 2013). The data is available from SCDNR LiDAR Data Products website at:

http://www.dnr.sc.gov/GIS/lidar.html.

For the April 16, 2008, countywide FIS, the boundaries were interpolated between cross-sections using true color aerial photography and control points (DTM) with a contour interval of 2 feet and a scale of 1:200 along detailed streams and 1:400 everywhere else (South Carolina Geodetic Survey, 2002).

In the Pickens County Unincorporated Areas FIS, January 19, 1982, for each stream studied in detail, except Middle Branch and Brushy Creek, the boundaries of the 1- and 0.2-percent annual chance floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:62,500, enlarged to 1:12,000, with a contour interval of 20 feet (USACE, 1976). The 1- and 0.2-percent annual chance flood boundaries for Middle Branch and Brushy Creek were taken from the FIS for Easley (FEMA, 1982[b]).

In the City of Clemson Hill FIS, February 1988, the boundaries were interpolated between cross sections, using topographic maps at a scale of 1:24000, with a contour interval of 20 feet (USGS, 1980).

In the City of Clemson FIS revision, March 2, 1993, the boundaries were interpolated between cross sections, using topographic maps at a scale of 1:24000 with a contour interval of 20 feet (USGS, 1980).

In the City of Easley FIS, January 19, 1982, the boundaries were interpolated between cross sections, using topographic maps at a scale of 1:1,200, with a contour interval of 5 feet (Alster and Associates, Inc., 1976), with the exception of Brushy Creek, downstream of cross section C, where a topographic map enlarged from a scale of 1:62,500 to 1:6,000, with a contour interval of 20 feet, was used (USGS, 1980).

The 1- and 0.2-percent annual chance floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 1-percent annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 0.2-percent annual chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent annual chance floodplain boundaries are close together, only the 1-percent floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 1-percent floodplain boundary is shown on the FIRM (Exhibit 2).

4.2 Floodways

Encroachment on floodplains, such as 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, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent annual chance 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-percent annual chance flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this FIS report and on the FIRM was 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. Results of the floodway computations on detailed studied streams are tabulated for selected cross sections (see Table 5, “Floodway Data”). In cases where the floodway and 1-percent annual chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage and heightens potential flood hazards by further increasing velocities. A listing of stream velocities at selected cross-sections is provided in Table 5, “Floodway Data”. To reduce the risk of property damage in areas where the stream velocities are high, the community may wish to restrict development in areas outside the floodway.

Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplains will not cause more than a 1.0-foot increase in the BFEs at any point within the community.

The area between the floodway and 1-percent annual chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the base flood flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1, "Floodway Schematic."

For limited detailed studied streams, BFE computations have been compiled in Table 6, "Limited Detailed Base Flood Elevation Data". No floodways were computed for streams studied by limited detailed methods.

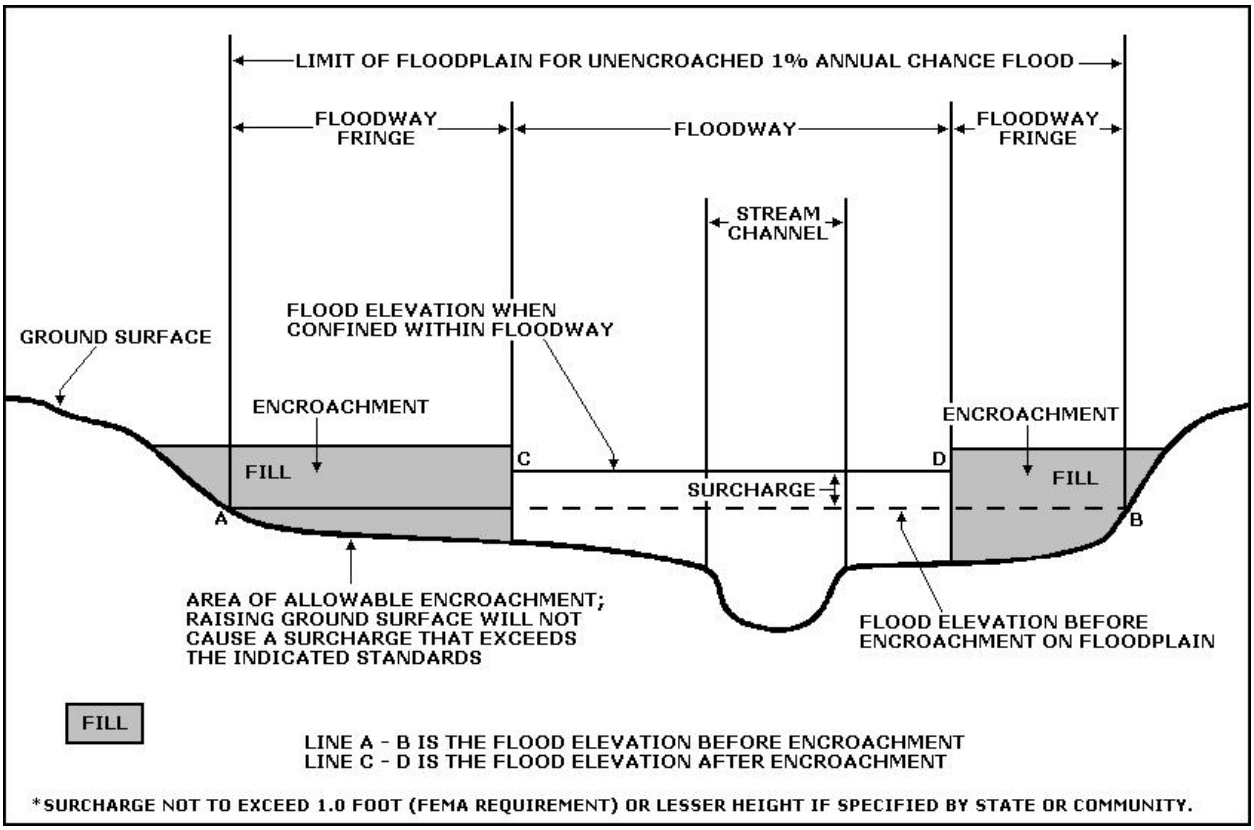

Figure 1 – Floodway Schematic

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NAVD88)	WITH FLOODWAY (FEET NAVD88)	INCREASE
Eighteenmile Creek								
A	43,283	260[2]	2,266	6.0	700.7	700.7	700.7	0.0
B	44,177	750[2]	5,544	3.9	701.8	701.8	701.8	0.0
C	44,803	300[2]	2,076	7.1	701.9	701.9	702.0	0.1
D	45,393	181[2]	1,544	7.8	702.9	702.9	703.0	0.1
E	46,055	300[2]	2,494	6.1	704.5	704.5	704.5	0.0
F	46,942	364[2]	2,645	6.7	705.0	705.0	705.6	0.6
G	47,373	410[2]	3,109	5.0	705.8	705.8	706.4	0.6
H	48,500	516[2]	3,580	5.1	706.4	706.4	707.2	0.8
I	49,464	128[2]	942	9.5	707.1	707.1	707.9	0.8
J	50,341	275[2]	1,869	8.4	709.9	709.9	710.5	0.6
K	50,600	230[2]	1,491	8.9	710.5	710.5	711.0	0.5
L	50,822	310	2,829	5.8	713.2	713.2	713.3	0.1
M	51,579	475	4,234	4.6	713.5	713.5	714.0	0.4
N	52,819	625	4,821	3.5	713.8	713.8	714.6	0.8
O	54,426	675	3,832	4.7	714.5	714.5	715.5	1.0

[1] Stream distance in feet above confluence with Seneca River

[2] Width extends beyond county boundary

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

PICKENS COUNTY, SC
AND INCORPORATED AREAS

FLOODWAY DATA

EIGHTEENMILE CREEK (NEAR CLEMSON)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NAVD88)	WITH FLOODWAY (FEET NAVD88)	INCREASE
Twelvemile Creek								
A	98,417	149	1,391	13.5	871.3	871.3	872.3	1.0
B	99,287	175	1,947	10.9	875.3	875.3	875.4	0.1
C	100,576	440	5,022	6.6	877.4	877.4	877.6	0.2
D	101,410	151	1,968	10.4	877.5	877.5	877.9	0.4
E	102,417	132	1,988	7.7	878.9	878.9	879.5	0.6
F	103,946	305	3,847	7.0	881.0	881.0	881.8	0.8
G	105,337	544	5,129	5.4	881.7	881.7	882.6	0.9
H	106,924	125	1,310	13.2	882.8	882.8	883.6	0.8
I	107,737	210	2,541	7.3	886.4	886.4	886.7	0.3
J	109,463	172	2,364	7.5	887.6	887.6	888.2	0.6
K	110,627	262	3,324	6.5	888.8	888.8	889.3	0.5
L	111,823	390	4,309	5.7	889.5	889.5	890.2	0.7
M	113,061	622	5,568	4.9	890.0	890.0	890.8	0.8
N	114,269	717	7,334	3.4	891.2	891.2	892.2	1.0
O	116,193	513	4,163	5.5	891.9	891.9	892.8	0.9
P	117,740	700	3,783	6.4	893.2	893.2	894.1	0.9
Q	118,420	560	4,154	6.7	894.8	894.8	895.2	0.4
R	120,077	800	5,046	5.9	895.7	895.7	896.6	0.9
S	121,482	730	4,307	5.3	897.0	897.0	897.8	0.8
T	122,737	380	2,291	7.8	899.3	899.3	900.0	0.7
U	124,231	425	3,703	4.4	904.5	904.5	904.6	0.1
V	126,824	70	870	12.2	906.2	906.2	906.6	0.4
W	127,903	85	980	10.4	909.5	909.5	910.0	0.5
X	128,848	130	1,780	6.9	912.1	912.1	912.7	0.6
Y	131,287	415	3,165	4.8	913.4	913.4	914.3	0.9
Z	132,417	109	1,084	11.9	915.3	915.3	915.8	0.5

1 Stream distance in feet above confluence with Lake Hartwell

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

PICKENS COUNTY, SC
AND INCORPORATED AREAS

FLOODWAY DATA

TWELVEMILE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NAVD88)	WITH FLOODWAY (FEET NAVD88)	INCREASE
Twelvemile Creek								
AA	133,481	200	2,090	4.5	918.2	918.2	919.0	0.8
AB	134,855	200	1,981	5.2	919.8	919.8	920.5	0.7
AC	135,907	145	1,709	2.6	920.2	920.2	921.2	1.0
AD	136,126	320	4,101	1.0	931.9	931.9	931.9	0.0
AE	139,189	574	8,556	0.4	932.0	932.0	932.0	0.0
AF	142,066	550	2,173	5.9	932.1	932.1	932.1	0.0
AG	142,827	225	1,125	9.4	934.4	934.4	935.0	0.6
AH	143,969	300	2,095	3.4	938.5	938.5	939.3	0.8
AI	145,426	49	508	7.7	942.5	942.5	943.1	0.6
AJ	146,985	130	877	6.5	945.2	945.2	945.7	0.5
AK	148,566	135	821	9.5	948.4	948.4	949.3	0.9
AL	149,915	230	1,155	8.0	951.3	951.3	952.2	0.9
AM	150,813	285	1,319	5.0	953.7	953.7	954.5	0.7
AN	151,249	305	1,179	6.6	954.6	954.6	955.2	0.6
AO	153,120	130	1,277	2.0	958.2	958.2	959.1	0.9
AP	153,575	750	14,905	0.2	982.2	982.2	982.3	0.1
AQ	156,446	550	8,731	0.8	982.2	982.2	982.3	0.1
AR	159,155	300	2,369	2.5	982.3	982.3	982.4	0.1
AS	160,813	180	767	5.8	983.3	983.3	984.0	0.7
AT	162,060	180	511	7.5	986.4	986.4	987.1	0.7
AU	163,358	175	706	6.1	991.2	991.2	991.9	0.7
AV	164,950	110	418	9.4	997.2	997.2	997.6	0.4
AW	166,021	60	282	8.3	999.7	999.7	1,000.3	0.6
AX	167,104	120	409	5.1	1,004.6	1,004.6	1,005.2	0.6
AY	168,054	125	327	8.1	1,010.9	1,010.9	1,011.0	0.1
AZ	168,758	150	672	3.6	1,017.4	1,017.4	1,018.1	0.7

[1] Stream distance in feet above confluence with Lake Hartwell

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

PICKENS COUNTY, SC

AND INCORPORATED AREAS

FLOODWAY DATA

TWELVEMILE CREEK

Table 6—Limited Detailed Base Flood Elevation Data

Cross Section[1]	Stream Station[2]	Flood Discharge *(cfs)*	1% Annual Chance Water-Surface Elevation *(feet NAVD 88)*
Camp Creek, cont.			
020	2,000	704	781.8
025	2,469	704	788.8
030	3,000	704	807.3
035	3,500	704	824.5
039	3,940	704	831.4
040	4,017	704	838.5
045	4,500	704	838.2
050	5,000	704	843.9
054	5,401	704	853.8
060	6,000	704	870.0
064	6,430	704	876.9
070	7,000	508	883.1
077	7,691	508	887.9
078	7,810	508	892.8
084	8,438	508	892.7
090	9,000	508	896.9
097	9,671	508	902.8
100	10,000	508	907.9
105	10,500	349	913.7
110	11,000	349	920.9
115	11,500	349	927.4
121	12,114	349	936.8
125	12,500	349	943.1
131	13,077	349	950.3
135	13,500	349	954.8
141	14,142	349	965.9
145	14,500	349	970.2
150	15,000	349	974.5
155	15,500	349	986.3
159	15,873	349	997.5
Cannon Creek			
010	1,000	1,552	889.5[3]
014	1,415	1,552	889.5[3]
015	1,522	1,552	889.5[3]
020	2,000	1,552	889.5[3]
026	2,573	1,552	889.5[3]
030	2,953	1,552	889.5[3]
031	3,074	1,552	889.5[3]
035	3,500	1,552	890.4
040	4,000	1,552	891.0
Carmel Creek			
000	18	962	825.1
003	267	962	825.7
003	343	962	826.8

[1]This table reflects all modeled cross-sections. Some cross-sections shown in this table may not appear on map.

[2]Feet above mouth.

[3]Elevations includes backwater effects.

Table 6—Limited Detailed Base Flood Elevation Data

Cross Section[1]	Stream Station[2]	Flood Discharge *(cfs)*	1% Annual Chance Water-Surface Elevation *(feet NAVD 88)*
Eastatoe Creek, cont.			
470	47,000	3,811	928.4
475	47,500	3,811	930.1
480	48,000	3,811	931.7
485	48,500	3,811	932.8
489	48,868	3,811	933.8
495	49,500	3,811	935.3
501	50,063	3,811	935.7
507	50,654	3,811	937.6
510	50,960	3,811	937.9
516	51,553	3,811	940.6
520	52,000	3,811	942.3
525	52,505	3,811	943.4
526	52,566	3,811	943.6
530	53,000	3,811	943.8
534	53,354	3,811	944.6
539	53,916	3,811	946.6
547	54,663	3,811	949.9
550	54,972	3,811	950.2
555	55,524	3,811	952.0
560	56,024	3,458	953.1
561	56,143	3,458	953.9
566	56,563	3,458	955.0
570	57,044	3,458	957.0
575	57,505	3,458	959.5
578	57,810	3,458	961.3
581	58,060	2,888	963.8
587	58,725	2,888	967.6
588	58,799	2,888	969.9
599	59,899	2,645	973.2
607	60,718	2,645	980.9
609	60,857	2,645	983.1
615	61,540	2,645	992.9
622	62,157	2,645	999.9
622	62,226	2,645	1,003.9
625	62,524	2,645	1,004.1
Eighteenmile Creek (near Clemson)			
120	11,967	5,328	715.0
124	12,448	5,328	715.8
130	13,013	5,328	717.4
135	13,500	4,893	718.4
141	14,067	4,893	719.9
146	14,634	4,751	720.1

[1]This table reflects all modeled cross-sections. Some cross-sections shown in this table may not appear on map.

[2]Feet above mouth.

Table 6—Limited Detailed Base Flood Elevation Data

Cross Section[1]	Stream Station[2]	Flood Discharge *(cfs)*	1% Annual Chance Water-Surface Elevation *(feet NAVD 88)*
Gregory Creek, cont.			
094	9,448	702	940.9
100	10,000	702	943.5
Hagood Branch			
003	288	928	934.6[3]
006	645	928	934.6[3]
008	768	928	935.5
011	1,131	928	935.8
022	2,153	928	939.4
025	2,498	928	940.9
029	2,898	928	945.5
030	2,980	928	946.8
032	3,152	928	947.7
035	3,523	928	953.9
040	4,007	928	960.6
044	4,364	928	962.9
047	4,736	928	963.4
052	5,236	928	971.9
057	5,672	928	976.5
058	5,845	928	979.7
059	5,930	928	982.9
061	6,073	928	983.7
Hamilton Creek			
001	108	1,214	828.2
005	500	1,214	830.7
010	1,000	1,214	839.4
015	1,500	1,214	844.9
020	2,000	1,214	846.5
025	2,500	1,214	847.9
030	3,000	1,214	848.6
037	3,705	1,214	851.7
038	3,794	1,214	855.1
045	4,500	1,214	857.6
050	5,000	1,214	861.1
054	5,440	1,214	862.7
060	6,000	1,214	864.4
066	6,599	1,214	867.1
067	6,699	1,214	870.2
070	7,015	1,214	871.0
075	7,500	1,214	871.4
081	8,149	1,000	873.3
088	8,757	1,000	875.1
089	8,879	1,000	878.1
095	9,531	1,000	878.5
099	9,897	1,000	880.8

[1]This table reflects all modeled cross-sections. Some cross-sections shown in this table may not appear on map.

[2]Feet above mouth.

[3]Elevations includes backwater effects.

TABLE 6—Limited Detailed Flood Hazard Data

Cross Section[1]	Stream Station[2]	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)
TWELVEMILE CREEK			
1698	169750	924	1021.27
1707	170667	564	1026.72
1719	171855	564	1034.93
1725	172458	564	1042.12
1730	172993	564	1048.26
1736	173554	564	1054.55
1738	173836	564	1060.81

[1] This table reflects all modeled cross sections. Some cross sections shown in this table may not appear on map.

[2] Feet above mouth.

Table 6—Limited Detailed Base Flood Elevation Data

Cross Section[1]	Stream Station[2]	Flood Discharge *(cfs)*	1% Annual Chance Water-Surface Elevation *(feet NAVD 88)*
Twelvemile Creek Tributary 12, cont.			
026	2,565	518	817.3
028	2,848	431	824.0
029	2,932	431	827.3
033	3,309	431	827.8
040	4,000	431	832.1
045	4,500	431	840.9
050	5,000	431	849.0
053	5,259	431	854.1
056	5,569	431	864.0
060	6,000	431	871.2
065	6,500	431	885.2
070	7,000	431	894.7
075	7,500	431	904.5
080	8,000	431	915.0
085	8,500	431	927.2
090	9,000	431	937.1
094	9,428	431	960.5
Twelvemile Creek Tributary 13			
001	90	448	912.6[3]
005	500	448	912.6[3]
010	1,000	448	912.6[3]
015	1,500	448	912.6[3]
017	1,741	448	913.3
019	1,880	448	926.0
020	2,000	448	926.0
024	2,384	448	926.0
Twelvemile Creek Tributary 14			
006	642	728	982.2[3]
011	1,121	728	982.2[3]
015	1,500	728	982.2[3]
019	1,889	728	982.2[3]
024	2,369	728	982.2[3]
031	3,109	728	982.2[3]
032	3,238	728	982.5
040	3,991	728	984.4
045	4,500	728	987.2
050	5,000	728	991.2
055	5,500	728	995.0
060	6,000	728	999.3
065	6,500	728	1,003.8
070	7,000	728	1,007.4
076	7,551	728	1,017.3
076	7,640	728	1,019.1
078	7,825	728	1,022.5

[1]This table reflects all modeled cross-sections. Some cross-sections shown in this table may not appear on map.

[2]Feet above mouth.

[3]Elevations includes backwater effects.

Table 6—Limited Detailed Base Flood Elevation Data

Cross Section[1]	Stream Station[2]	Flood Discharge *(cfs)*	1% Annual Chance Water-Surface Elevation *(feet NAVD 88)*
Twelvemile Creek Tributary 15			
001	81	446	982.9
006	563	446	982.9
010	1,000	446	982.9
015	1,500	446	984.7
020	2,000	446	992.9
025	2,500	446	996.5
030	3,000	446	998.8
Weaver Creek			
003	299	2,146	944.8
009	917	2,146	945.6
013	1,335	2,146	945.6
019	1,917	2,146	949.0
025	2,542	2,146	949.9
West Fork Gregory Creek			
000	8	739	938.1
004	396	739	938.2
010	1,000	739	942.3
013	1,317	739	944.7
016	1,558	739	956.5
021	2,098	739	956.4
Wolf Creek			
005	500	2,832	876.5[3]
010	1,000	2,832	876.5[3]
015	1,500	2,832	876.6
020	2,000	2,832	876.7
025	2,500	2,832	876.6
028	2,812	2,832	877.0
034	3,431	2,832	878.1
040	4,000	2,832	879.1
045	4,500	2,832	879.4
050	5,000	2,832	879.8
055	5,500	2,832	881.2
062	6,158	2,832	882.9
064	6,356	2,832	883.5
070	7,000	2,832	884.6
073	7,322	2,623	885.3
077	7,723	2,623	915.8
410	41,006	1,771	996.5
415	41,500	1,771	996.9
420	42,000	1,771	997.7
425	42,500	1,771	998.2
430	43,000	1,771	1,002.0
435	43,500	1,771	1,003.5
440	44,000	1,032	1,004.4

[1]This table reflects all modeled cross-sections. Some cross-sections shown in this table may not appear on map.

[2]Feet above mouth.

[3]Elevations includes backwater effects.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1- percent annual chance floodplains that are determined in the FIS report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1- percent annual chance floodplains that are determined in the FIS report by detailed methods. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2- percent annual chance floodplain, areas within the 0.2- percent annual chance floodplain, areas of 1- percent annual chance flooding where average depths are less than 1 foot, areas of 1-percent annual chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1- percent annual chance flood by levees. No BFEs or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent 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.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2- percent annual chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The countywide Flood Insurance Rate Map presents flooding information for the entire geographic area of Pickens County. Historical data relating to the precountywide maps prepared for each community are presented in Table 7, “Community Map History”.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Central, Town of*	N/A	N/A	N/A	
Clemson, City of	December 15, 1978	None	February 17, 1988	March 2, 1993
Easley, City of	June 28, 1974	April 30, 1976 March 24, 1978	April 19, 1982	
Liberty, Town of	June 7, 1974	None	June 25, 1976	
Norris, Town of*	N/A	N/A	N/A	
Pickens County (Unincorporated Areas)	February 14, 1975	December 23, 1977	July 19, 1982	
Pickens, City of	June 7, 1974	None	June 25, 1976	
Six Mile, Town of*	N/A	N/A	N/A	

*This community does not have a map history prior to the first countywide mapping

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

PICKENS COUNTY, SC AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

Information pertaining to revised and unrevised flood hazards for each jurisdiction within Pickens County has been compiled into this FIS. Therefore, this FIS supersedes all previously printed FIS reports and FIRMs for all of the incorporated and unincorporated jurisdictions within Pickens County and should be considered authoritative for the purposes of the NFIP.

The [TBD], countywide FIS, is a part of the larger Seneca Watershed study covering flooding sources in Anderson, Oconee and Pickens Counties, South Carolina. Additional materials related to the entire Seneca Watershed study may be obtained by accessing the Technical Data Support Notebook.

This is a multi-volume FIS. Each volume may be revised separately, in which case it supersedes the previously printed volume. Users should refer to the Table of Contents in Volume 1 for the current effective date of each volume; volumes bearing these dates contain the most up-to-date flood hazard data.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this FIS can be obtained by contacting FEMA, Federal Insurance and Mitigation Administration, Koger Center - Rutgers Building, 3003 Chamblee Tucker Road, Atlanta, Georgia 30341.

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