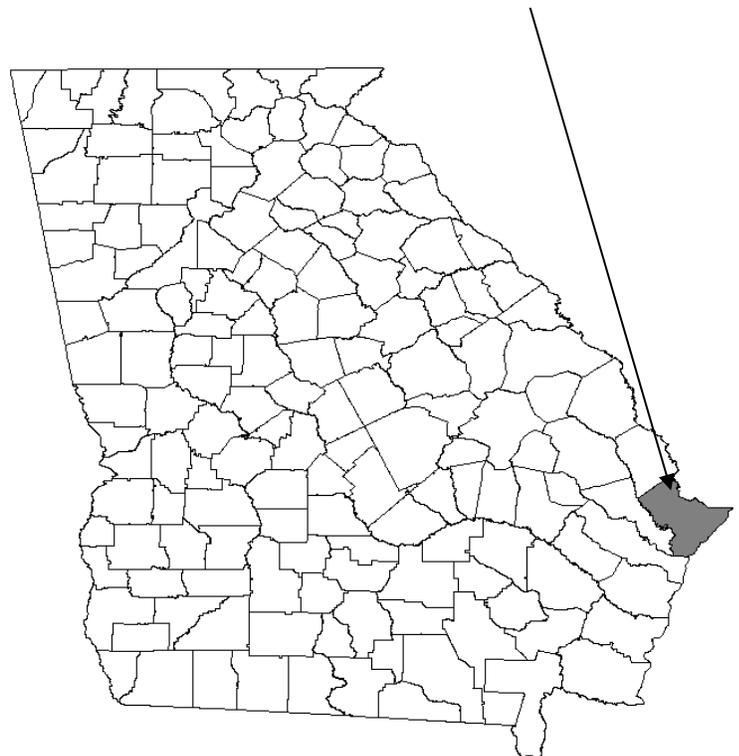


FLOOD INSURANCE STUDY



CHATHAM COUNTY, GEORGIA AND INCORPORATED AREAS

CHATHAM COUNTY



***Community
Name***

***Community
Number***

| | |
|--|--------|
| BLOOMINGDALE, CITY OF | 130452 |
| CHATHAM COUNTY (UNINCORPORATED AREAS) | 130030 |
| GARDEN CITY, CITY OF | 135161 |
| POOLER, CITY OF | 130261 |
| PORT WENTWORTH, CITY OF | 135162 |
| SAVANNAH, CITY OF | 135163 |
| THUNDERBOLT, TOWN OF | 130460 |
| TYBEE ISLAND, CITY OF | 135164 |
| VERNONBURG, TOWN OF | 135165 |

Effective: September 26, 2008



Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
13051CV000A

**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) report may not contain all data available within the Community Map Repository. Please contact the Community Map Repository for any additional data.

The Federal Emergency Management Agency (FEMA) may revise and republish part or all of this FIS report at any time. In addition, FEMA may revise part of this FIS report by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS report. Therefore, users should consult with community officials and check the Community Map Repository to obtain the most current FIS report components.

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

| <u>Old Zone(s)</u> | <u>New Zone</u> |
|--------------------|-----------------|
| A1 through A30 | AE |
| VI through V30 | VE |
| B | X |
| C | X |

Initial Countywide FIS Effective Date: September 26, 2008

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FLOOD INSURANCE STUDY CHATHAM COUNTY, GEORGIA AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Chatham County, including the Cities of Bloomingdale, Garden City, Pooler, Port Wentworth, Savannah, and Tybee Island; the Towns of Thunderbolt and Vernonburg; and the unincorporated areas of Chatham County (referred to collectively herein as Chatham County), and 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.

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.

The Digital Flood Insurance Rate Map (DFIRM) and FIS report for this countywide study have been produced in digital format. Flood hazard information was converted to meet the Federal Emergency Management Agency (FEMA) DFIRM database specifications and Geographic Information System (GIS) format requirements. The flood hazard information was created and is provided in a digital format so that it can be incorporated into a local GIS and be accessed more easily by the community.

1.2 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.

Precountywide Analyses

Information on the authority and acknowledgements for each jurisdiction included in this countywide FIS, as compiled from their previously printed FIS reports, is shown below in the following tabulation:

Bloomingtondale, City of: For the initial January 2, 1981, FIS report and the July 2, 1981 Flood Insurance Rate Map (FIRM) (FIA, 1981a), the hydrologic and hydraulic analyses were prepared by Post, Buckley, Schuh & Jernigan, Inc. (PBS&J), for the Federal Insurance Administration (FIA), under Contract No. H-4778. The work was completed in July 1979.

For the May 7, 2001, revision (FEMA, 2001), the hydrologic and hydraulic analyses for Pipe Makers Canal Tributary No. 2 were prepared by Braswell Engineering, Inc., for FEMA, under Contract No. EMW-96-CO-0021. The work was completed in May 1999.

Chatham County
(Unincorporated Areas): For the May 19, 1987, FIS report (FEMA, 1987a), the hydrologic and hydraulic analyses for the coastal flooding from the Atlantic Ocean were performed by PBS&J for FEMA, under Contract No. EMW-C-0947. The work was completed in February 1984.

All remaining flooding information was taken from the previous Type 10 (FIA, 1971) and Type 15 (FEMA, 1983) FIS reports.

Garden City, City of: For the May 19, 1987, FIS report (FEMA, 1987b), the hydrologic and hydraulic analyses were obtained from the FIS report for Chatham County, Georgia (Unincorporated Areas) (FEMA, 1987a).

Pooler, City of: For the March 30, 1981, FIS report (FIA, 1981b), the hydrologic and hydraulic analyses were performed by PBS&J, for the FIA, under Contract No. H-4778. The work was completed in August 1979.

Port Wentworth, City of: For the May 19, 1987 FIS report (FEMA, 1987c), the hydrologic and hydraulic analyses were obtained from the Type 19 (FEMA, 1987a) and Type 15 (FEMA, 1983) FIS reports for Chatham County, Georgia (Unincorporated Areas).

Savannah, City of: For the September 4, 1987 (FEMA, 1987d) FIS report, the hydrologic and hydraulic analyses for the storm surge were obtained from the Type 19 (FEMA, 1987a) FIS report for Chatham County, Georgia (Unincorporated Areas).

The riverine hydrologic and hydraulic analyses were obtained from the previous Type 19 FIS report for the City of Savannah, Chatham County, Georgia and Flood Plain Information Reports for Pipe Makers Canal, Dundee Canal and Salt Creek, Casey Canal-North, Casey Canal-South, Springfield Canal, Harmon Canal, and Wilshire Canal and Tributaries (USACE, 1968a; USACE, 1968b; USACE, 1972; USACE, 1969; USACE, 1974; USACE, 1970; USACE, 1971).

Thunderbolt, Town of: The hydrologic and hydraulic analyses for the July 2, 1987, FIS report (FEMA, 1987e), were obtained from the Type 19 FIS report for Chatham County, Georgia (Unincorporated Areas) (FEMA, 1987a).

Tybee Island, City of: The hydrologic and hydraulic analyses for the June 17, 1986, FIS report (FEMA, 1986), were obtained from the FIS report for Chatham County, Georgia (Unincorporated Areas) (FEMA, 1987a).

Vernonburg, Town of: The hydrologic and hydraulic analyses for the July 2, 1987, FIS report (FEMA, 1987f), were obtained from the FIS report for Chatham County, Georgia (Unincorporated Areas) (FEMA, 1987a).

This Countywide FIS Report

For this initial countywide FIS, PBS&J was contracted by Chatham County to complete the *Mapping Services to Update Flood Hazard Maps in Chatham County*, Contract No. QBS-06-8-4. Under this contract, PBS&J upgraded previously completed engineering reports for inclusion into the FEMA DFIRM and FIS for Chatham County. The previously completed engineering reports

contained detailed hydrology and hydraulic modeling for various flooding sources within Chatham County which were submitted to and approved by Chatham County. The flooding sources and previously completed engineering reports upgraded by PBS&J under this contract are presented in the following table:

| <u>Flooding Source</u> | <u>Engineering Report</u> | <u>Company</u> | <u>Date of Study</u> |
|------------------------|---|-------------------------------------|----------------------|
| Hardin Canal | Hardin Canal Re-Analysis Using ATLM Data | Thomas & Hutton Engineering Company | January 7, 2000 |
| Kingsway Canal | Kingsway Canal Design Study Report | Thomas & Hutton Engineering Company | July 2004 |
| Louis Mills Branch | Louis Mills Branch/Redgate Canal Engineering Analysis | Thomas & Hutton Engineering Company | March 27, 1998 |
| Pipe Makers Canal | Pipe Makers Canal Drainage Study, Supplemental Report | EMC Engineering | April 1999 |
| Placentia Canal | Placentia Canal Concept Design Shell Road to Tide Gate | Hussey, Gay, Bell, & DeYoung, Inc. | May 1996 |
| Quacco Canal | Quacco/Regency Park Drainage Improvements Alternatives Report | Thomas & Hutton Engineering Company | November 2005 |
| Rahn Dairy Canal | Redgate/Rahn Dairy Canal Design Study Report | Thomas & Hutton Engineering Company | July 2004 |

The hydrologic and hydraulic analyses for Black Creek and Black Creek Tributary No. 2 were reviewed and incorporated by PBS&J, for the Georgia Department of Natural Resources (DNR), under Contract No. EMA-2005-CA-5211, with FEMA. The work was completed in July 2007.

The flooding sources incorporated by PBS&J under Contract No. DR912 with the City of Savannah are listed in the following table:

| <u>Flooding Source</u> | <u>Study Contractor</u> |
|--|---|
| Casey Canal | EMC Engineering |
| Chippewa Canal | USACE |
| Coffee Bluff Basin | Hussey, Gay, Bell, & DeYoung, Inc. |
| Colonial Oaks Canal | EMC Engineering |
| Colonial Oaks Canal Tributary No. 1 | EMC Engineering |
| Colonial Oaks Canal Tributary No. 1.1 | EMC Engineering |
| Evergreen Cemetery Tributary | USACE |
| Fell Street Basin | EMC Engineering |
| Harmon Canal | USACE |
| Little Ogeechee River Tributary | Kimley - Horn |
| Springfield Canal | Thomas & Hutton Engineering Company and PBS&J |
| Springfield Canal Tributary A | Thomas & Hutton Engineering Company |
| Tributary to Little Ogeechee River Tributary | Kimley - Horn |
| Wilshire Canal | Thomas & Hutton Engineering Company |
| Wilshire Canal Tributary A | Thomas & Hutton Engineering Company |
| Wilshire Canal Tributary A-1 | Thomas & Hutton Engineering Company |
| Windsor Forest Canal East | EMC Engineering |
| Windsor Forest Canal Tributary | EMC Engineering |

Flooding Source

Study Contractor

Windsor Forest Canal Tributary No. 2
Windsor Forest Canal Tributary No. 3
Windsor Forest Canal West

EMC Engineering
EMC Engineering
EMC Engineering

Base map information shown on the Flood Insurance Rate Map (FIRM) was provided for Chatham County and captured at a resolution of 1 foot per pixel. The projection used in the preparation of this map is Georgia State Plane East (FIPS zone 1001). The horizontal datum is North American Datum 1983.

1.3 Coordination

An initial meeting is held with representatives from FEMA, the community, and the study contractor to explain the nature and purpose of a FIS, and to identify the streams to be studied or restudied.

Precountywide Analyses

The initial and final meeting dates for previous FIS reports for Chatham County and its communities are listed in the following tabulation:

| <u>Community</u> | <u>FIS Date</u> | <u>Initial Meeting</u> | <u>Final Meeting</u> |
|--|--------------------------------|---------------------------|-----------------------|
| Bloomington, City of | January 2, 1981 May 7, 2001 | May 1978 July 1, 1999* | August 27, 1980 ** |
| Chatham County (Unincorporated Areas) | May 19, 1987 | June 22, 1982 | November 21, 1985 |
| Garden City, City of | May 19, 1987 | ** | November 19, 1985 |
| Pooler, City of | March 30, 1981 | May 1978 | August 27, 1980 |
| Port Wentworth, City of | May 19, 1987 | ** | November 19, 1985 |
| Savannah, City of | September 4, 1987 | ** | November 21, 1985 |
| Thunderbolt, Town of | July 2, 1987 | ** | November 19, 1985 |
| Tybee Island, City of | June 17, 1986 | ** | November 20, 1985 |
| Vernonburg, Town of | July 2, 1987 | ** | November 22, 1985 |

*Notified by a letter

** Data not available

This Countywide FIS Report

For this initial countywide FIS, the initial meeting was held on September 29, 2004, and attended by representatives of FEMA, the Georgia DNR, PBS&J, and the communities. The final meeting was held on November 7, 2007, and attended by representatives of FEMA, the Georgia DNR, PBS&J, and all the communities except for the Town of Vernonburg. All problems raised at the meeting have been addressed.

2.0 **AREA STUDIED**

2.1 Scope of Study

This FIS covers the geographic area of Chatham County, Georgia, including the incorporated communities listed in Section 1.1. The areas studied by detailed methods were selected with priority given to all known flood hazards and areas of projected development or proposed construction.

Precountywide Analyses

The following streams were studied by detailed methods in Chatham County:

| | |
|---------------------------------------|--|
| Atlantic Ocean | Pipe Makers Canal Tributary No. 2 |
| Black Creek | Salt Creek Tributary |
| Black Creek Tributary No. 2 | Savannah River |
| Casey Canal | Springfield Canal |
| Chippewa Canal | Springfield Canal Tributary A |
| Colonial Oaks Canal | St. Augustine Creek |
| Colonial Oaks Canal Tributary No. 1 | St. Augustine Creek Tributary |
| Colonial Oaks Canal Tributary No. 1.1 | Tributary to Little Ogeechee River Tributary |
| Hardin Canal | Wilshire Canal |
| Harmon Canal | Wilshire Canal Tributary A |
| Kingsway Canal | Wilshire Canal Tributary A-1 |
| Little Ogeechee River | Windsor Forest Canal East |
| Little Ogeechee River Tributary | Windsor Forest Canal Tributary |
| Louis Mills Branch | Windsor Forest Canal Tributary No. 2 |
| Ogeechee River | Windsor Forest Canal Tributary No. 3 |
| Pipe Makers Canal | Windsor Forest Canal West |

The limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2).

For the May 19, 1987, FIS report for Chatham County, Georgia (Unincorporated Areas), the areas studied by detailed methods were selected based on the extent and validity of available existing hydrologic and hydraulic data. A detailed coastal flooding analysis of the Atlantic Ocean was performed on the complete coastline of Chatham County.

This Countywide Analyses

For this initial countywide FIS, the areas studied by detailed methods were selected based on the extent and validity of available existing hydrologic and hydraulic data.

The following streams were studied by detailed methods as part of this countywide revision:

| <u>Stream</u> | <u>Reach Limits</u> |
|--|--|
| Black Creek | From its confluence with Savannah River to approximately 11,540 feet upstream of Augusta Road / State Highway 30 / 21 |
| Black Creek Tributary No. 2 | From its confluence with Black Creek to approximately 2,980 feet upstream of Saussy Road |
| Chippewa Canal | From its confluence with Harmon Canal to approximately 1,060 feet upstream of Mall Boulevard |
| Colonial Oaks Canal | From 420 feet downstream of Coffee Bluff Road to Briarcliff Circle |
| Colonial Oaks Canal Tributary No. 1 | From its confluence with Colonial Oaks Canal to approximately 660 feet upstream of Rockingham Road |
| Colonial Oaks Canal Tributary No. 1.1 | From its confluence with Colonial Oaks Canal Tributary No. 1 to approximately 310 feet upstream of Stillwood Drive |
| Hardin Canal | From U.S. Highway 17 / Atlantic Coastal Highway / Ogeechee Road to approximately 1,180 feet upstream of Osteen Road |
| Harmon Canal | From the confluence with Vernon River to approximately 600 feet upstream of West Montgomery Cross Road / State Highway 204 |
| Kingsway Canal | From its confluence with Vernon River to approximately 1,180 feet upstream of Kings Way |
| Little Ogeechee River Tributary | From Little Neck Road to approximately 3,120 feet upstream of Middle Landing Road |
| Louis Mills Branch | From its confluence with South Springfield Canal to approximately 1,980 feet upstream of Marshall Avenue |
| Pipe Makers Canal | From its confluence with Savannah River to U.S. Highway 80 / State Highway 17 / 26 |
| Placentia Canal* | From its confluence with Wilmington River to Bona Bella Avenue |
| Quacco Canal* | From the Atlantic Coastal Highway / State Highway 25 / U.S. Highway 17 to Quacco Road |
| Rahn Dairy Canal* | From its confluence with Salt Creek to Buckhalter Avenue |
| Tributary to Little Ogeechee River Tributary | From its confluence with Little Ogeechee River Tributary to approximately 3,300 feet upstream of Middle Landing Road |
| Windsor Forest Canal East | From its confluence with Windsor Forest Canal West to approximately 710 feet upstream of Deerfield Road |

* Flooding controlled entirely by the Atlantic Ocean

| <u>Stream</u> | <u>Reach Limits</u> |
|--------------------------------------|---|
| Windsor Forest Canal Tributary | From its confluence with Windsor Forest Canal West to approximately 2,980 feet upstream of the confluence |
| Windsor Forest Canal Tributary No. 2 | From its confluence with Windsor Forest Canal East to approximately 390 feet upstream of Winwood Place |
| Windsor Forest Canal Tributary No. 3 | From its confluence with Windsor Forest Canal East and Colonial Oaks Canal to approximately 410 feet upstream of Windsor Road |
| Windsor Forest Canal West | From Thorny Bush Road to approximately 3,410 feet upstream of Roger Warlick Drive |

For this countywide revision, reaches of streams that have been studied by detailed methods were selected for redelineation based on more recent topography. Chatham County provided PBS&J with countywide digital GIS topographic data dated August 2001 (Thomas & Hutton, 2001). The topographic data was provided as a Digital Elevation Model (DEM) in raster grid format and the elevation data in the North American Vertical Datum of 1988 (NAVD). The DEM was created from 1-foot contour data, with a vertical accuracy of 6 inches, generated from a countywide airborne LIDAR survey completed in 1999. The following streams were redelineated as part of this countywide revision:

| <u>Stream</u> | <u>Reach Limits</u> |
|-------------------------------|---|
| Casey Canal | From approximately 2,600 feet downstream of East Montgomery Cross Road to East Victory Drive / U.S. Highway 80 / State Highway 26 |
| Coffee Bluff Basin* | From its confluence with Vernon River to approximately 1,080 feet upstream of Bordeaux Lane |
| Evergreen Cemetery Basin | From Mitchell Street to approximately 1,600 feet upstream of Mitchell Street |
| Fell Street Basin | From approximately 2,050 feet upstream of its confluence with Savannah River to approximately 500 feet upstream of Tuten Avenue |
| Springfield Canal | From Louisville Road to approximately 2,700 feet upstream of Derenne Avenue / Highway 516 |
| Springfield Canal Tributary A | From its confluence with Springfield Canal to Ogeechee Road / State Highway 25 / U.S. Highway 17 |

*A stillwater elevation was also developed in the basin model for Coffee Bluff Ponding Area.

Stream

Reach Limits

Wilshire Canal

From approximately 1,220 feet downstream of White Bluff Road to just upstream of Wilshire Boulevard

For this countywide FIS, the FIS report and FIRM were converted to countywide format, and the flooding information for the entire county, including both incorporated and unincorporated areas, is shown. Also, the vertical datum was converted from the National Geodetic Vertical Datum of 1929 (NGVD) to NAVD. In addition, the Transverse Mercator, State Plane coordinates, previously referenced to the North American Datum of 1927, are now referenced to the North American Datum of 1983.

Approximate analyses were used to study those areas having low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by FEMA and the communities.

The following tabulation presents Letters of Map Change (LOMCs) incorporated into this countywide study:

| <u>LOMC</u> | <u>Case Number</u> | <u>Date Issued</u> | <u>Project Identifier</u> |
|-------------|--------------------|--------------------|--|
| LOMR | 914074 | June 11, 1991 | Site-specific wave height analysis, in the vicinity of Navajo Road and Apache Street, just south of Abercorn Extension |
| LOMR | 92-04-070P | June 17, 1992 | Kemira Plant site south of Barnwell Island and the Savannah River, north of the Wilmington River, and west of Elba Island in the vicinity of Habersham Creek |
| LOMR | 95-04-325P | April 3, 1996 | Restudy of the Ogeechee River |
| LOMR | 00-04-045P | June 18, 2000 | Pipe Makers Canal Tributary No. 2, from its confluence with Pipe Makers Canal to approximately 5,175 feet upstream of its confluence |
| LOMR | 00-04-047P | June 18, 2000 | Pipe Makers Canal Tributary No. 2, from its confluence with Pipe Makers Canal to approximately 2,798 feet upstream of its confluence |
| LOMR | 00-04-051P | February 16, 2001 | Little Ogeechee River |
| LOMR | 03-04-063P | May 15, 2003 | Site-specific wave height analysis, approximately 1,000 feet southwest of the intersection of Apache Avenue and Fulton Road |

| <u>LOMC</u> | <u>Case Number</u> | <u>Date Issued</u> | <u>Project Identifier</u> |
|-------------|--------------------|--------------------|--|
| LOMR | 03-04-587P | March 30, 2004 | Site-specific wave height analysis, approximately 1,700 feet southwest of the intersection of State Route 359 and Rio Road |
| LOMR | 04-04-205P | June 3, 2004 | Site-specific wave height analysis on six areas just west of the intersection of State Route 359 and Rio Road |

The following tabulation lists streams that have names in this countywide FIS other than those used in the previously printed FIS reports for the communities in which they are located.

| <u>Community</u> | <u>Old Name</u> | <u>New Name</u> |
|--|--|--|
| Garden City, City of Bloomingdale, City of Chatham County (Unincorporated Areas) Pooler, City of Chatham County (Unincorporated Areas) | Savannah and Ogeechee Canal Tributary No. 2 | Dundee Canal Pipe Makers Canal Tributary No. 2 |
| | Lower Springfield Canal Tributary | Louis Mills Branch |

2.2 Community Description

Chatham County, approximately 438 square miles in area, is located in the southeastern portion of Georgia, bordering the Atlantic Ocean. The county is bordered by Bryan County to the southwest across the Ogeechee River; Liberty County to the south across St. Catherine's Sound; Effingham County to the northwest; Jasper County, South Carolina, to the northeast across the Savannah River; and, the Atlantic Ocean to the southeast. The Atlantic Ocean coastline accounts for approximately 30 miles of the county's border.

The 2000 population of Chatham County was reported to be 232,048 (U.S. Census Bureau, 2000). Savannah, the county seat and the largest city in the county, had a population of 131,510 in 2000. The county is served by several primary highways and by one major airport.

The climate in southeast Georgia is warm and temperate to subtropical. The average temperature in January is 63 degrees Fahrenheit (°F), and is 92°F in July. The average annual precipitation is 49.6 inches, with the maximum average monthly precipitation occurring in August (The Weather Channel, 2007).

The county is situated on a low coastal plain with much of its area consisting of tidal marshes and swamps. Elevations range from sea level at the coast to approximately 50 feet in the northwestern portion of the county.

The Savannah River (northern boundary) and the Ogeechee River (southern boundary) have drainage areas extending far beyond the limits of Chatham County. Other streams have chiefly tidal estuaries within the county and include the Little Ogeechee River, Vernon River, Bear River, Wilmington River, Bull River, and numerous tributaries to these. Main openings to the Atlantic Ocean are Ossabaw Sound and Wassaw Sound, both of which are wide and deep.

Much of the land situated in the floodplain is undeveloped marshland, with some residential, commercial, and industrial development.

2.3 Principal Flood Problems

Chatham County is subject to flooding caused by hurricanes and tropical storms. Major storms and hurricanes caused flooding in 1871, 1881, 1885, 1893, 1896, 1898, 1911, 1940, 1944, 1947, 1952, 1959, and 1979 (Dunn and Miller, 1964; National Climatic Center, 1979; Tannehill, 1956). The highest surges occurred during the hurricanes of 1881 and 1893, which caused flood heights up to 15 and 18 feet NAVD, respectively, in Savannah Beach (Dunn and Miller, 1964; Tannehill, 1956).

Georgia hasn't been hit by a major hurricane in 108 years, but hurricanes do not have to be fully developed or even make landfall in Georgia to wreak havoc. More recently, according to the Georgia Emergency Management Agency (GEMA), major storms and hurricanes caused flooding in 1989, 1994, 1996, 1999, and 2005 (GEMA, 2006).

The primary factors contributing to flooding in Chatham County are its openness to Atlantic Ocean surges and unfavorable bathymetry extending offshore. Many of the large streams near the coast have wide mouths and are bordered by extensive areas of low marsh. In addition, the terrain at the coast is generally too low to provide an effective barrier. The offshore ocean depths are shallow for great distances, generating a high Atlantic Ocean surge.

A storm history of Chatham County and its vicinity during the past 140 years is summarized below. Damage figures are determined in dollar values at the time of the storm. No attempt has been made to adjust these figures to current dollar values.

August 16 - 19, 1871

A tropical cyclone moved overland from Florida and caused damage along the Florida, Georgia, and South Carolina coasts. At Savannah, Georgia, the wind speed was 72 miles per hour (mph) from the north.

August 21 - 29, 1881

This storm reached hurricane intensity northeast of Puerto Rico on August 22. The lowest barometric pressure reading was 29.08 inches. The storm center

entered the coast south of Savannah on August 27. Damage in Savannah was estimated at \$1.5 million. Approximately 335 people were killed in and near the city. Nearly 100 vessels were wrecked along the Atlantic coast. Damage was very heavy on Tybee Island and other coastal islands near Savannah. The highest tide observed was estimated to reach an elevation of 15.6 feet NAVD at Savannah Beach, approximating a flood of at least 1-percent-annual-chance magnitude.

August 21 - 26, 1885

This storm moved inland north of Savannah on August 25. It caused heavy damage in the Carolinas. Total damage was estimated at about \$1.7 million. Damage inflicted by this storm in Georgia was relatively light.

August 15 - September 2, 1893

This major hurricane, which originated near the Cape Verde Islands, reached the Georgia coast on August 27. It was accompanied by a tremendous storm wave that submerged the islands along the Georgia and South Carolina coasts. Between 2,000 and 2,500 people lost their lives on the coastal islands and in the lowland between Tybee Island and Charleston. Property damage along the Atlantic coast was estimated at \$10 million. Nearly every building on Tybee Island was damaged and the railroad to the island was wrecked. The highest tide known to have occurred in the county was estimated to have a range of 16.1 to 18.6 feet NAVD at Savannah Beach.

September 22 - 29, 1896

This hurricane entered the northwestern Florida coast near St. Mark. Its center passed through southeastern Georgia and South Carolina on September 28 and 29. Hurricane winds persisted when the hurricane moved inland. Savannah recorded maximum winds of 75 mph. Damage in Savannah was estimated at \$1 million. Damage was also heavy on Tybee Island and over much of southeastern Georgia. Because the damaging hurricane wind was of a short duration near Chatham County and occurred during a low tide period, destruction caused by storm surge was relatively light compared with the hurricanes of 1881 and 1893.

August 30 - September 1, 1898

This hurricane entered the Georgia-South Carolina coast on August 30. Its center passed over Tybee Island. Winds on Tybee Island were estimated at 100 mph. The storm surges were not high enough to cause extensive damage; however, the hurricane was accompanied by very heavy rain, and the countryside was flooded for 100 miles around Savannah. Most roads and railroads were impassable because of high water.

August 23 - 30, 1911

The center of this hurricane entered the coast between Savannah and Charleston on August 28. A maximum wind of 88 mph from the northwest was recorded at Savannah. Damage in the Savannah area was remarkably low; however, property on Tybee Island was heavily damaged. Excessive rains accompanied the storm

and caused considerable damage to roads, crops, and other property throughout southern Georgia.

August 5 - 15, 1940

This was the first hurricane to affect Georgia since August 1911. Its center entered the South Carolina coast to the north of Savannah on August 11. The wind at Savannah reached 73 mph, and damage in the Savannah area was estimated at \$850,000. The highest tide observed at Beaufort, South Carolina, was estimated to be 11.5 feet NAVD. High tides of 6.5 and 5.5 feet NAVD were recorded at Fort Pulaski, Georgia, and at Fort Jackson, Savannah Harbor, Georgia, respectively.

October 12 - 23, 1944

This hurricane entered the gulf coast of Florida and moved northeastward across the peninsula. Its center crossed the east coast near Jacksonville, Florida, in a north-northeast direction and moved inland again near Savannah. The hurricane was downgraded to a tropical storm by the time it reached Georgia. The highest tide, 5.0 feet NAVD along the Georgia coast, was observed at Fort Pulaski, near the mouth of the Savannah River. The estimated damage in Georgia was \$500,000.

October 9 - 16, 1947

The center of this hurricane entered the Georgia coast just south of Savannah on October 15. At Savannah, the maximum wind speed was 77 mph, and the lowest barometric pressure was 28.77 inches. Heavy losses were sustained at Savannah and Savannah Beach, where more than 1,500 buildings were substantially damaged. Total damage in the coastal area was estimated at more than \$2 million. The highest tide, 7.0 feet NAVD, was recorded at Fort Jackson.

August 18 - September 2, 1952 (Hurricane Able)

Hurricane Able moved inland on August 30. Its center passed near Beaufort with maximum winds of approximately 100 mph. Damage from this storm was estimated at about \$2.8 million.

September 20 - October 2, 1959 (Hurricane Gracie)

Hurricane Gracie moved inland on September 29. Its center passed over the South Carolina coast near Beaufort. Wind gusts of hurricane force were felt in the Savannah area, and damage was inflicted over the upper Georgia coastal area. The total damage inflicted by the storm was estimated at \$14 million with damage in Georgia estimated at more than \$500,000. Highwater marks, which were reported near Edisto Beach, South Carolina, ranged from 6.4 to 11.0 feet NAVD.

August 25 - September 7, 1979 (Hurricane David)

Hurricane David was the most intense storm of the century to affect the islands of the eastern Caribbean. However, the storm was not a major hurricane when it struck the United States. David struck just north of Palm Beach, Florida, on

September 3 and made a second landfall about 24 hours later near Savannah Beach, Georgia. In the United States, David was responsible for five deaths and about \$300 million in damages. The death toll and damage were much greater in Dominica, Cuba, and the Dominican Republic (NCC, 1979).

September 9 - September 25, 1989 (Hurricane Hugo)

Hurricane Hugo was a destructive Category 5 hurricane that killed 82 people, left 56,000 homeless and caused \$16.3 billion in damages, making it the most destructive hurricane ever recorded up to that time. Hugo was originally forecast to move toward Savannah, but instead turned north toward Charleston, South Carolina. Savannah was evacuated in anticipation of Hugo but saw no effects other than isolated showers (GEMA, 2006).

June 30 - July 10, 1994 (Tropical Storm Alberto)

Tropical Storm Alberto made landfall in the Florida Panhandle on July 4, 1994, then moved into western Georgia, where it made a loop July 5-6, dumping 27.61 inches of rain in Americus (21 inches within 24 hours). Alberto's winds and tides did only minor damage to the Florida coast, but the excessive rains that fell in Georgia caused catastrophic flooding from Clayton County through central and southwest Georgia to the Florida border, resulting in 33 deaths, \$500 billion in damage and a major disaster declaration for 55 counties (GEMA, 2006).

September 27 - October 6, 1995 (Hurricane Opal)

After coming ashore in the Florida Panhandle on October 4, 1995, Opal swept through Georgia with high winds, heavy rain and tornadoes, killing 14 people and resulting in a major disaster declaration for 50 counties (GEMA, 2006).

September 7 - September 19, 1999 (Hurricane Floyd)

Hurricane Floyd triggered the second largest evacuation in U.S. history when 2.6 million coastal residents of five states including around 350,000 people in Georgia, were ordered from their homes as Hurricane Floyd approached. Floyd struck the Bahamas at peak strength, causing heavy damage. It then paralleled the east coast of the U.S., causing massive evacuations and costly preparations. In total, Floyd was responsible for 57 fatalities and \$5.7 billion in damage, mostly in North Carolina (GEMA, 2006).

August 23 - August 31, 2005 (Hurricane Katrina)

Hurricane Katrina was the costliest and one of the deadliest hurricanes in the history of the U.S. Katrina formed on August 23, 2005, and caused devastation along much of the north-central Gulf Coast. At least 1,836 people lost their lives in Hurricane Katrina and in the subsequent floods. It is estimated to have been responsible for \$81.2 billion in damages (GEMA, 2006).

2.4 Flood Protection Measures

Some inland drainage has been improved. The seawall at Savannah Beech provides some protection from waves and flooding.

Levees exist in the study area that provide the community with some degree of protection against flooding. However, it has been ascertained that some of these levees may not protect the community from rare events such as the 1-percent-annual-chance flood. The criteria used to evaluate protection against the 1-percent-annual-chance flood are 1) adequate design, including freeboard, 2) structural stability, and 3) proper operation and maintenance. Levees that do not protect against the 1-percent-annual-chance flood are not considered in the hydraulic analysis of the 1-percent-annual-chance floodplain.

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 1-percent-annual-chance (100-year) flood 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 the community.

Precountywide Analyses

Probability estimates for the 1-percent-annual-chance flood for Casey Canal, Salt Creek Tributary, Wilshire Canal, Wilshire Canal Tributary A, and Wilshire Canal Tributary A-1 are partially based on a statistical analysis of storm rainfall, runoff, and tide characteristics. In order to determine the 1-percent-annual-chance flood, statistical studies on storm rainfall made by the Weather Bureau

and storm tide records were used. On Casey Canal, flood heights were computed from the ponding that would result, assuming that the storm tide would keep the tide gate at Montgomery Cross Road closed.

Frequency curves of peak flows were constructed at selected locations along Salt Creek Tributary. These curves reflect the judgment of engineers who have studied the area and are familiar with the region.

Flood discharges for the Little Ogeechee River and the Ogeechee River were determined utilizing the regression equations developed by the U.S. Geological Survey (USGS) (USGS, 1993).

Peak discharge rates for Pipe Makers Canal Tributary No. 2 were calculated using the USGS urban regression equations (USGS, 1994).

Elevations for the Savannah River were obtained from a map provided by the USACE which showed 1-percent-annual-chance elevations (USACE, 1976).

Flood discharges for Springfield Canal, Springfield Canal Tributary A, St. Augustine Creek, and St. Augustine Creek Tributary were determined using a regional flood-frequency analysis (FIA, 1971).

Inundation from the Atlantic Ocean caused by passage of storms (storm surge) was determined by the Environmental Sciences Services Administration's (ESSA) joint probability method (ESSA, 1970). The storm populations were described by probability distributions of 5 parameters that influence surge heights. These parameters were central pressure depression (which measures the intensity of the storm), radius to maximum winds, forward speed of the storm, shoreline crossing point, and crossing angle. These characteristics were described statistically based on an analysis of observed storms in the vicinity of Chatham County. The National Oceanic and Atmospheric Administration (NOAA) is the primary source of hurricane data (NOAA, 1973; NOAA, 1981; NOAA, 1965; and NOAA, 1975). A summary of the parameters used for the area is presented in Table 1.

Table 1 - Parameter Values for Surge Elevation Computations

| | <u>P</u> | <u>PP</u> | <u>F</u> | <u>PF</u> | <u>R</u> | <u>PR</u> | <u>A</u> | <u>PA</u> | <u>FN</u> |
|-----------------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|---------------------------|
| Entering Storms | 83 | 0.03 | 7 | 0.45 | 12 | 0.24 | | | 65 ¹ / 0.00107 |
| | 67 | 0.08 | | | | | | | |
| | 53 | 0.11 | | | | | 327 | 0.51 | 20 ¹ / 0.0012 |
| | 42 | 0.13 | 11 | 0.30 | 20 | 0.26 | | | |
| | 33 | 0.16 | | | | | 301 | 0.49 | 25 ² / 0.00124 |
| | 23 | 0.29 | | | | | | | |
| | 9 | 0.20 | 15 | 0.25 | 28 | 0.50 | | | 70 ² / 0.00131 |

Table 1 – Parameter Values for Surge Elevation Computations (*Continued*)

| | <u>P</u> | <u>PP</u> | <u>F</u> | <u>PF</u> | <u>R</u> | <u>PR</u> | <u>A</u> | <u>PA</u> | <u>FN</u> |
|-----------------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|------------------------------|
| Parallel Storms | 83 | 0.03 | 7 | 0.32 | 12 | 0.24 | | | $65^1 / 0.0039^3 / 0.0042^4$ |
| | 67 | 0.08 | | | | | | | |
| | 53 | 0.11 | | | | | | | $20^1 / 0.0045^3 / 0.0048^4$ |
| | 42 | 0.13 | 11 | 0.30 | 20 | 0.26 | 35 | 1.0 | |
| | 33 | 0.16 | | | | | | | $25^2 / 0.0051^3 / 0.0054^4$ |
| | 23 | 0.29 | | | | | | | |
| | 9 | 0.20 | 15 | 0.38 | 28 | 0.50 | | | $70^2 / 0.0058^3 / 0.0061^4$ |
| Exiting Storms | 83 | 0.03 | 7 | 0.45 | 12 | 0.24 | | | $65^1 / 0.0026$ |
| | 67 | 0.08 | | | | | | | |
| | 53 | 0.11 | | | | | 54 | 0.75 | $20^1 / 0.0013$ |
| | 42 | 0.13 | | | 20 | 0.26 | | | |
| | 33 | 0.16 | | | | | 94 | 0.25 | $25^2 / 0.00069$ |
| | 23 | 0.29 | | | | | | | |
| | 9 | 0.20 | 13 | 0.55 | 28 | 0.50 | | | $70^2 / 0.00056$ |

- P = Central Pressure (in millibars)
- PP = Probability of storm with P Value
- F = Forward velocity of storm (KTS)
- PF = Probability of storm with F Value
- R = Radius to maximum winds (NM)
- PR = Probability of storm with R Value
- A = Direction of storm (Degrees from true North)
- PA = Probability of storm with A Value
- D = Distance from shore (NM)
- FN = Frequency of storm occurrence (Nautical Mile / Year)
- ¹ Nautical miles south of Georgia / South Carolina Boundary
- ² Nautical miles north of Georgia / South Carolina Boundary
- ³ 15 Nautical miles offshore
- ⁴ 45 Nautical miles offshore

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For Black Creek and Black Creek Tributary No. 2, the USACE Hydrologic Engineering Center’s (HEC) HEC-HMS Version 2.1.2 (HEC, 2001a) was used to generate flood hydrographs.

A calibrated XP-SWMM (XP Software, Inc., 2006) model for Coffee Bluff Ponding Area, Colonial Oaks Canal, Colonial Oaks Canal Tributary No. 1, Colonial Oaks Canal Tributary No. 1.1, Windsor Forest Canal East, Windsor Forest Canal Tributary, Windsor Forest Canal Tributary No. 2, Windsor Forest Canal Tributary No. 3, and Windsor Forest Canal West representing as-built,

existing conditions was provided by the City of Savannah. The model applied the Soil Conservation Service (SCS) unit-hydrograph methodology with a Type III rainfall distribution (SCS, 1986). The unit-hydrograph peak rate factor applied in the model ranged between 200 and 300.

The hydrology for Harmon Canal and Chippewa Canal was revised by the USACE, Savannah District. The USACE study applied the HEC-HMS, Version 1.0 (HEC, 1998), computer software for the existing conditions watershed, segmenting the watershed into 11 sub-watersheds. The HEC-HMS model applied the SCS hydrology methodology (SCS, 1986) to estimate peak runoff. The model was calibrated to the July 15, 1996, flood, adjusting the unit-hydrograph parameters to match the peak and volume of the observed flood. The modified Puls flood hydrograph routing procedure was used to model the flood peak attenuation for ponds, reservoirs, and storage features throughout the watershed. The Muskingum-Cunge method was applied to translate the flood hydrographs through stream reaches between watershed model nodes. The flood discharges computed by the model were compared to the discharges estimated by the USGS regional flood discharge-frequency relationships (USGS, 1993).

The hydrology for Hardin Canal, Kingsway Canal, Louis Mills Branch, Quacco Canal, and Rahn Dairy Canal was adapted from studies prepared by Thomas & Hutton Engineering in the period between 1998 and 2004 (Thomas & Hutton, 1998, 2000, 2004a, 2004b, and 2005). The hydrology for Pipe Makers Canal was adapted from a study prepared by EMC Engineering dated April 1999 (EMC, 1999). The hydrology for Placentia Canal was adapted from a study prepared by Hussey, Gay, Bell, & DeYoung dated May 1996 (Hussey, Gay, Bell, & DeYoung, 1996). The studies applied either the XP-SWMM or Interconnected Channel and Pond Routing (ICPR) dynamic routing computer software (Streamline Technologies, Inc., 2002) and the SCS dimensional unit-hydrology methodology (SCS, 1986) applying a peak rate factor of 323. The National Weather Service Technical Paper 40 rainfall-depth-duration-frequency relationships (NWS, 1961) were used in the runoff modeling with an SCS Type III distribution. The peak runoff rates computed in the models were compared to estimates of peak discharge computed by the USGS regional regression relationships for Georgia (USGS, 1993).

The report provided by Kimley-Horn and Associates for the Little Ogeechee River Tributary and the Tributary to Little Ogeechee River Tributary describes the methodology used to delineate the drainage sub-basins using a combination of ESRI ArcMap 9.1 (ESRI, 2005), USGS topographic contours, survey data, and field investigations. The watershed was divided into 16 sub-basins, ranging in size from 47 acres to 1,166 acres. The USGS rural regression equations (USGS, 1993) were used to determine peak discharges.

Peak discharge-drainage area relationships for 10-, 2-, 1-, and 0.2-percent-annual-chance floods for each of the flooding sources studied in detail in the county are presented in Table 2.

Table 2 - Summary of Discharges

| <u>Flooding Source and Location</u> | <u>Drainage Area (square miles)</u> | Peak Discharges (cubic feet per second) | | | |
|--|---|---|--|--|--|
| | | <u>10-Percent- Annual- Chance</u> | <u>2-Percent- Annual- Chance</u> | <u>1-Percent- Annual- Chance</u> | <u>0.2-Percent- Annual- Chance</u> |
| BLACK CREEK | | | | | |
| At confluence with Savannah River | 26.55 | 1,039 | 1,553 | 2,084 | 2,713 |
| Just upstream of Interstate Highway 95 / State Highway 405 | 22.50 | 1,056 | 1,344 | 1,841 | 2,329 |
| At confluence of Black Creek Tributary No. 2 | 20.49 | 1,059 | 1,347 | 1,845 | 2,333 |
| At Augusta Road / State Highway 30 / 21 | 19.52 | 794 | 1,039 | 1,287 | 1,619 |
| At confluence of Black Creek Tributary No. 1 | 18.54 | 1,018 | 1,345 | 1,799 | 2,249 |
| At CSX | 16.63 | 802 | 1,102 | 1,579 | 1,928 |
| At Norfolk Southern Railway | 13.44 | 807 | 1,116 | 1,639 | 1,992 |
| BLACK CREEK TRIBUTARY NO. 2 | | | | | |
| At confluence with Black Creek | 0.97 | 246 | 303 | 536 | 675 |
| CASEY CANAL | | | | | |
| | * | * | * | * | * |
| CHIPPEWA CANAL | | | | | |
| At confluence with Harmon Canal | 1.15 | 1,116 | 1,463 | 1,633 | 2,000 |
| COLONIAL OAKS CANAL | | | | | |
| Outfall at Atlantic Ocean | ** | 359 | 448 | 492 | 558 |
| At divergence from Windsor Forest Canal East | ** | 9 | 9 | 9 | 9 |
| COLONIAL OAKS CANAL TRIBUTARY NO. 1 | | | | | |
| Just above confluence with Colonial Oaks Canal | 0.19 | 139 | 159 | 171 | 193 |
| COLONIAL OAKS CANAL TRIBUTARY NO. 1.1 | | | | | |
| Just above confluence with Colonial Oaks Canal Tributary No. 1 | 0.06 | 47 | 52 | 54 | 58 |

*Data not available

**Flow split; contributing drainage area not determined

Table 2 - Summary of Discharges (Continued)

| <u>Flooding Source and Location</u> | <u>Drainage Area (square miles)</u> | Peak Discharges (cubic feet per second) | | | |
|---|---|---|--|--|--|
| | | <u>10-Percent- Annual- Chance</u> | <u>2-Percent- Annual- Chance</u> | <u>1-Percent- Annual- Chance</u> | <u>0.2-Percent- Annual- Chance</u> |
| HARDIN CANAL | | | | | |
| At Atlantic Coastal Highway / U.S. Highway 17 / Ogeechee Road | 18.20 | * | * | 547 | * |
| At Interstate Highway 16 / State Highway 404 | 14.40 | * | * | 1,224 | * |
| At Interstate Highway 95 / State Highway 405 | 13.10 | * | * | 1,094 | * |
| At Bloomingdale Road / State Highway 17 | 1.50 | * | * | 186 | * |
| At Osteen Road | 0.90 | * | * | 78 | * |
| HARMON CANAL | | | | | |
| At confluence with Vernon River | 3.13 | 2,442 | 3,213 | 3,585 | 4,402 |
| Just downstream of the confluence of Chippewa Canal | 2.94 | 2,415 | 3,160 | 3,523 | 4,321 |
| KINGSWAY CANAL | | | | | |
| At confluence with Vernon River | 0.40 | * | * | 355 | * |
| At Harry Truman Parkway | 0.30 | * | * | 187 | * |
| LITTLE OGEECHEE RIVER | | | | | |
| Just upstream of Interstate Highway 16 / State Highway 404 | 32.6 | 1,530 | 2,530 | 3,020 | 4,280 |
| LITTLE OGEECHEE RIVER TRIBUTARY | | | | | |
| At Little Neck Road | 7.31 | 605 | 995 | 1,183 | 1,666 |
| At New Hampstead Parkway | 2.86 | 338 | 553 | 657 | 921 |
| At Highgate Boulevard | 0.55 | 122 | 199 | 235 | 327 |
| LOUIS MILLS BRANCH | | | | | |
| At confluence with South Springfield Canal | 2.85 | * | * | 577 | * |
| At Louis Mills Boulevard / Chatham Parkway | 0.30 | * | * | 281 | * |
| OGEECHEE RIVER | * | * | * | * | * |
| PIPE MAKERS CANAL | | | | | |
| At Augusta Road | 44.10 | 976 | 1,148 | 1,314 | 1,565 |
| At Interstate Highway 95 / State Highway 405 | 19.70 | 860 | 1,117 | 1,374 | 1,698 |
| PIPE MAKERS CANAL TRIBUTARY NO. 2 | | | | | |
| At confluence with Pipe Makers Canal | 1.43 | 268 | 456 | 556 | 803 |

*Data not available

Table 2 - Summary of Discharges (Continued)

| <u>Flooding Source and Location</u> | <u>Drainage Area (square miles)</u> | Peak Discharges (cubic feet per second) | | | |
|--|---|---|--|--|--|
| | | <u>10-Percent- Annual- Chance</u> | <u>2-Percent- Annual- Chance</u> | <u>1-Percent- Annual- Chance</u> | <u>0.2-Percent- Annual- Chance</u> |
| PIPE MAKERS CANAL TRIBUTARY NO. 2 (Continued) Just downstream of U.S. Highway 80 / State Highway 26 | 0.65 | 166 | 277 | 336 | 481 |
| SALT CREEK TRIBUTARY At confluence with Salt Creek | 7.40 | * | * | 810 | * |
| At Interstate Highway 16 / State Highway 404 | 6.40 | * | * | 720 | * |
| SAVANNAH RIVER | * | * | * | * | * |
| SPRINGFIELD CANAL | * | * | * | * | * |
| SPRINGFIELD CANAL TRIBUTARY A | * | * | * | * | * |
| ST. AUGUSTINE CREEK | * | * | * | * | * |
| ST. AUGUSTINE CREEK TRIBUTARY | * | * | * | * | * |
| TRIBUTARY TO LITTLE OGEECHEE RIVER TRIBUTARY At the confluence with Little Ogeechee River Tributary | 0.71 | 143 | 232 | 275 | 383 |
| At Highgate Boulevard | 0.19 | 62 | 101 | 119 | 165 |
| WILSHIRE CANAL | * | * | * | * | * |
| WILSHIRE CANAL TRIBUTARY A | * | * | * | * | * |
| WILSHIRE CANAL TRIBUTARY A-1 | * | * | * | * | * |
| WINDSOR FOREST CANAL EAST At confluence with Windsor Forest Canal West | ** | 436 | 558 | 615 | 718 |
| Just below divergence of Colonial Oaks Canal / confluence of Windsor Forest Canal Tributary No. 3 | 0.05 | 129 | 144 | 157 | 185 |

*Data not available

**Flow split; contributing
drainage area not determined

Table 2 - Summary of Discharges (*Continued*)

| <u>Flooding Source and Location</u> | <u>Drainage Area (square miles)</u> | Peak Discharges (cubic feet per second) | | | |
|---|-------------------------------------|---|--------------------------------|--------------------------------|----------------------------------|
| | | <u>10-Percent-Annual-Chance</u> | <u>2-Percent-Annual-Chance</u> | <u>1-Percent-Annual-Chance</u> | <u>0.2-Percent-Annual-Chance</u> |
| WINDSOR FOREST CANAL EAST (CONTINUED) | | | | | |
| Just above divergence of Colonial Oaks Canal / confluence of Windsor Forest Canal Tributary No. 3 | ** | 39 | 52 | 58 | 66 |
| WINDSOR FOREST CANAL TRIBUTARY | | | | | |
| Just above confluence with Windsor Forest Canal West | 1.04 | 182 | 239 | 261 | 304 |
| WINDSOR FOREST CANAL TRIBUTARY NO. 2 | | | | | |
| Just above Windsor Road | 0.03 | 36 | 46 | 51 | 69 |
| WINDSOR FOREST CANAL TRIBUTARY NO. 3 | | | | | |
| Just above Windsor Road | 0.09 | 100 | 116 | 121 | 128 |
| WINDSOR FOREST CANAL WEST | | | | | |
| Outfall at Atlantic Ocean | 1.40 | 519 | 702 | 777 | 948 |

**Flow split; contributing drainage area not determined

Stillwater elevations for lakes studied in detail are shown in Table 3.

Table 3 - Summary of Stillwater Elevations

| <u>Flooding Source</u> | Water Surface Elevations (Feet NAVD ¹) | | | |
|---------------------------|--|--------------------------------|--------------------------------|----------------------------------|
| | <u>10-Percent-Annual-Chance</u> | <u>2-Percent-Annual-Chance</u> | <u>1-Percent-Annual-Chance</u> | <u>0.2-Percent-Annual-Chance</u> |
| Coffee Bluff Ponding Area | 11.6 | 13.2 | 13.8 | 14.4 |

¹North American Vertical Datum of 1988

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 Table in the

FIS report. Flood elevations shown on the FIRM 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.

Users of the FIRM should also be aware that coastal flood elevations are provided in the Transect Data table in this report. If the elevation on the FIRM is higher than the elevation shown in this table, a wave height, wave run-up and/or wave setup component likely exists, in which case, the higher elevation should be used for construction and/or floodplain management purposes.

Precountywide Analyses

Hydraulic analyses of the shoreline characteristics of the flooding sources studied in detail were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the shorelines.

Cross section data for Pipe Makers Canal Tributary No. 2 were obtained from field surveys. All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry.

Flood profiles for Casey Canal were computed using stream characteristics for the selected reaches as determined from observed flood profiles, topographic maps, and valley cross sections which were surveyed in 1967 (USACE, 1968b).

Elevations for the Savannah River were obtained from a map provided by the USACE which showed 1-percent-annual-chance elevations (USACE, 1976).

Water surface profiles for St. Augustine Creek, St. Augustine Creek Tributary, Springfield Canal, Springfield Canal Tributary A, were taken from the Type 10 FIS (FIA, 1971) report performed by the SCS for Chatham County. All data are on file with the SCS.

Water surface elevations (WSELs) of floods of the selected recurrence intervals on the Ogeechee River were computed using the USACE's HEC-2 step-backwater computer program (HEC, 1984).

WSELs of floods of the selected recurrence intervals on the Little Ogeechee River and Pipe Makers Canal Tributary No. 2 were computed using the USACE's HEC-2 step-backwater computer program (HEC, 1991).

Water surface profiles for Wilshire Canal, Wilshire Canal Tributary A, and Wilshire Canal Tributary A-1 were computed using stream characteristics for the selected reaches as determined from observed conditions, topographic maps, and valley cross sections obtained in 1970.

Starting WSELs for Pipe Makers Canal Tributary No. 2 were based on the slope - area method.

Hydraulic analyses, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding sources studied, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the shorelines.

For areas subject to flooding directly from the Atlantic Ocean, the FEMA standard storm surge model was used to simulate the coastal surge generated by any chosen storm (that is, any combination of the 5 storm parameters defined previously). By performing such simulations for a large number of storms, each of known total probability, the frequency distribution of surge height can be established as a function of coastal location. These distributions incorporate the large-scale surge behavior, but do not include an analysis of the added effects associated with much fine scale wave phenomena, such as wave height or runup. As the final step in the calculations, the astronomic tide for the region is then statistically combined with the computed storm surge to yield recurrence intervals of total water level (TetraTech, Inc., 1981).

The storm-surge elevations for the 10-, 2-, 1-, and 0.2-percent-annual-chance floods have been determined for Chatham County and are shown in Table 4, Transect Data. The analyses reported herein reflect the stillwater elevations due to tidal and wind setup effects and include the contributions from wave action effects.

All dunes and structures were assumed to remain intact for purposes of this analysis. The FEMA storm surge model was utilized to simulate the hydrodynamic behavior of the surge generated by the various synthetic storms. This model utilizes a grid pattern approximating the geographical features of the study area and the adjoining areas. Surges were computed utilizing grids of 8 by 5 nautical miles and 6,000 feet by 6,000 feet, depending on the resolution required.

Underwater depths and land heights for the model grid systems were obtained from NOAA nautical charts, USGS topographic maps, and aerial photogrammetry and field surveys conducted as part of this study (NOAA, 1977; NOAA, 1979; USGS, various dates; Woolpert Consultants, 1982 and 1983).

This Countywide Revision

A calibrated XP-SWMM model (XP Software, Inc., 2006) for Coffee Bluff Basin, Colonial Oaks Canal, Colonial Oaks Canal Tributary No. 1, Colonial Oaks Tributary No. 1.1, Windsor Forest Canal East, Windsor Forest Canal Tributary, Windsor Forest Canal Tributary No. 2, Windsor Forest Canal Tributary No. 3, and Windsor Forest Canal West representing as-built, existing

conditions was provided by the City of Savannah. Top of roadway elevations were estimated from the topographic data from the countywide Digital Elevation Model (DEM). A cross section was drawn perpendicular to the flow-path at each node in the XP-SWMM model. The cross sections were transferred to the DEM in the ArcGIS (ESRI, 2005) platform. The WSEL was integrated with the bare earth DEM to create a flood depth grid which was transferred to the flood delineation polygon.

Flood water elevations for Louis Mills Branch were estimated using the ICPR model which uses the node-link concept to describe the connectivity between subbasins. The node-link network provides the computational framework for the ICPR model. For Louis Mills Branch, the node locations were compared to the topographic map and aerial photographs. The original node locations in the work map were digitized into ArcGIS (ESRI, 2005).

The flow hydrographs for Black Creek and Black Creek Tributary No. 2 were imported into HEC-RAS, Version 3.0.1 (HEC, 2001b), to use for an unsteady flow analysis.

The estimated WSELs for Pipe Makers Canal were based on a XP-SWMM model study prepared by EMC Engineering (EMC, 1999). Airborne Laser Terrain Mapping (ALTM) was used to estimate channel and floodplain geometry, supplemented by field surveys of culvert and bridge crossings of the canal.

The estimated WSELs for Hardin Canal, Kingsway Canal, Louis Mills Branch, Quacco Canal, and Rahn Dairy Canal were based on ICPR model studies prepared by Thomas & Hutton (Thomas & Hutton, 1998, 2000, 2004a, and 2004b). ALTM was used to estimate channel and floodplain geometry.

The estimated WSELs for Placentia Canal were based on a XP-SWMM model prepared by Hussey, Gay, Bell & DeYoung (Hussey, Gay, Bell & DeYoung, 1996).

A calibrated HEC-RAS, Version 3.1.1 (HEC, 2003), computer model prepared by the USACE, Savannah District, was used to estimate the flood elevation profiles for Harmon Canal and Chippewa Canal.

The hydraulics for Little Ogeechee River Tributary and Tributary to Little Ogeechee River Tributary were developed using HEC-GeoRAS (HEC, 2002) within ArcMap 9.1 (ESRI, 2005) to import channel and overbank geometries into a HEC-RAS, Version 3.1.3 (HEC, 2005), model. The City of Savannah's 2-foot contour interval topographic mapping data were used as the source for the digital terrain model, supplemented with survey data for the existing and newly built structures (Little Neck Road and Highgate Boulevard, respectively). The structure at New Hampstead Parkway was not included in the final existing

model since it was not complete at the time of the report submission. Other structures seen in aerial photographs were old logging road crossings that currently have remains of rusted, flattened CMP culverts. The culverts are in the process of being removed as part of the site development and, in some cases, as mandated by the USACE.

The estimated WSELs for Coffee Bluff Basin were based on an XP-SWMM model provided by the City of Savannah. The model used a fixed backwater elevation of 3.59 feet NAVD, mean high tide.

The starting WSELs applied in the ICPR model for Hardin Canal, Kingsway Canal, and Rahn Dairy Canal was 4.4 feet NAVD. The 1-percent-annual-chance flooding for Hardin Canal is controlled by the flooding effects from the Atlantic Ocean in the stream reach from the confluence with Salt Creek to Interstate Highway 16. The 1-percent-annual-chance flooding for Kingsway Canal is controlled by the flooding effects from the Atlantic Ocean upstream of the confluence with the Vernon River.

The starting WSELs for Black Creek, Black Creek Tributary No. 2, Chippewa Canal, Harmon Canal, Little Ogeechee River Tributary, and Tributary to Little Ogeechee River Tributary were based on normal depth.

The starting WSELs for Colonial Oaks Canal, Colonial Oaks Canal Tributary No. 1, Colonial Oaks Canal Tributary 1.1, Windsor Forest Canal East, Windsor Forest Canal Tributary, Windsor Forest Canal Tributary No. 2, Windsor Forest Canal Tributary No. 3, and Windsor Forest Canal West were based on mean high tide.

Initial stage, representing the starting WSEL for Louis Mills Branch, was specified at each node.

The starting WSELs applied in the XP-SWMM model for Pipe Makers Canal was 2.66 feet NAVD.

The starting WSELs applied in the XP-SWMM model for Placentia Canal was 4.4 feet NAVD.

The starting WSELs applied in the ICPR model for Quacco Canal was 5.13 feet NAVD.

The 1-percent-annual-chance flooding for Placentia Canal, Quacco Canal, Rahn Dairy Canal is controlled by the flooding effects from the Atlantic Ocean for the entire stream reaches. The 1-percent-annual-chance flood elevation from the Atlantic Ocean is 11.1 feet NAVD.

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 Manning's "n" values for all detailed studied streams are listed in the following table:

| <u>FLOODING SOURCE</u> | <u>CHANNEL "n"</u> | <u>OVERBANK "n"</u> |
|--|--------------------|---------------------|
| Black Creek | 0.060-0.100 | 0.100 |
| Black Creek Tributary No. 2 | 0.040 | 0.100 |
| Casey Canal | * | * |
| Chippewa Canal | 0.033-0.050 | 0.030-0.110 |
| Coffee Bluff Basin | 0.015-0.025 | 0.200-0.300 |
| Colonial Oaks Canal | 0.025-0.150 | 0.020-0.030 |
| Colonial Oaks Canal Tributary No. 1 | 0.025-0.150 | 0.020-0.030 |
| Colonial Oaks Canal Tributary No. 1.1 | 0.025-0.150 | 0.200-0.300 |
| Hardin Canal | 0.040-0.050 | 0.100-0.150 |
| Harmon Canal | 0.033 to 0.05 | 0.030-0.110 |
| Kingsway Canal | 0.030-0.040 | * |
| Little Ogeechee River | * | * |
| Little Ogeechee River Tributary | 0.040-0.040 | 0.030-0.100 |
| Louis Mills Branch | 0.035-0.070 | 0.080-0.120 |
| Ogeechee River | * | * |
| Pipe Makers Canal | 0.070-0.300 | 0.150-0.250 |
| Pipe Makers Canal Tributary No. 2 | 0.030 | 0.040-0.085 |
| Placentia Canal | * | * |
| Quacco Canal | 0.030-0.040 | 0.050-0.120 |
| Rahn Dairy Canal | 0.030 | 0.040-0.050 |
| Salt Creek Tributary | * | * |
| Savannah River | * | * |
| Springfield Canal | * | * |
| Springfield Canal Tributary A | * | * |
| St. Augustine Creek | * | * |
| St. Augustine Creek Tributary | * | * |
| Tributary to Little Ogeechee River Tributary | 0.040-0.040 | 0.030-0.100 |
| Wilshire Canal | * | * |
| Wilshire Canal Tributary A | * | * |
| Wilshire Canal Tributary A-1 | * | * |
| Windsor Forest Canal East | 0.025-0.150 | 0.020-0.030 |
| Windsor Forest Canal Tributary | 0.025-0.150 | 0.020-0.030 |
| Windsor Forest Canal Tributary No. 2 | 0.025-0.150 | 0.200-0.300 |
| Windsor Forest Canal Tributary No. 3 | 0.025-0.150 | 0.020-0.030 |
| Windsor Forest Canal West | 0.025-0.150 | 0.020-0.030 |

* Data not available

The profile baselines depicted on the FIRM represent the hydraulic modeling baselines that match the flood profiles on this FIS report. As a result of improved topographic data, the profile baseline, in some cases, may deviate significantly from the channel centerline or appear outside the Special Flood Hazard Area.

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 Wave Height Analysis

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding was developed by the National Academy of Sciences (NAS) (NAS, 1977). This method is based on the following three major concepts. First, depth-limited waves in shallow water reach a maximum breaking height that is equal to 0.78 times the stillwater depth. The wave crest elevation is 70-percent of the total wave height plus the stillwater elevation. The second major concept is that wave height may be diminished by dissipation of energy due to the presence of obstructions such as sand dunes, dikes and seawalls, buildings, and vegetation. The amount of energy dissipation is a function of the physical characteristics of the obstruction and is determined by procedures described in the NAS report. The third major concept is that wave height can be regenerated in open fetch areas due to the transfer of wind energy to the water. This added energy is related to the fetch length and depth.

As described in *Procedures for Applying Marsh Grass Methodology* (FEMA, 1984), a modification to the NAS Methodology (NAS, 1977) has been developed to analyze in detail the attenuating effect of marsh grass on waves. The rate of wave energy dissipation is dependent on the wave characteristics (e.g. height and period), and the species of marsh grass. Two conditions result from this modification depending on the initial wave height at the beginning of the marsh segment: 1) if the initial wave is relatively small, wave growth will occur but at a significantly lower rate as compared to the NAS methodology, and 2) if the initial wave is sufficiently large, a wave height reduction will occur over the marsh.

Wave heights were computed along transects (cross section lines) that were located along the coastal areas, as illustrated in the Transect Location Map (Figure 1), in accordance with the *Users Manual for Wave Height Analysis* (FEMA, 1981c). These transects are also shown on the FIRM. The transects were located with consideration given to the physical and cultural characteristics

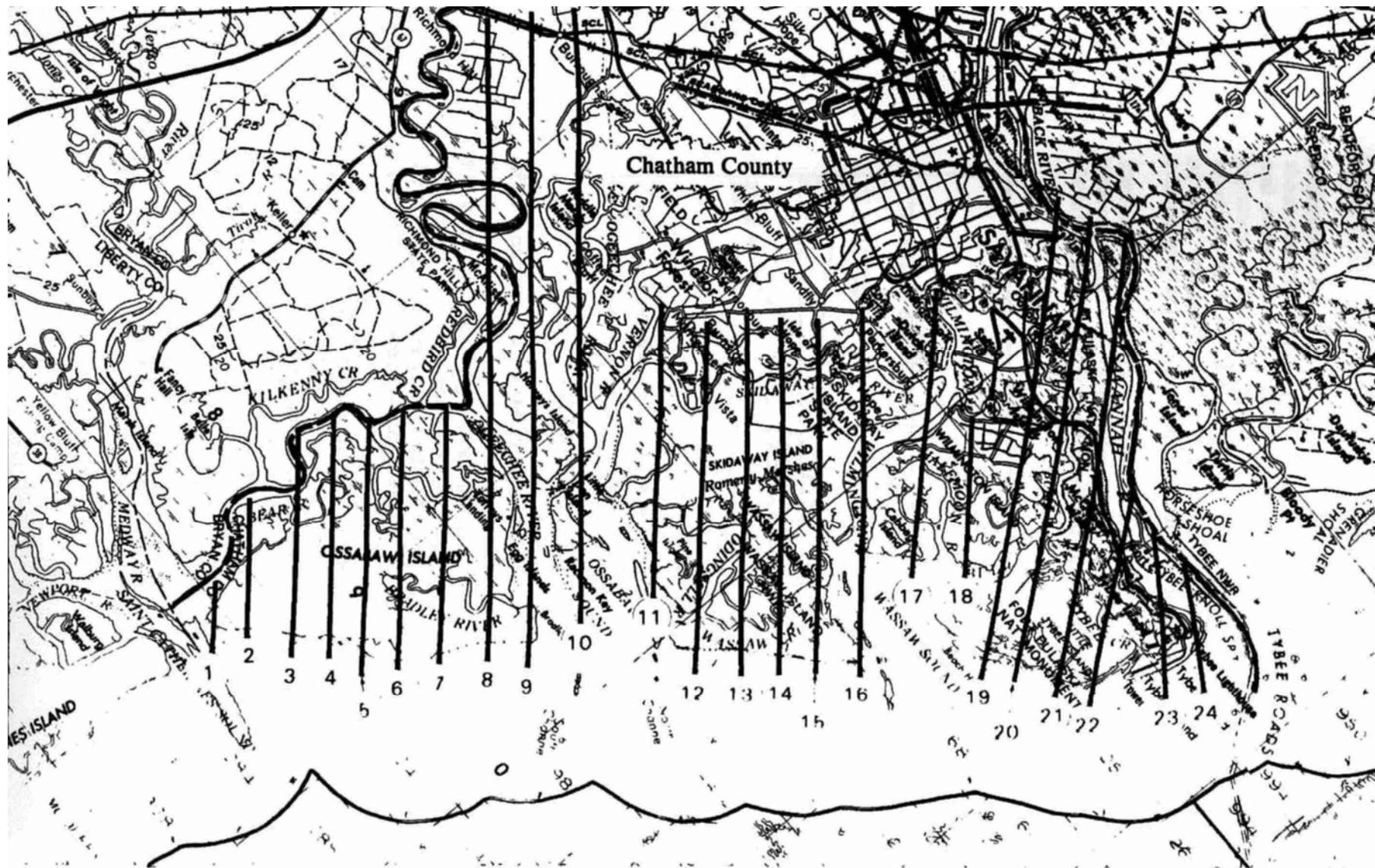


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

**CHATHAM COUNTY, GA
AND INCORPORATED AREAS**

TRANSECT LOCATION MAP

ATLANTIC OCEAN

of the land so that they would closely represent conditions in their locality. Transects were spaced close together in areas of complex topography and dense development. In areas having more uniform characteristics, they were spaced at larger intervals. It was also necessary to locate transects in areas where unique flooding existed and in areas where computed wave heights varied significantly between adjacent transects.

The transects were continued inland until the wave was dissipated or until flooding from another source with equal or greater elevation was reached. Along each transect, wave heights and elevations were computed considering the combined effects of changes in ground elevation, vegetation, and physical features. The stillwater elevations for the 1-percent-annual-chance flood were used as the starting elevations for these computations. Wave heights were calculated to the nearest 0.1 foot, and wave elevations were determined at whole-foot increments along the transects. Areas with a wave height component 3-feet or greater were designated as velocity zones (VE). Other areas subject to wave action were designated as AE Zones with Base Flood Elevations (BFEs) adjusted to include wave crest elevations. Table 4 provides a listing of the transect locations and stillwater starting elevations, as well as the initial wave crest elevations

Table 4 - Transect Locations, Stillwater Starting Elevations, and Initial Wave Crest Elevations

| <u>Transect</u> | <u>Location</u> | <u>Stillwater (feet NAVD)</u> | <u>Wave Crest (feet NAVD)</u> |
|-----------------|---|-----------------------------------|-----------------------------------|
| 1 | Across Ossabaw Island approximately 1 mile northeast of the intersection between Bryan, Chatham, and Liberty Counties boundary line | 12.1 | 19.2 |
| 2 | Across Ossabaw Island approximately 1 mile east of the confluence of Bear River | 12.1 | 19.2 |
| 3 | Across Ossabaw Island approximately 2 miles east of the confluence of Bear River | 12.1 | 19.2 |
| 4 | Across Ossabaw Island approximately 1 mile southwest of Pelican Point | 12.1 | 19.2 |
| 5 | Across Ossabaw Island approximately 1,000 feet southwest of Pelican Point | 12.1 | 19.2 |
| 6 | Across Ossabaw Island approximately 1 mile northeast of Pelican Point | 12.1 | 19.2 |
| 7 | Across Ossabaw Island approximately 2 miles northeast of Pelican Point | 12.1 | 19.2 |
| 8 | Across Ossabaw Island approximately 2 miles southwest of Bradley Point | 12.1 | 19.2 |
| 9 | Across Ossabaw Island approximately 1,000 feet southwest of Bradley Point | 12.1 | 19.2 |
| 10 | Across Raccoon Key and continues up to approximately 1 mile south of CSX Railroad | 12.1 | 19.2 |

Table 4 - Transect Locations, Stillwater Starting Elevations, and Initial Wave Crest Elevations
(Continued)

| <u>Transect</u> | <u>Location</u> | <u>Stillwater (feet NAVD)</u> | <u>Wave Crest (feet NAVD)</u> |
|-----------------|---|-----------------------------------|-----------------------------------|
| 11 | Across the western side of Wassaw Island, continuing through the western portion of Skidaway Island | 12.1 | 19.2 |
| 12 | Across Wassaw Island approximately 0.5 mile southeast of the confluence of the Odingsell River, continuing through Skidaway Island | 12.1 | 19.2 |
| 13 | Across Wassaw Island approximately 1.5 miles southeast of the confluence of the Odingsell River, continuing through Skidaway Island | 12.1 | 19.2 |
| 14 | Across Wassaw Island approximately 2.5 miles southeast of the confluence of the Odingsell River, continuing through Skidaway Island | 12.1 | 19.2 |
| 15 | Across Wassaw Island approximately 3 miles south of the confluence of the Wilmington River, continuing through Skidaway Island | 12.1 | 19.2 |
| 16 | Across the eastern portion of Wassaw Island approximately 3 miles southeast of the confluence of the Wilmington River | 12.1 | 19.2 |
| 17 | Across Cabbage Island approximately 1 mile east of the confluence of the Wilmington River | 12.1 | 19.2 |
| 18 | Across the western portion of Petit Chou Island approximately 1 miles southeast of the confluence of the Tybee River | 12.1 | 19.2 |
| 19 | Across Tybee Island approximately 2 miles southeast of the confluence of the Bull River | 12.1 | 19.2 |
| 20 | Across Tybee Island approximately 2.3 miles southeast of the confluence of the Bull River | 12.1 | 19.2 |
| 21 | Across Tybee Island approximately 2 miles southwest of the confluence of Tybee Creek | 12.1 | 19.2 |
| 22 | Across Tybee Island approximately 0.8 mile southwest of the confluence of Tybee Creek | 12.1 | 19.2 |
| 23 | Across Tybee Island approximately 0.5 mile east of the confluence of Tybee Creek | 12.1 | 19.2 |
| 24 | Across the eastern portion of Tybee Island approximately 1 mile southeast of the Tybee Island Lighthouse | 12.1 | 19.2 |

After analyzing wave heights along each transect, wave elevations were interpolated between transects. Various source data were used in the interpolation, including topographic maps (USGS, various dates), aerial photographs (Woolpert Consultants, 1983), and engineering judgment. Controlling features affecting the elevations were identified and considered in relation to their positions at a particular transect and their variation between transects.

Figure 2 is a profile for a hypothetical transect showing the effects of energy dissipation on a wave as it moves inland. This figure shows the wave elevations being decreased by obstructions, such as buildings, vegetation, and rising ground elevations and being increased by open, unobstructed wind fetches. Actual wave conditions may not necessarily include all of the situations shown in Figure 2.

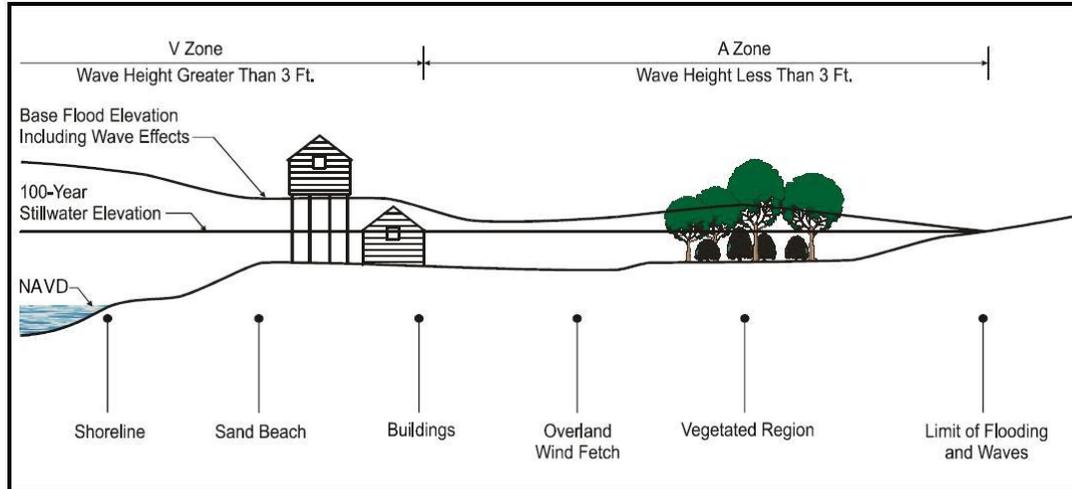


Figure 2 - Transect Schematic

Results from the wave height analysis are incorporated into the information presented on the FIRM and summarized in Table 5. Computed wave elevations were based on existing topography, vegetation, and development patterns.

3.4 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 NGVD. With the finalization of the NAVD, many FIS reports and FIRMs are being prepared using NAVD as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD. Structure and ground elevations in the community must, therefore, be referenced to NAVD. It is important to note that adjacent communities may be referenced to NGVD. This may result in differences in BFEs across the corporate limits between the communities. The average conversion factor that was used to convert the data in this FIS report to NAVD was calculated using the National Geodetic Survey's VERTCON online utility (NGS, 2007). The data points used to determine the conversion are listed in Table 6.

| FLOODING SOURCE | TRANSECTS | STILLWATER ELEVATION (FEET NAVD) | | | | ZONE ¹ | BASE FLOOD ELEVATION (FEET NAVD) ² |
|-----------------|-----------|----------------------------------|-------------------------|-------------------------|---------------------------|-------------------|---|
| | | 10-PERCENT-ANNUAL-CHANCE | 2-PERCENT-ANNUAL-CHANCE | 1-PERCENT-ANNUAL-CHANCE | 0.2-PERCENT-ANNUAL-CHANCE | | |
| ATLANTIC OCEAN | 1-10 | 8.7 * | 10.7 * | 12.1 * | 13.3 * | VE | 14-19 |
| | | 9.3 * | 11.0 * | 11.1 * | 13.5 * | AE | 12-14 |
| | | | | | | VE | 13-16 |
| | | | | | | AE | 11-13 |
| | 1-8 | 9.6 * | 11.6 * | 12.1 * | 14.5 * | VE | 14-19 |
| | | 9.3 * | 11.0 * | 11.1 * | 13.5 * | AE | 12-14 |
| | | | | | | VE | 13-16 |
| | | | | | | AE | 11-13 |
| | 1-9 | 9.5 * | 11.3 * | 12.1 * | 14.0 * | VE | 14-19 |
| | | 9.3 * | 11.0 * | 11.1 * | 13.5 * | AE | 12-14 |
| | | | | | | VE | 13-16 |
| | | | | | | AE | 11-13 |
| | 8-10 | 9.5 * | 11.3 * | 12.1 * | 14.0 * | VE | 14-19 |
| | | 9.7 * | 11.8 * | 13.1 * | 14.5 * | AE | 12-14 |
| | | 9.3 * | 11.0 * | 11.1 * | 13.5 * | VE | 15-17 |
| | | | | | | AE | 13-16 |
| | | | | | VE | 13-16 | |
| | | | | | AE | 11-13 | |

¹Includes the effects of wave action, where applicable

²Due to map scale limitations, BFEs shown on the FIRM may represent average elevation for the zone depicted

*Data not available

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

**CHATHAM COUNTY, GA
AND INCORPORATED AREAS**

TRANSECT DATA

ATLANTIC OCEAN

| FLOODING SOURCE | TRANSECTS | STILLWATER ELEVATION (FEET NAVD) | | | | ZONE ¹ | BASE FLOOD ELEVATION (FEET NAVD) ² |
|-------------------------------|-----------|----------------------------------|-------------------------|-------------------------|---------------------------|-------------------|---|
| | | 10-PERCENT-ANNUAL-CHANCE | 2-PERCENT-ANNUAL-CHANCE | 1-PERCENT-ANNUAL-CHANCE | 0.2-PERCENT-ANNUAL-CHANCE | | |
| ATLANTIC OCEAN (CONTINUED) | 6-10 | 9.5 | 11.3 | 12.1 | 14.0 | VE | 14-19 |
| | | 9.7 | 11.8 | 13.1 | 14.5 | VE | 15-17 |
| | | 9.3 | 11.0 | 11.1 | 13.5 | VE | 13 |
| | | * | * | * | * | AE | 11-13 |
| | 8-13 | 9.5 | 11.3 | 12.1 | 14.0 | VE | 14-19 |
| | | * | * | * | * | AE | 14 |
| | | 9.7 | 11.8 | 13.1 | 14.5 | VE | 15-17 |
| | | 9.4 | 10.9 | 11.1 | 12.7 | VE | 13 |
| | 11-16 | * | * | * | * | AE | 11-13 |
| | | 8.8 | 10.8 | 12.1 | 13.6 | VE | 14-19 |
| | | * | * | * | * | AE | 12-14 |
| | | 9.4 | 10.9 | 11.1 | 12.7 | VE | 13 |
| | 14-17 | * | * | * | * | AE | 11-13 |
| | | 9.2 | 11.3 | 12.1 | 13.9 | VE | 14-19 |
| | | * | * | * | * | AE | 12-14 |
| | | 10.2 | 12.4 | 13.1 | 15.2 | VE | 15-17 |

¹Includes the effects of wave action, where applicable

²Due to map scale limitations, BFEs shown on the FIRM may represent average elevation for the zone depicted

*Data not available

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

**CHATHAM COUNTY, GA
AND INCORPORATED AREAS**

TRANSECT DATA

ATLANTIC OCEAN

| FLOODING SOURCE | TRANSECTS | STILLWATER ELEVATION (FEET NAVD) | | | | ZONE ¹ | BASE FLOOD ELEVATION (FEET NAVD) ² |
|-------------------------------|----------------------|----------------------------------|-------------------------|-------------------------|---------------------------|-------------------|---|
| | | 10-PERCENT-ANNUAL-CHANCE | 2-PERCENT-ANNUAL-CHANCE | 1-PERCENT-ANNUAL-CHANCE | 0.2-PERCENT-ANNUAL-CHANCE | | |
| ATLANTIC OCEAN (CONTINUED) | 14-17 (CONTINUED) | 8.3 * | 10.2 * | 11.1 * | 13.2 * | VE | 13-14 |
| | | | | | | AE | 11-13 |
| | 13-16 | 9.2 * | 11.3 * | 12.1 * | 13.9 * | VE | 14-19 |
| | | | | | | AE | 12-14 |
| | | 10.2 * | 12.4 * | 13.1 * | 15.2 * | VE | 15-17 |
| | | 8.3 * | 10.2 * | 11.1 * | 13.2 * | VE | 13-14 |
| | 17-20 | | | | | AE | 11-13 |
| | | 9.2 * | 11.3 * | 12.1 * | 13.9 * | VE | 14-19 |
| | | | | | | AE | 12-14 |
| | | 10.5 * | 12.4 * | 13.1 * | 14.7 * | VE | 15-17 |
| | | | | | | AE | 13-15 |
| | 17-24 | 8.3 * | 10.2 * | 11.1 * | 13.2 * | VE | 14-16 |
| | | | | | | AE | 11-13 |
| | | 9.2 * | 11.3 * | 12.1 * | 13.9 * | VE | 14-19 |
| | | | | | | AE | 12-14 |
| | 10.5 | 12.4 | 13.1 | 14.7 | VE | 15-17 | |

¹Includes the effects of wave action, where applicable

²Due to map scale limitations, BFEs shown on the FIRM may represent average elevation for the zone depicted

*Data not available

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

**CHATHAM COUNTY, GA
AND INCORPORATED AREAS**

TRANSECT DATA

ATLANTIC OCEAN

| FLOODING SOURCE | TRANSECTS | STILLWATER ELEVATION (FEET NAVD) | | | | ZONE ¹ | BASE FLOOD ELEVATION (FEET NAVD) ² |
|-------------------------------|----------------------|----------------------------------|-------------------------|-------------------------|---------------------------|-------------------|---|
| | | 10-PERCENT-ANNUAL-CHANCE | 2-PERCENT-ANNUAL-CHANCE | 1-PERCENT-ANNUAL-CHANCE | 0.2-PERCENT-ANNUAL-CHANCE | | |
| ATLANTIC OCEAN (CONTINUED) | 17-24 (CONTINUED) | * | * | * | * | AE | 13-15 |
| | | 8.3 | 10.2 | 11.1 | 13.2 | VE | 14-16 |
| | | * | * | * | * | AE | 11-13 |
| | 19-24 | 9.4 | 11.6 | 12.1 | 14.6 | VE | 14-19 |
| | | * | * | * | * | AE | 13-14 |
| | | 10.5 | 12.4 | 13.1 | 14.7 | VE | 16-48 |
| | | 8.3 | 10.2 | 11.1 | 13.2 | VE | 13-15 |
| | | * | * | * | * | AE | 13 |
| | 21-24 | 9.4 | 11.6 | 12.1 | 14.6 | VE | 14-19 |
| | | * | * | * | * | AE | 13-14 |
| | | 10.5 | 12.4 | 13.1 | 14.7 | VE | 16-48 |
| | | 8.3 | 10.2 | 11.1 | 13.2 | VE | 13-15 |
| | | * | * | * | * | AE | 13 |
| | N/A | 9.1 | 10.4 | 11.1 | 12.6 | AE | 11 |
| | N/A | 8.0 | 9.4 | 9.9 | 11.4 | AE | 10 |
| N/A | 9.4 | 10.9 | 11.5 | 12.7 | AE | 11 | |

¹Includes the effects of wave action, where applicable

²Due to map scale limitations, BFEs shown on the FIRM may represent average elevation for the zone depicted

*Data not available

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

**CHATHAM COUNTY, GA
AND INCORPORATED AREAS**

TRANSECT DATA

ATLANTIC OCEAN

Table 6 - Vertical Datum Conversion

| <u>Quad Name</u> | <u>Corner</u> | <u>Latitude</u> | <u>Longitude</u> | <u>Conversion from NGVD to NAVD</u> |
|--------------------|---------------|-----------------|------------------|---|
| Meldrim | SW | 81.37 | 32.13 | -0.856 |
| Meldrim | NE | 81.25 | 32.25 | -0.915 |
| Meldrim | SE | 81.25 | 32.12 | -0.902 |
| Port Wentworth | NE | 81.20 | 32.25 | -0.922 |
| Port Wentworth | SE | 81.13 | 32.13 | -0.928 |
| Limehouse | SE | 81.00 | 32.13 | -0.919 |
| Mildrem SE | SE | 81.25 | 32.00 | -0.892 |
| Garden City | SE | 81.13 | 32.00 | -0.919 |
| Savannah | SE | 81.00 | 32.00 | -0.932 |
| Fort Pulaski | SE | 80.88 | 32.00 | -0.932 |
| Tybee Island North | SE | 80.75 | 32.00 | -0.958 |
| Richmond Hill | SE | 81.25 | 31.87 | -0.928 |
| Burroughs | SE | 81.13 | 31.87 | -0.928 |
| Isle of Hope | SE | 81.00 | 31.87 | -0.942 |
| Wassaw Sound | SE | 80.88 | 31.87 | -0.958 |
| Oak Level | SE | 81.12 | 31.75 | -0.955 |
| Racoon Key | SE | 81.00 | 31.75 | -0.965 |
| Meldrim | SW | 81.37 | 32.13 | -0.856 |
| | | | Average: | -0.927 |

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

Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

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. Therefore, each FIS provides 1-percent-annual-chance (100-year) flood elevations and delineations of the 1- and 0.2-percent-annual-chance (500-year) floodplain boundaries and 1-percent-annual-chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data Table, and Summary of Stillwater Elevations Table. Users should reference the data presented in the FIS report as well as additional information that may be available at the local 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 Atlantic Ocean and the coastally influenced flooding sources; Ogeechee River, Salt Creek Tributary, Savannah River, St. Augustine Creek, St. Augustine Creek Tributary, Wilshire Canal, from the confluence of Wilshire Canal Tributary A to just downstream of Mercy Road, Wilshire Canal Tributary A, and Wilshire Canal Tributary A-1, the boundaries were interpolated between transects using topographic maps at a scale of 1:24,000, with a contour interval of 5 feet (USGS, various dates).

The boundaries on Pipe Makers Canal Tributary No. 2 were interpolated between cross sections, using site mapping at a scale of 1:4,800, with a contour interval of 1 foot (Braswell Engineering, 1999), based on February 1997 aerial photography.

The boundaries on the Little Ogeechee River were interpolated between cross sections using a certified topographic survey map at a scale of 1:6,000, with a contour interval of 1 foot (Hussey, Gay, Bell & DeYoung, 2000).

For Black Creek, Black Creek Tributary No. 2, Casey Canal, Chippewa Canal, Coffee Bluff Basin, Colonial Oaks Canal, Colonial Oaks Canal Tributary No. 1, Colonial Oaks Canal Tributary No. 1.1, Evergreen Cemetery Basin, Fell Street Basin, Hardin Canal, Harmon Canal, Kingsway Canal, Little Ogeechee River Tributary, Louis Mills Branch, Pipe Makers Canal, Placentia Canal, Quacco

Canal, Rahn Dairy Canal, Springfield Canal, Springfield Canal Tributary A, Tributary to Little Ogeechee River Tributary, Wilshire Canal, from approximately 1,285 feet downstream of White Bluff Road to the confluence of Wilshire Canal Tributary A, Windsor Forest Canal East, Windsor Forest Canal Tributary, Windsor Forest Canal Tributary No. 2, Windsor Forest Canal Tributary No. 3, and Windsor Forest Canal West, the boundaries were interpolated using 1-foot contours derived from LiDAR data (Thomas & Hutton, 2001).

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary was delineated using the Type 15 FIS for Chatham County and Flood Hazard Boundary Map for Chatham County (FEMA, 1983 and FIA, 1976).

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, AE, and VE), 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-annual-chance 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.

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 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 have been tabulated for selected cross sections (Table 7). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

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 WSEL of the 1-percent-annual-chance 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 3.

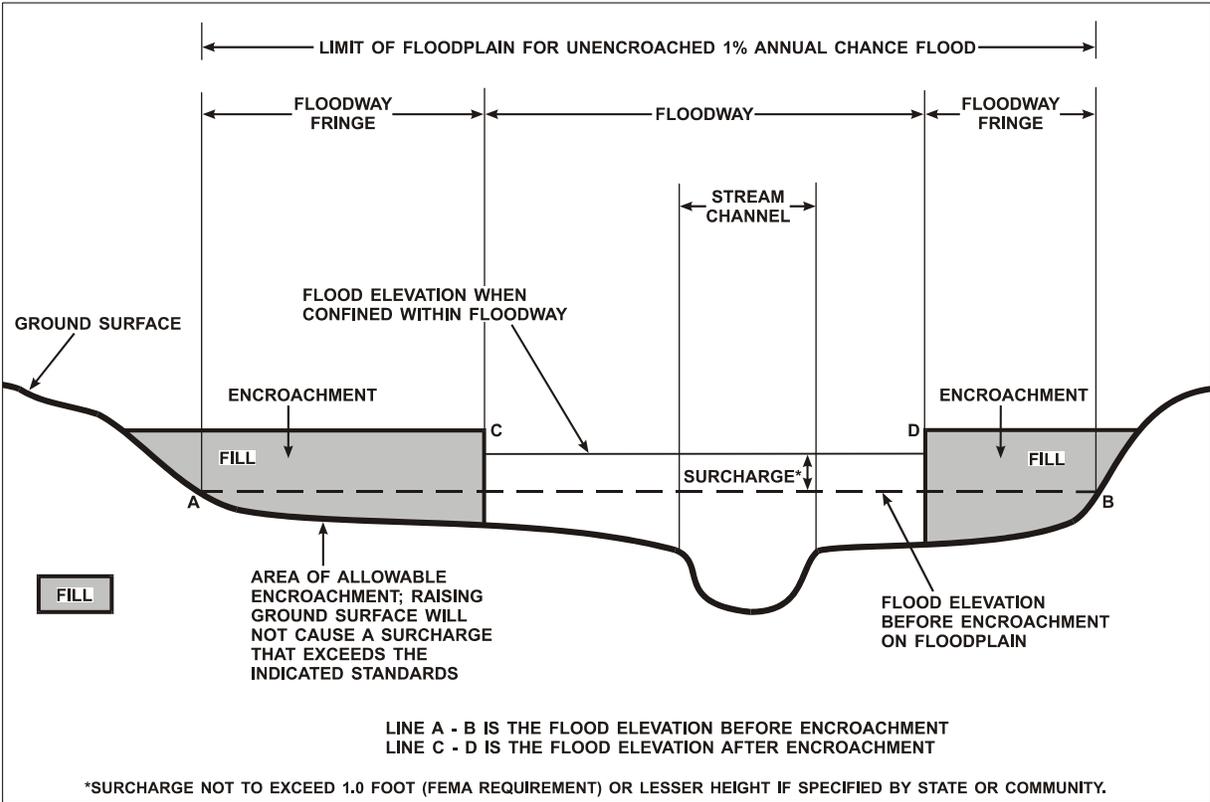


Figure 3 - Floodway Schematic

No floodways were computed for Black Creek, Black Creek Tributary No. 2, Casey Canal, Chippewa Canal, Colonial Oaks Canal, Colonial Oaks Canal Tributary No. 1, Colonial Oaks Canal Tributary No. 1.1, Hardin Canal, Harmon Canal, Kingsway Canal, Little Ogeechee River, Little Ogeechee River Tributary, Louis Mills Branch, Ogeechee River, Salt Creek Tributary, Savannah River,

| FLOODING SOURCE | | | FLOODWAY ¹ | | | 1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION | | | |
|-------------------|-------|-----------------------|-----------------------|-----------------------|----------------------------------|--|------------------------------------|---------------------------------|--------------------|
| NODES | LINKS | DISTANCE ² | WIDTH (FEET) | PEAK FLOW (CFS) | VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| PIPE MAKERS CANAL | | | | | | | | | |
| A | A-B | 15,025 | 1,430 | 1,672 | 0.2 | 11.3 | 11.3 | 12.1 | 0.8 |
| B | | 15,628 | | | | 11.3 | 11.3 | 12.1 | 0.8 |
| C | C-D | 20,903 | 1,523 | 1,888 | 0.2 | 11.4 | 11.4 | 12.2 | 0.8 |
| D | | 21,596 | | | | 11.4 | 11.4 | 12.2 | 0.8 |
| E | E-F | 25,805 | 2733 | 2345 | 0.4 | 12.1 | 12.1 | 13.1 | 1.0 |
| F | | 26,405 | | | | 12.1 | 12.1 | 13.1 | 1.0 |
| G | G-H | 30,004 | 998 | 2645 | 0.7 | 12.7 | 12.7 | 13.5 | 0.8 |
| H | | 30,603 | | | | 12.8 | 12.8 | 13.6 | 0.8 |
| I | I-J | 35,153 | 1725 | 2609 | 1.3 | 15.9 | 15.9 | 16.6 | 0.7 |
| J | | 36,291 | | | | 15.9 | 15.9 | 16.6 | 0.7 |
| K | K-L | 42,582 | 1463 | 1620 | 1.2 | 17.3 | 17.3 | 18.1 | 0.8 |
| L | | 43,579 | | | | 17.4 | 17.4 | 18.2 | 0.8 |
| M | M-N | 50,600 | 1056 | 1331 | 0.8 | 19.0 | 19.0 | 19.8 | 0.8 |
| N | | 51,602 | | | | 19.2 | 19.2 | 20.0 | 0.8 |

¹Values represent maximum along link

²Feet above confluence with Savannah River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

**CHATHAM COUNTY, GA
AND INCORPORATED AREAS**

FLOODWAY DATA

PIPE MAKERS CANAL

| FLOODING SOURCE | | | FLOODWAY ¹ | | | BASE FLOOD WATER SURFACE ELEVATION | | | |
|----------------------------------|-------|-----------------------|------------------------------|--------------------|-------------------------------|------------------------------------|---------------------------------|------------------------------|--------------------|
| NODES | LINKS | DISTANCE ² | WIDTH ³ (FEET) | PEAK FLOW (CFS) | VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| PIPE MAKERS CANAL (CONTINUED) | | | | | | | | | |
| O | O-P | 60,626 | 729 | 451 | 1.8 | 19.9 | 19.9 | 20.7 | 0.8 |
| P | | 61,626 | | | | | | | |
| Q | Q-R | 65,121 | 665 | 570 | 0.7 | 20.6 | 20.6 | 21.2 | 0.6 |
| R | | 65,823 | | | | | | | |

¹Values represent maximum along link

²Feet above confluence with Savannah River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

**CHATHAM COUNTY, GA
AND INCORPORATED AREAS**

FLOODWAY DATA

PIPE MAKERS CANAL

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|--------------------------------|-----------------------|-----------------|-------------------------------------|--|--|------------------------------------|---------------------------------|--------------------|
| CROSS SECTION | DISTANCE ¹ | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| PIPE MAKERS TRIBUTARY NO. 2 | | | | | | | | |
| A | 1,870 | 130 | 385 | 1.4 | 19.6 | 18.8 ² | 19.8 | 1.0 |
| B | 2,778 | 150 | 465 | 1.2 | 19.6 | 19.2 ² | 20.2 | 1.0 |
| C | 5,368 | 240 | 649 | 0.9 | 19.6 | 19.5 ² | 20.5 | 1.0 |
| D | 6,597 | 285 | 798 | 0.7 | 19.7 | 19.7 | 20.7 | 1.0 |
| E | 7,962 | 195 | 478 | 1.2 | 19.9 | 19.9 | 20.8 | 0.9 |
| F | 8,554 | 195 | 443 | 0.8 | 20.0 | 20.0 | 21.0 | 1.0 |
| G | 9,481 | 165 | 428 | 0.8 | 21.1 | 21.1 | 21.7 | 0.6 |
| H | 10,055 | 676 | 1,613 | 0.2 | 21.2 | 21.2 | 21.8 | 0.6 |

¹Feet above confluence with Pipe Makers Canal

²Elevation computed without consideration of backwater effects from Pipe Makers Canal

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

**CHATHAM COUNTY, GA
AND INCORPORATED AREAS**

FLOODWAY DATA

PIPE MAKERS TRIBUTARY NO. 2

Springfield Canal, Springfield Canal Tributary A, St. Augustine Creek, St. Augustine Creek Tributary, Tributary to Little Ogeechee River Tributary, Wilshire Canal, Wilshire Canal Tributary A, Wilshire Canal Tributary A-1, Windsor Forest Canal East, Windsor Forest Canal Tributary, Windsor Forest Canal Tributary No. 2, Windsor Forest Canal Tributary No. 3, and Windsor Forest Canal West.

4.3 Base Flood Elevations

Areas within the community studied by detailed engineering methods have BFEs established in AE and VE Zones. These are the elevations of the 1-percent-annual-chance (base flood) relative to NAVD. In coastal areas affected by wave action, BFEs are generally maximum at the normal open shoreline. These elevations generally decrease in a landward direction at a rate dependent on the presence of obstructions capable of dissipating the wave energy. Where possible, changes in BFEs have been shown in 1-foot increments on the FIRM. However, where the scale did not permit, 2- or 3-foot increments were sometimes used. BFEs shown in the wave action areas represent the average elevation within the zone. Current program regulations generally require that all new construction be elevated such that the first floor, including basement, is elevated to or above the BFE in AE and VE Zones.

4.4 Velocity Zones

The USACE has established the 3-foot wave height as the criterion for identifying coastal high hazard zones (USACE, 1975). This was based on a study of wave action effects on structures. This criterion has been adopted by FEMA for the determination of VE zones. Because of the additional hazards associated with high-energy waves, the NFIP regulations require much more stringent floodplain management measures in these areas, such as elevating structures on piles or piers. In addition, insurance rates in VE zones are higher than those in AE zones.

The location of the VE zone is determined by the 3-foot wave as discussed previously. The detailed analysis of wave heights performed in this study allowed a much more accurate location of the VE zone to be established. The VE zone generally extends inland to the point where the 1-percent-annual-chance stillwater flood depth is insufficient to support a 3-foot wave.

5.0 INSURANCE APPLICATIONS

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

Zone AE

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

Zone VE

Zone VE is the flood insurance risk zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. 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 risk 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 base flood depths are shown within this zone.

The FIRM for Chatham County includes areas designated by Congress as units of the Coastal Barrier Resources System (CBRS), where federally backed flood insurance is not available.

The Coastal Barrier Resources Act of 1982 and the Coastal Barrier Improvement Act of 1990 define and establish a system of protected coastal areas (including the Great Lakes) known as the CBRS. The Acts define areas within the CBRS as depositional geologic features consisting of unconsolidated sedimentary materials; subject to wave, tidal, and wind energies; and protecting landward aquatic habitats from direct wave attack. The Acts further define coastal barriers as “all associated aquatic habitats, including the adjacent wetlands, marshes, estuaries, inlets and nearshore waters, but only if such features and associated habitats contain few manmade structures and these structures and man’s activities on such features, and within such habitats do not significantly impede geomorphic and ecological processes.” The Acts provide protection to CBRS areas by prohibiting most expenditures of Federal funds within them. These prohibitions refer to

“any form of loan, grant, guarantee, insurance, payment, rebate, subsidy or any other form of direct or indirect Federal assistance,” with specific and limited exceptions. The CBRS boundaries depicted on the FIRM for Chatham County were adopted into public law by Acts of Congress and are, therefore, considered final and not subject to appeal.

In addition to the CBRS, the Coastal Barrier Improvement Act of 1990 established Otherwise Protected Areas (OPAs). OPAs are undeveloped coastal barriers within the boundaries of an area established under Federal, State, or local law, or held by a qualifying organization, primarily for wildlife refuge, sanctuary, recreational, or natural resource conservation purposes.

Congress designated the initial CBRS areas in 1982. Subsequent modifications of the CBRS are introduced as legislation to be acted on by Congress, and originate from State and local requests, as well as recommendations made by the U.S. Fish and Wildlife Service. After Congress approves additions to the CBRS, the new areas are assigned a unique effective date, after which Federal assistance prohibitions apply. In cooperation with the U.S. Department of the Interior, FEMA transfers CBRS boundaries to FIRMs using Congressionally adopted source maps titled *Coastal Barrier Resources System*. FIRMs clearly depict the different CBRS areas and their effective dates with special map notes and symbols. It should be noted that although FEMA shows CBRS areas on FIRMs, only Congress may authorize a revision of CBRS boundaries.

Within CBRS boundaries, Federal flood insurance is not available for structures built or substantially improved on or after the date that the subject area was added to the CBRS. To assist map users in determining the correct insurance prohibition date in CBRS areas, each separate CBRS unit is clearly identified on the FIRM. It is important to note that insurance for structures in OPAs may be obtained if written documentation is provided, which certifies that the structures are used in a manner consistent with the purpose for which the area is protected.

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 risk 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 FIRM presents flooding information for the entire geographic area of Chatham County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood-prone. This countywide FIRM also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps, where applicable. Historical data relating to the maps prepared for each community are presented in Table 8.

7.0 OTHER STUDIES

This report either supersedes or is compatible with all previous studies on streams studied in this report and should be considered authoritative for purposes of the NFIP.

8.0 LOCATION OF DATA

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

9.0 BIBLIOGRAPHY AND REFERENCES

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| COMMUNITY NAME | INITIAL IDENTIFICATION | FLOOD HAZARD BOUNDARY MAP REVISION DATE | FIRM EFFECTIVE DATE | FIRM REVISION DATE |
|--|------------------------|---|---------------------|--|
| Bloomingdale, City of | October 15, 1976 | None | July 2, 1981 | September 26, 2008 May 7, 2001 |
| Chatham County (Unincorporated Areas) | March 5, 1976 | None | August 1, 1980 | September 26, 2008 September 20, 1995 September 3, 1992 May 19, 1987 October 1, 1983 |
| Garden City, City of | March 16, 1973 | None | March 16, 1973 | September 26, 2008 May 19, 1987 November 21, 1980 March 19, 1976 July 1, 1974 |
| Pooler, City of | July 25, 1975 | None | September 30, 1981 | September 26, 2008 |
| Port Wentworth, City of | March 16, 1973 | None | March 16, 1973 | September 26, 2008 May 19, 1987 December 26, 1975 July 1, 1974 |
| Savannah, City of | September 18, 1970 | None | May 21, 1971 | September 26, 2008 September 4, 1987 November 21, 1980 July 1, 1974 |

FEDERAL EMERGENCY MANAGEMENT AGENCY

**CHATHAM COUNTY, GA
AND INCORPORATED AREAS**

COMMUNITY MAP HISTORY

TABLE 8

| COMMUNITY NAME | INITIAL IDENTIFICATION | FLOOD HAZARD BOUNDARY MAP REVISION DATE | FIRM EFFECTIVE DATE | FIRM REVISION DATE |
|-----------------------|------------------------|---|---------------------|--|
| Thunderbolt, Town of | December 23, 1977 | None | July 2, 1987 | September 26, 2008 |
| Tybee Island, City of | January 14, 1972 | None | January 14, 1972 | September 26, 2008 June 17, 1986 September 5, 1975 July 1, 1974 |
| Vernonburg, Town of | July 27, 1973 | None | July 27, 1973 | September 26, 2008 July 2, 1987 October 31, 1975 July 1, 1974 |

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

**CHATHAM COUNTY, GA
AND INCORPORATED AREAS**

COMMUNITY MAP HISTORY

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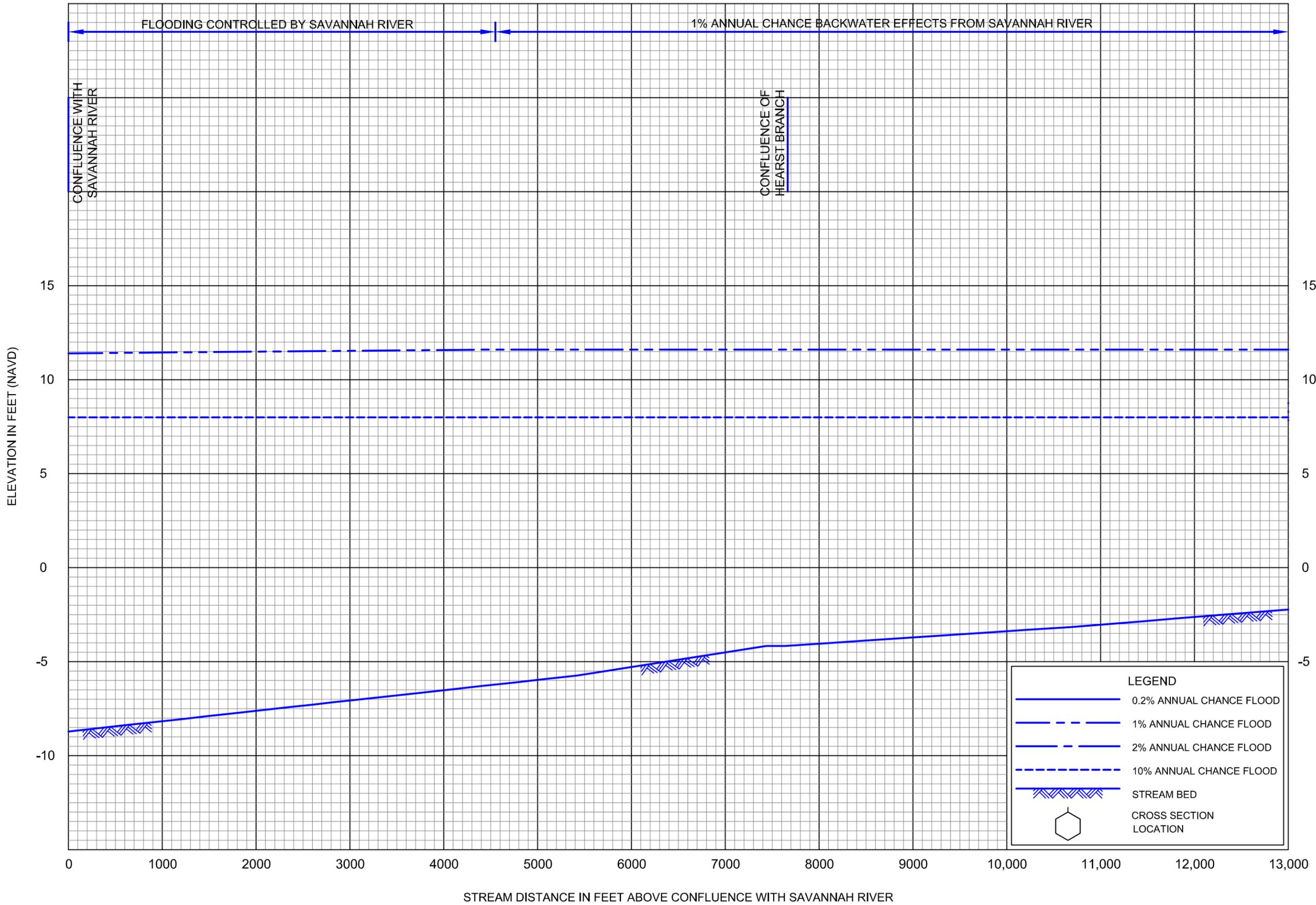
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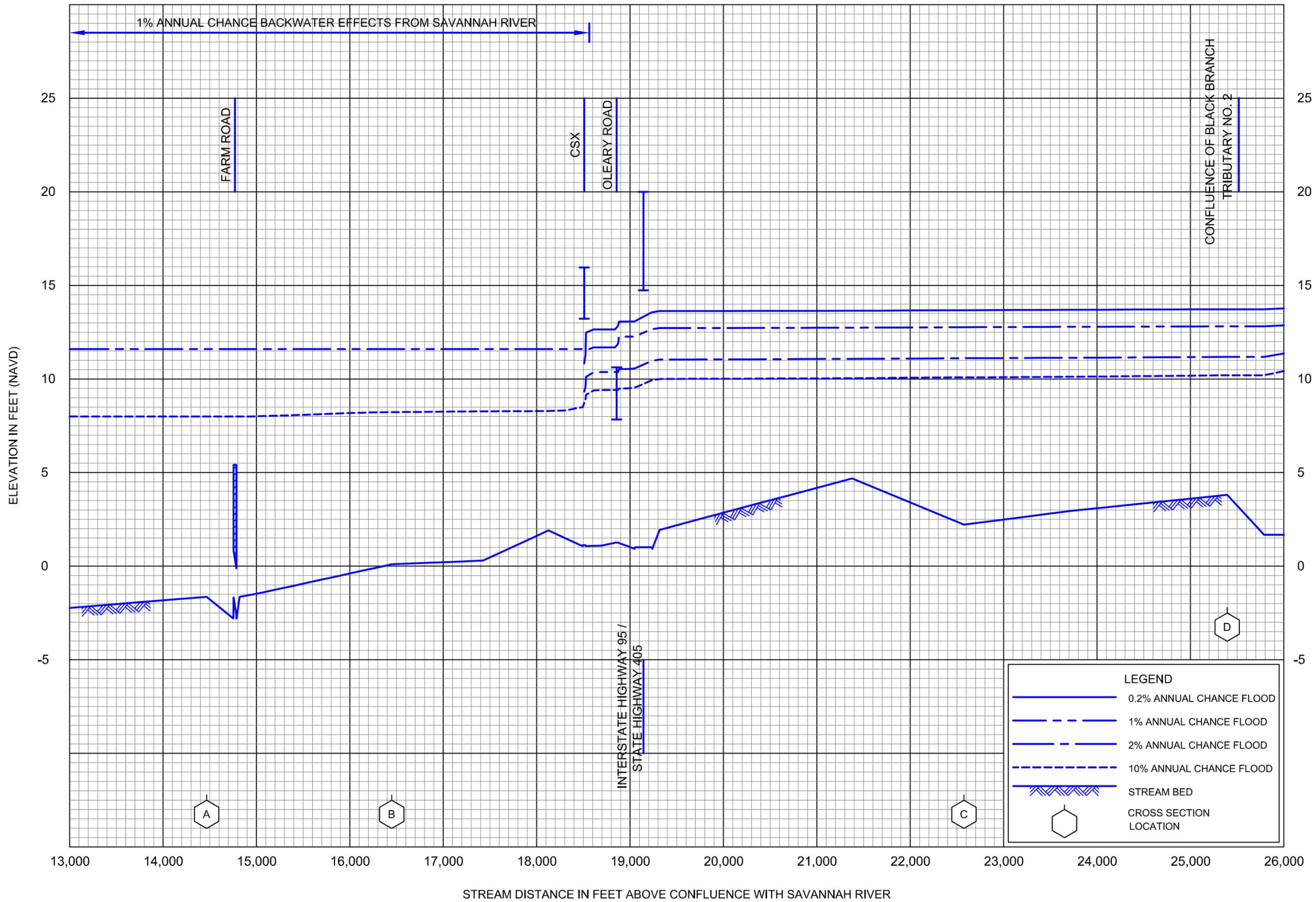


FLOOD PROFILES

BLACK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA
AND INCORPORATED AREAS

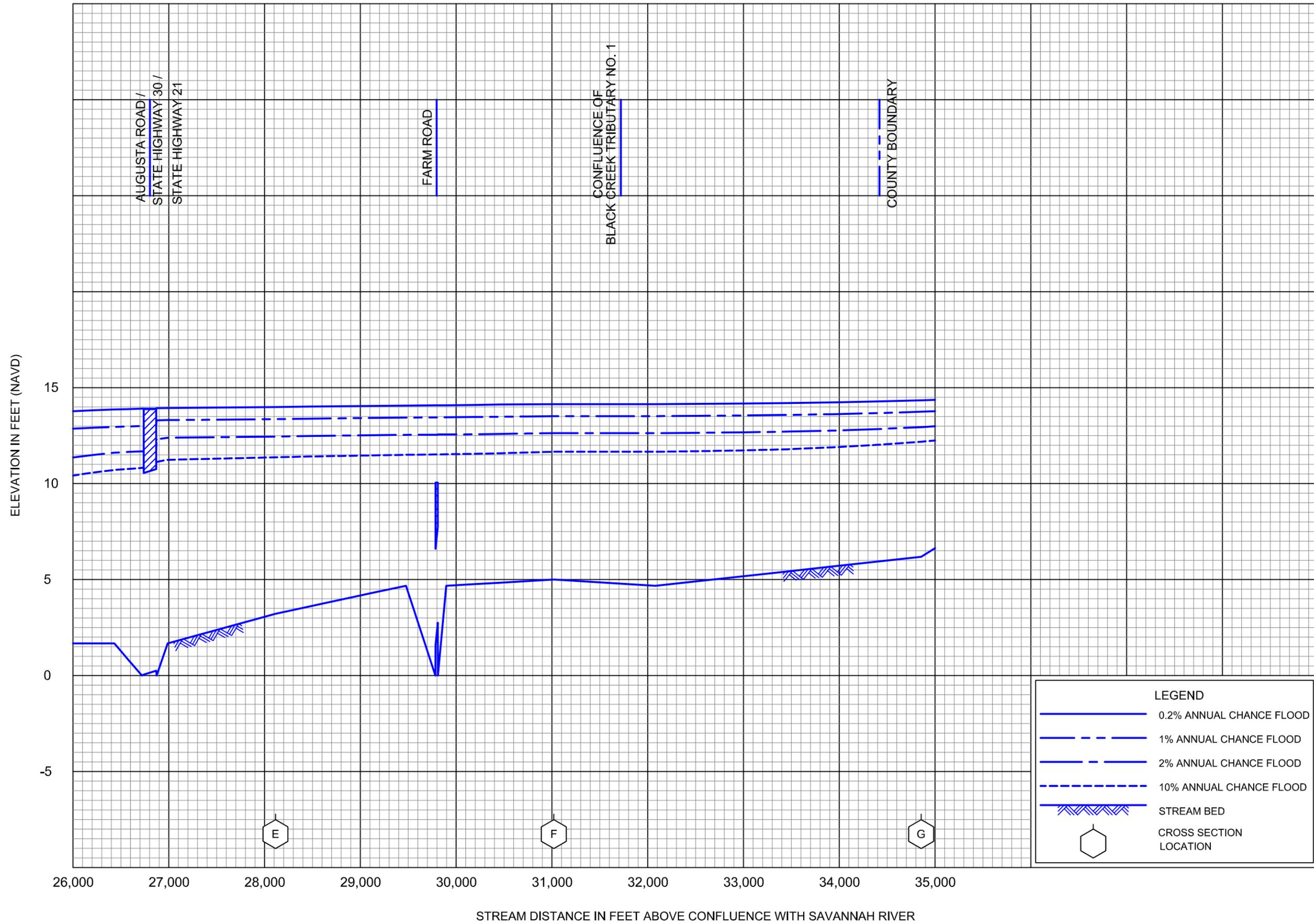


FLOOD PROFILES

BLACK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA
AND INCORPORATED AREAS



AUGUSTA ROAD /
STATE HIGHWAY 30 /
STATE HIGHWAY 21

FARM ROAD

CONFLUENCE OF
BLACK CREEK TRIBUTARY NO. 1

COUNTY BOUNDARY

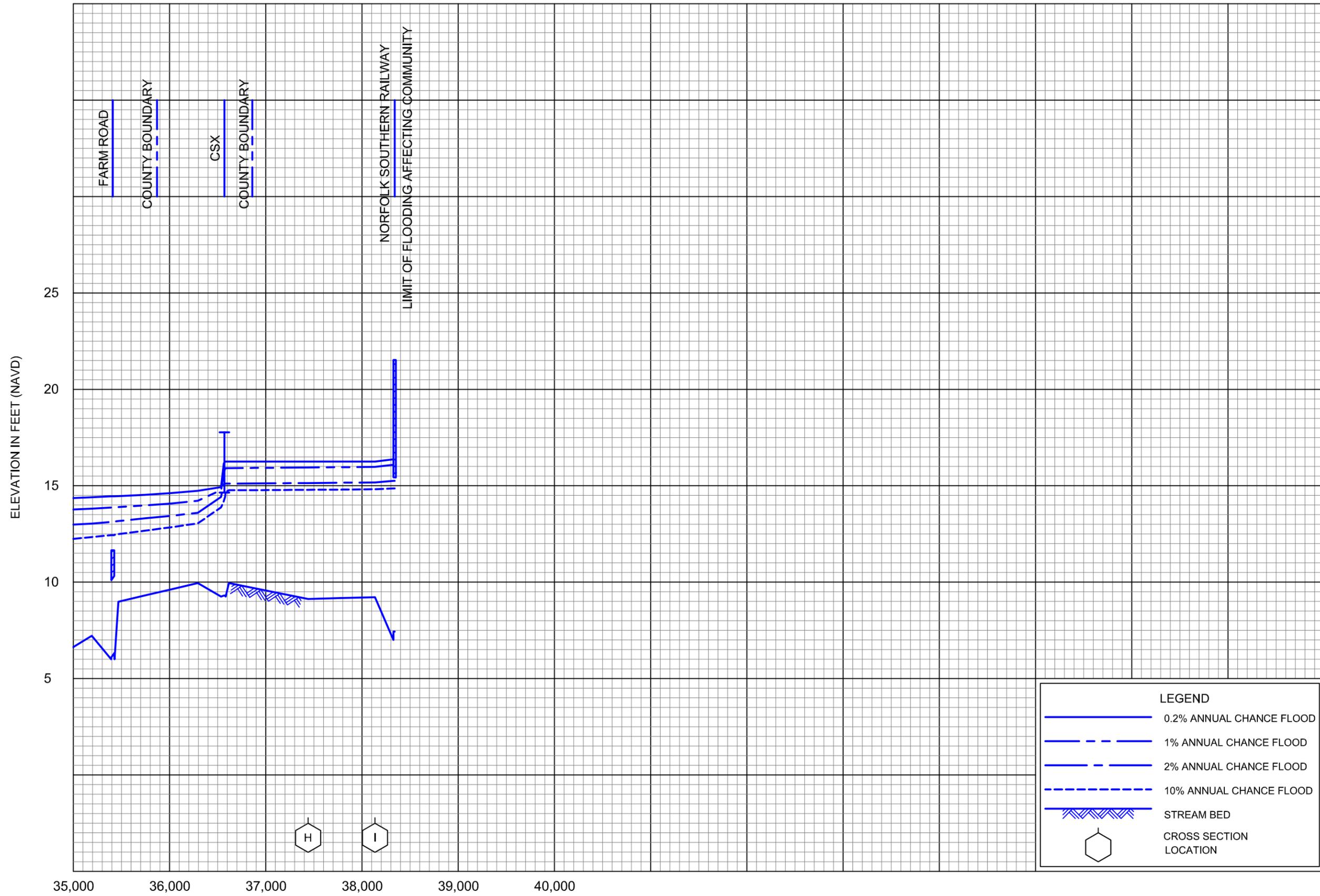
LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

BLACK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
CHATHAM COUNTY, GA
AND INCORPORATED AREAS



LEGEND

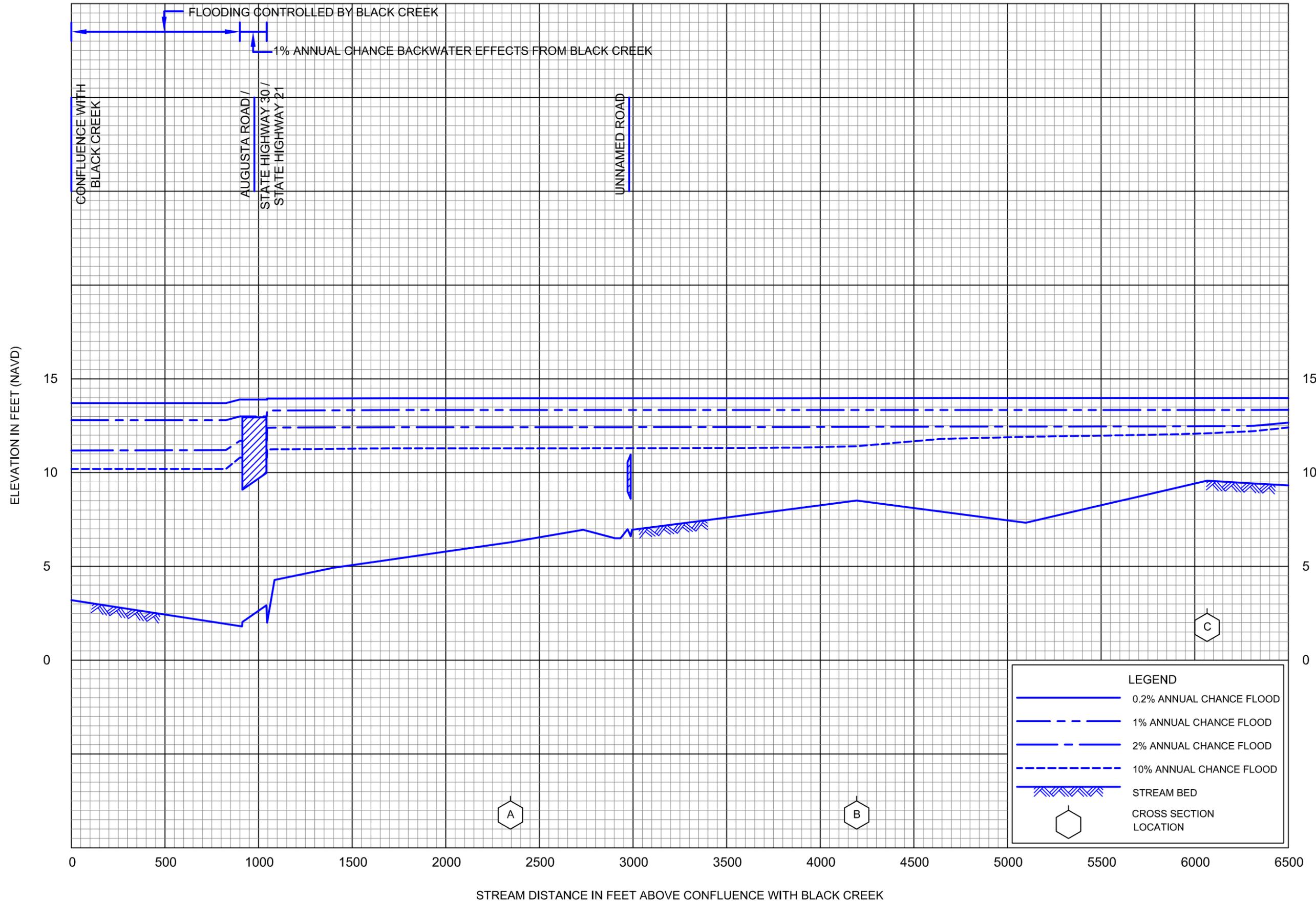
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

BLACK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA
AND INCORPORATED AREAS

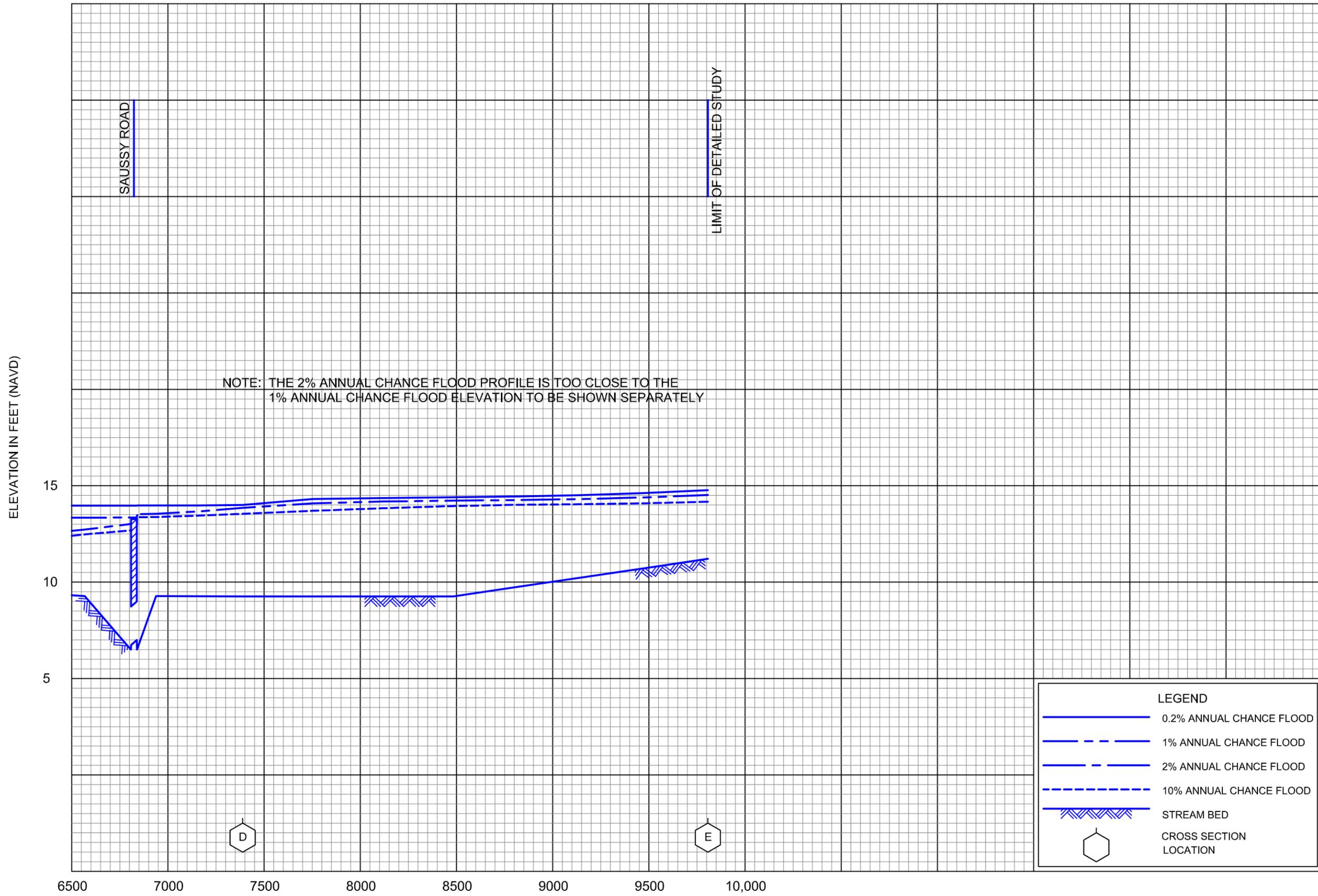


FLOOD PROFILES

BLACK CREEK TRIBUTARY NO. 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

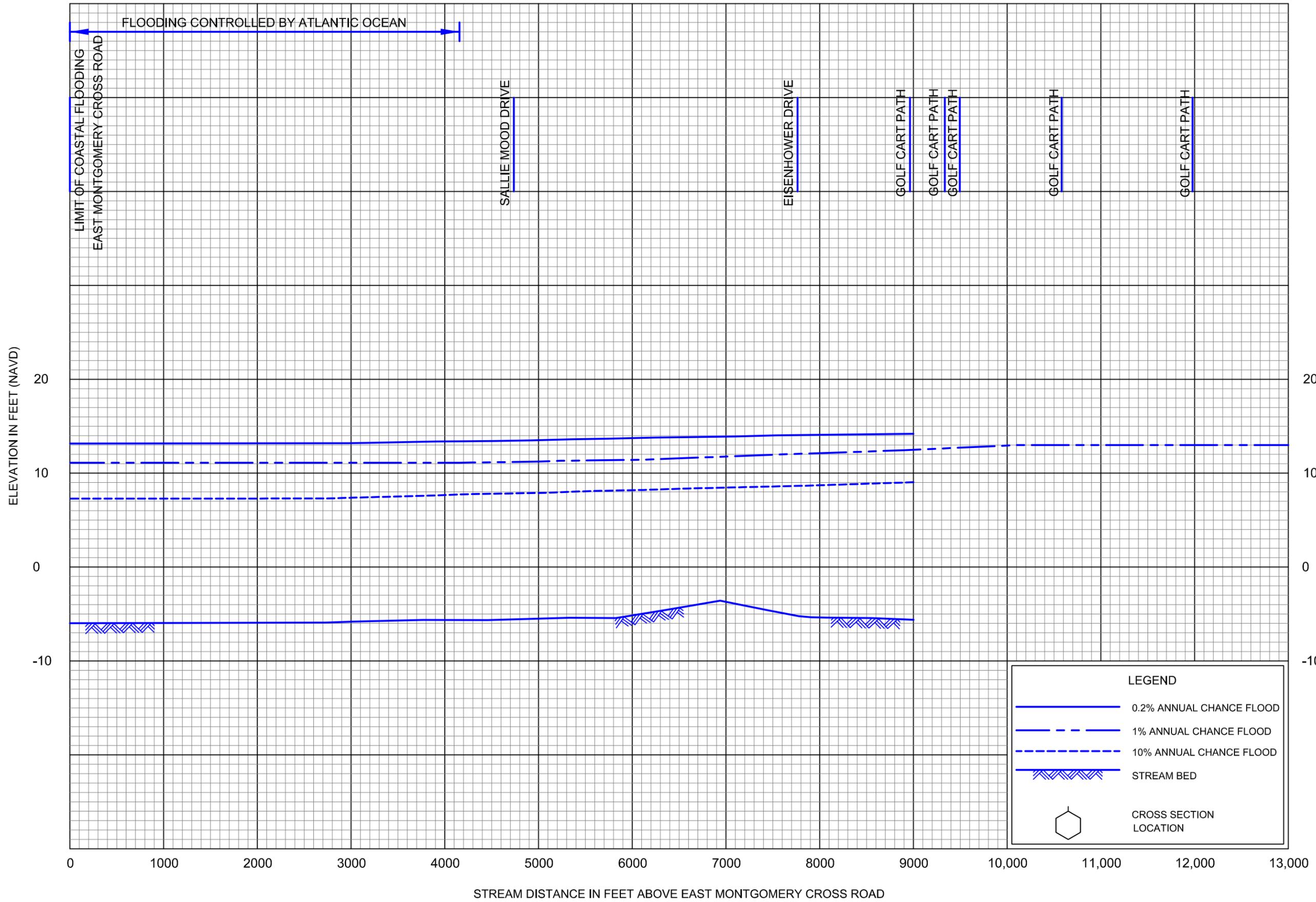
CHATHAM COUNTY, GA
AND INCORPORATED AREAS

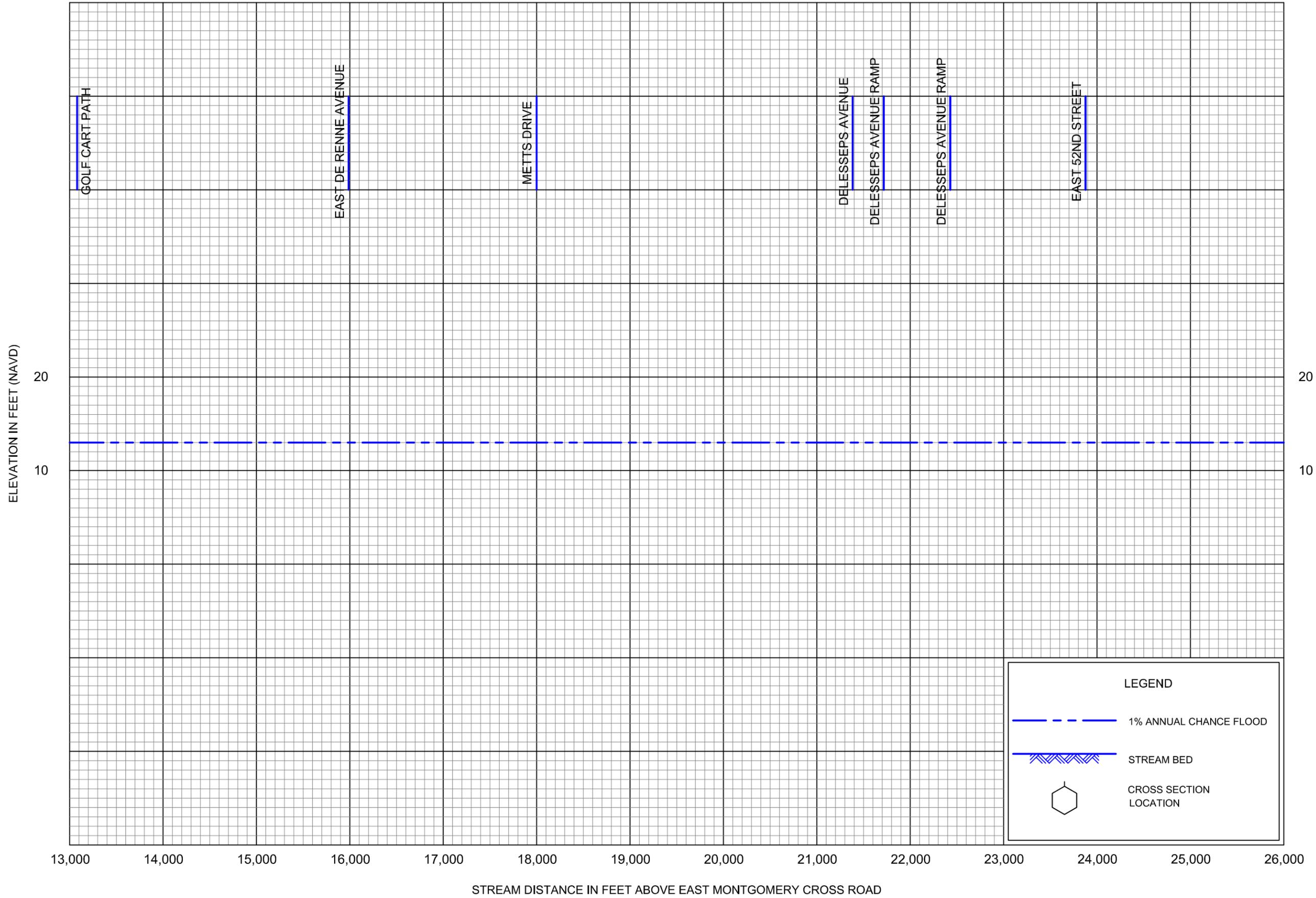


FLOOD PROFILES

BLACK CREEK TRIBUTARY NO. 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
 CHATHAM COUNTY, GA
 AND INCORPORATED AREAS





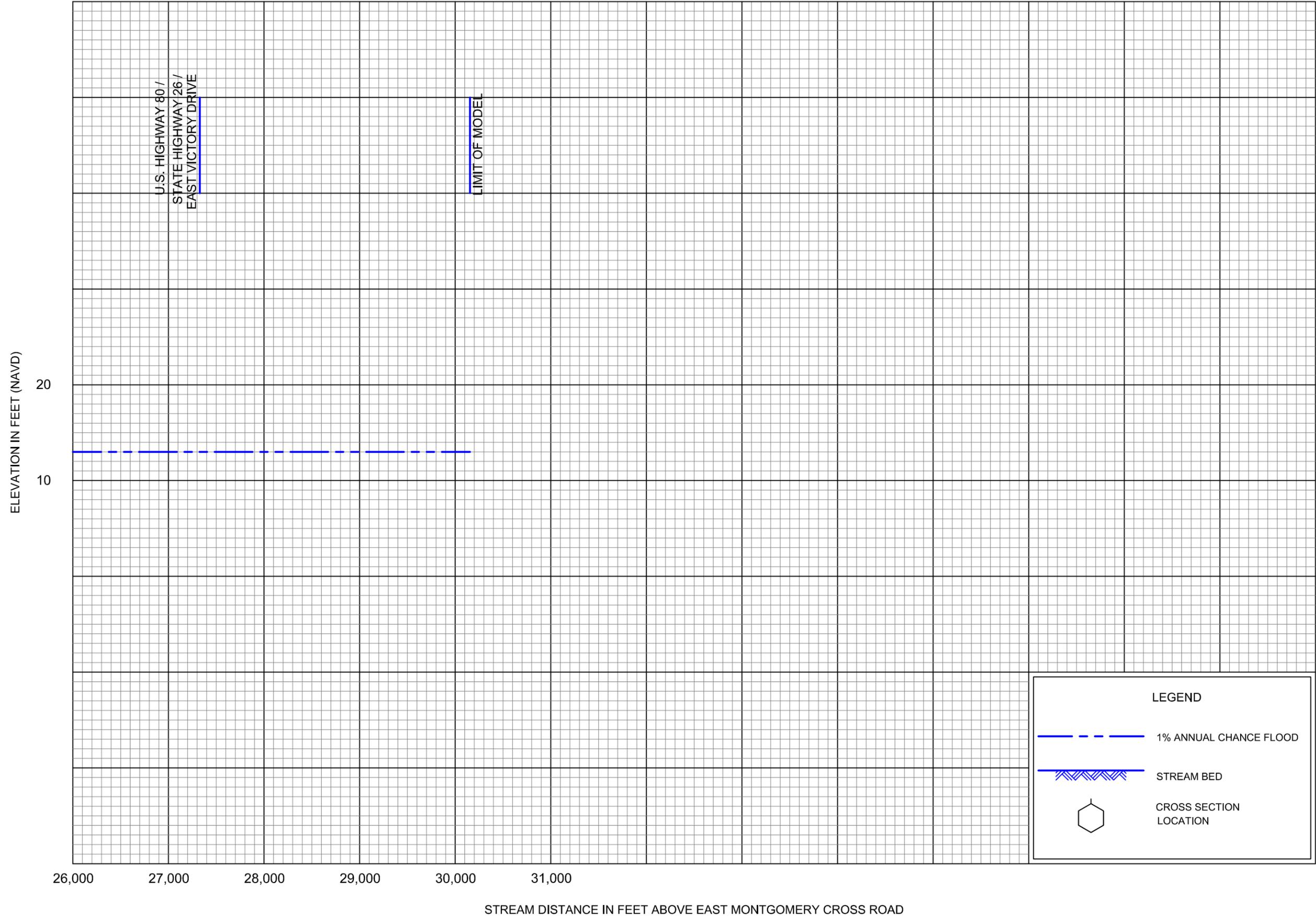
LEGEND

-  1% ANNUAL CHANCE FLOOD
-  STREAM BED
-  CROSS SECTION LOCATION

FLOOD PROFILES

CASEY CANAL

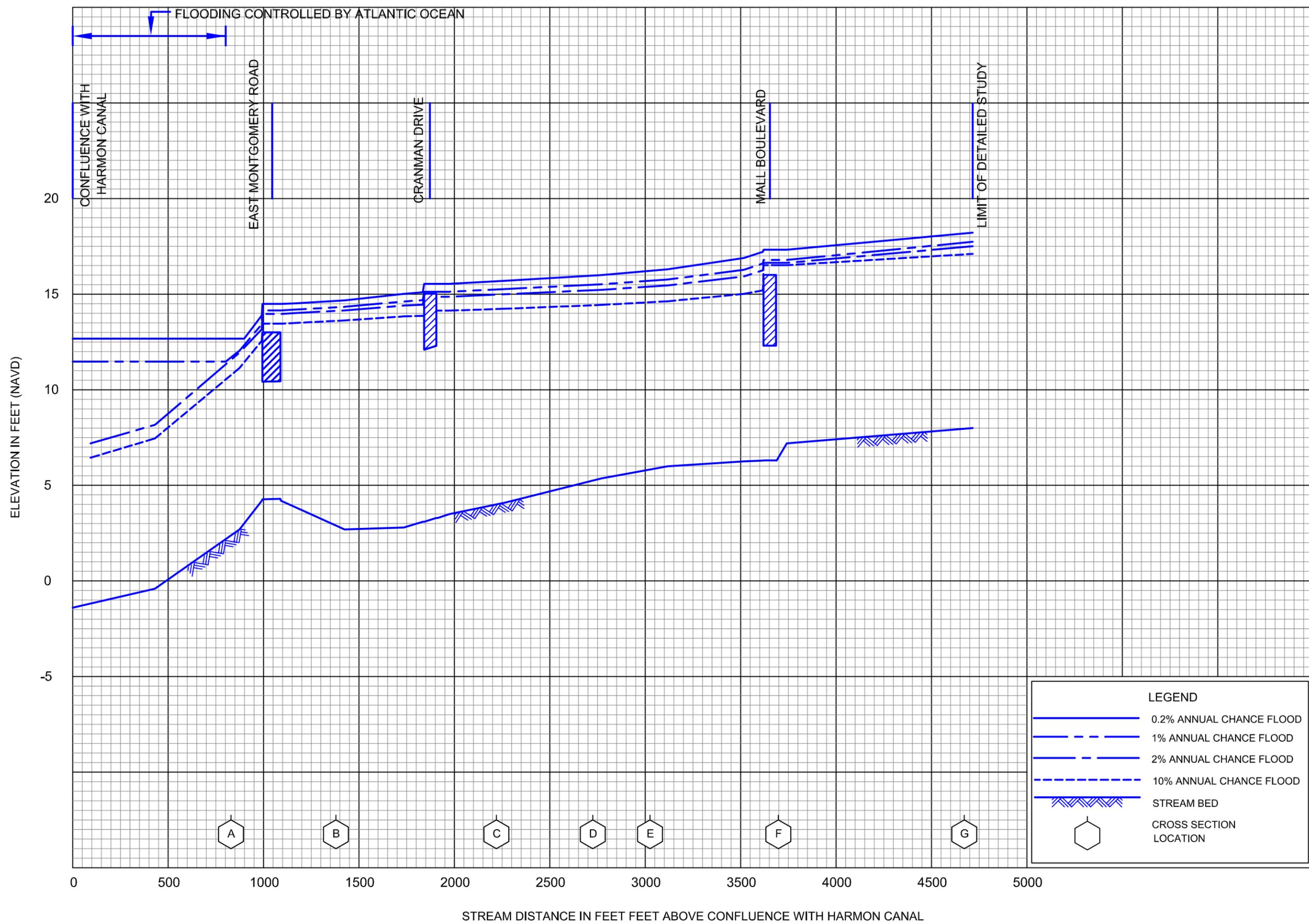
FEDERAL EMERGENCY MANAGEMENT AGENCY
CHATHAM COUNTY, GA
 AND INCORPORATED AREAS



FLOOD PROFILES

CASEY CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY
 CHATHAM COUNTY, GA
 AND INCORPORATED AREAS

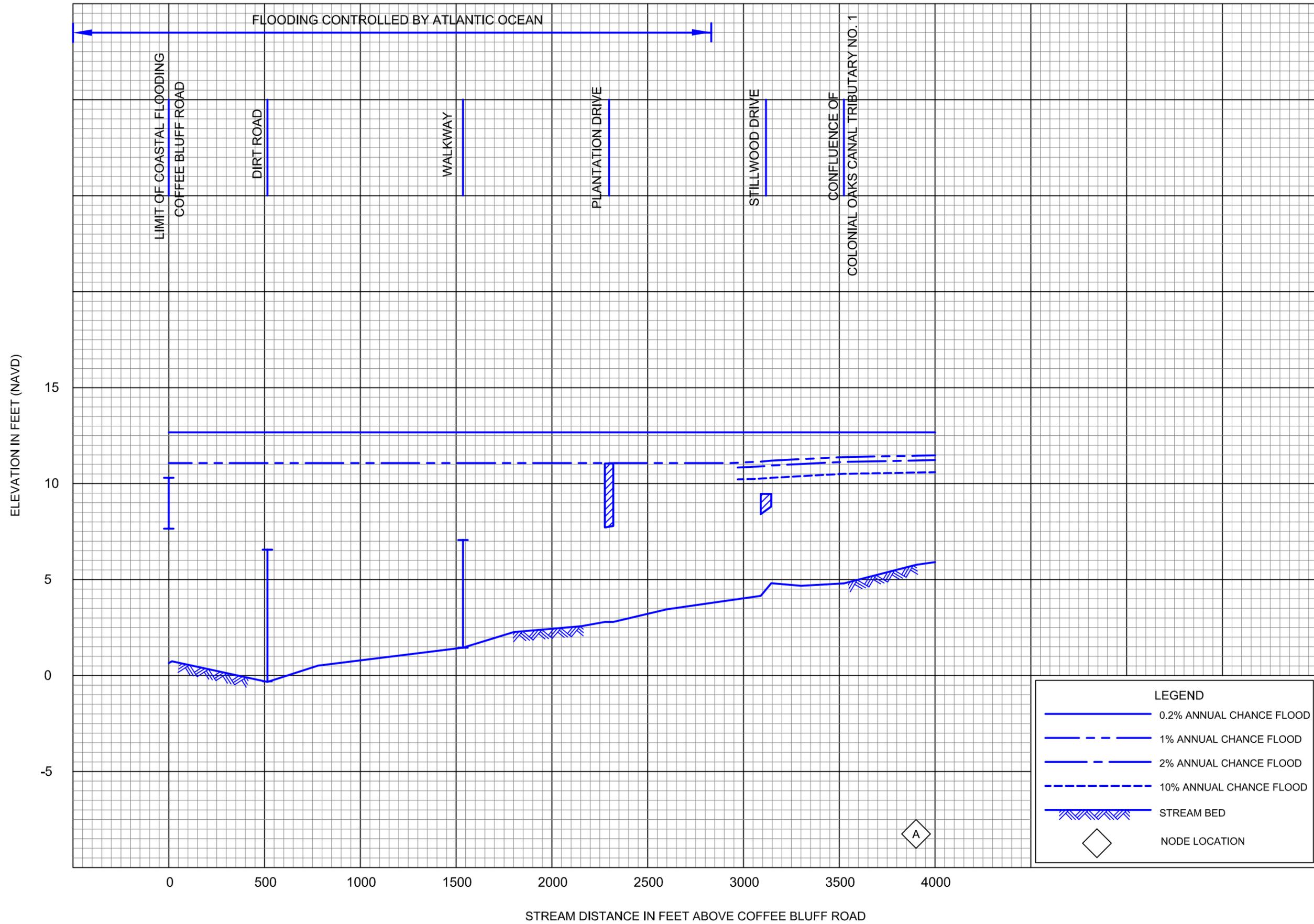


LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES
CHIPPEWA CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY
CHATHAM COUNTY, GA
AND INCORPORATED AREAS



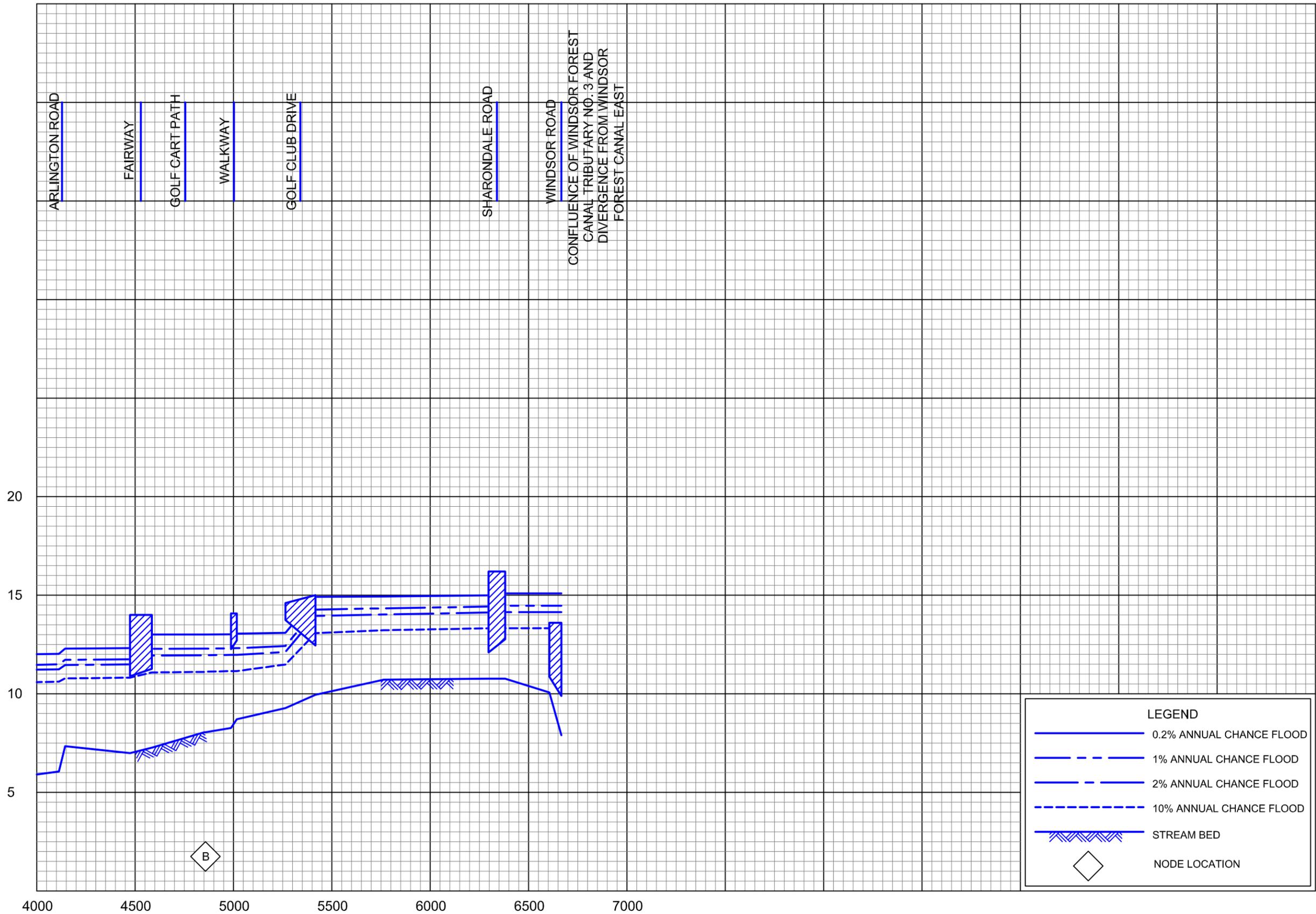
FLOOD PROFILES

COLONIAL OAKS CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA
AND INCORPORATED AREAS

ELEVATION IN FEET (NAVD)



20

15

10

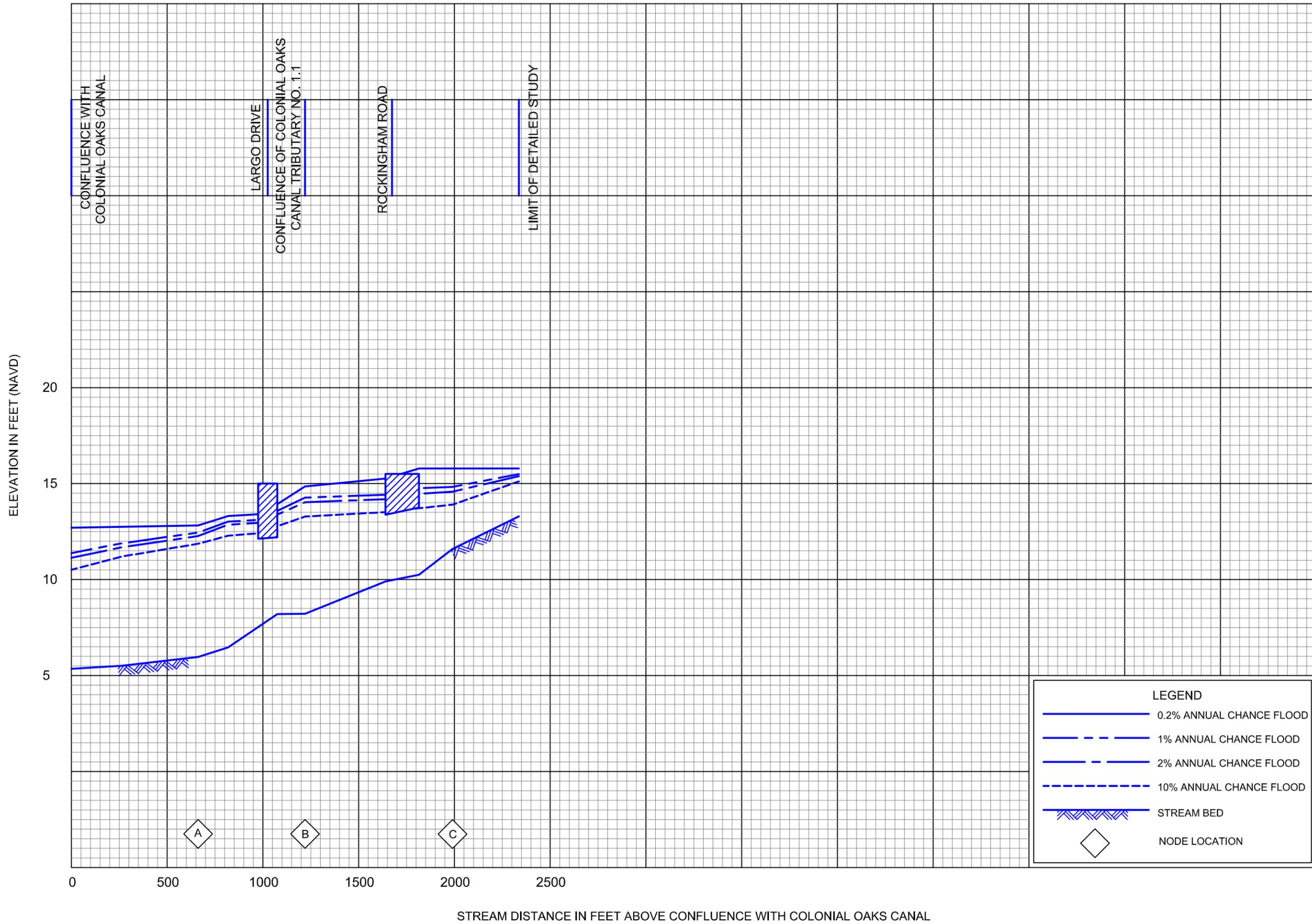
FLOOD PROFILES

COLONIAL OAKS CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA

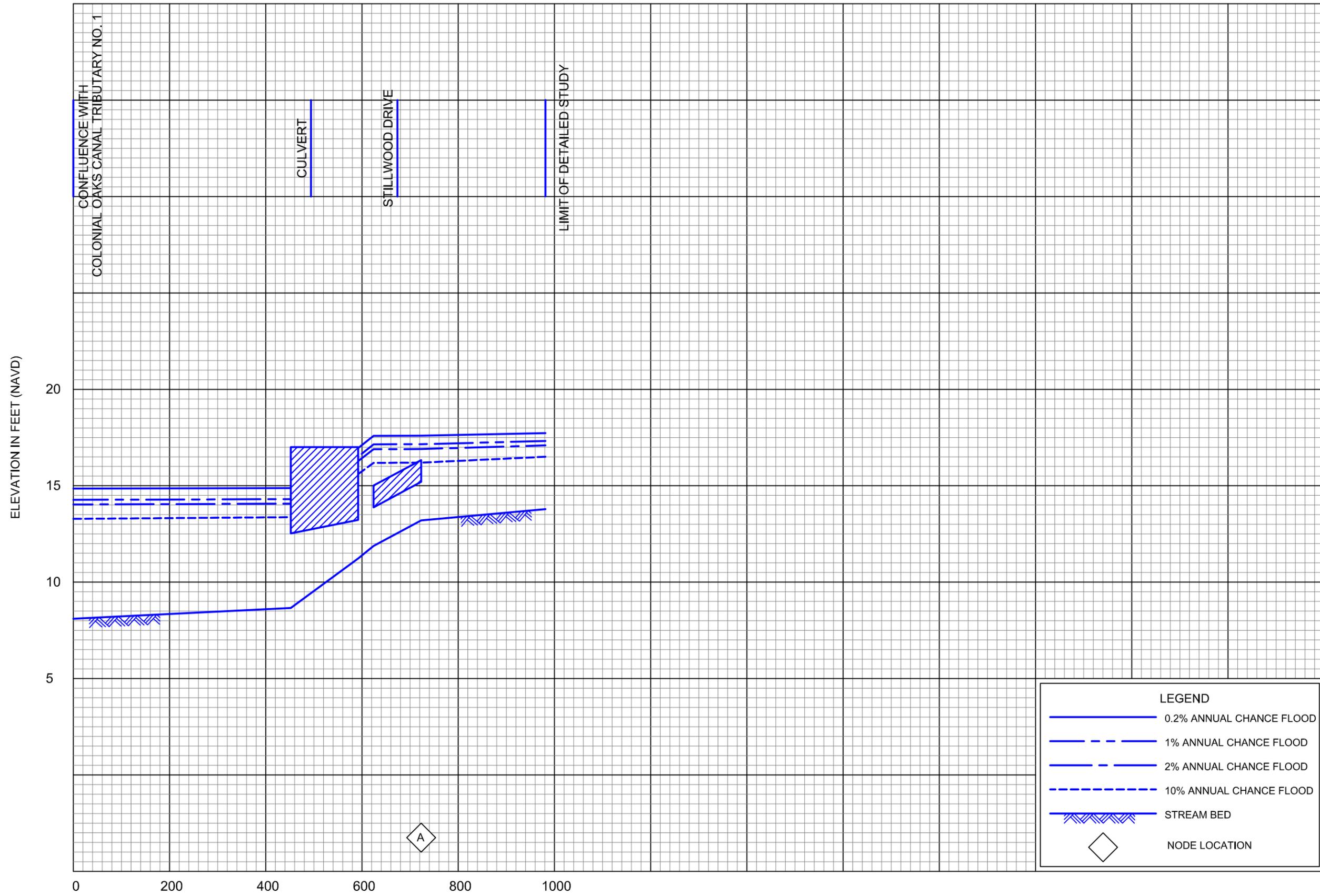
AND INCORPORATED AREAS



FLOOD PROFILES

COLONIAL OAKS CANAL TRIBUTARY NO. 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
 CHATHAM COUNTY, GA
 AND INCORPORATED AREAS

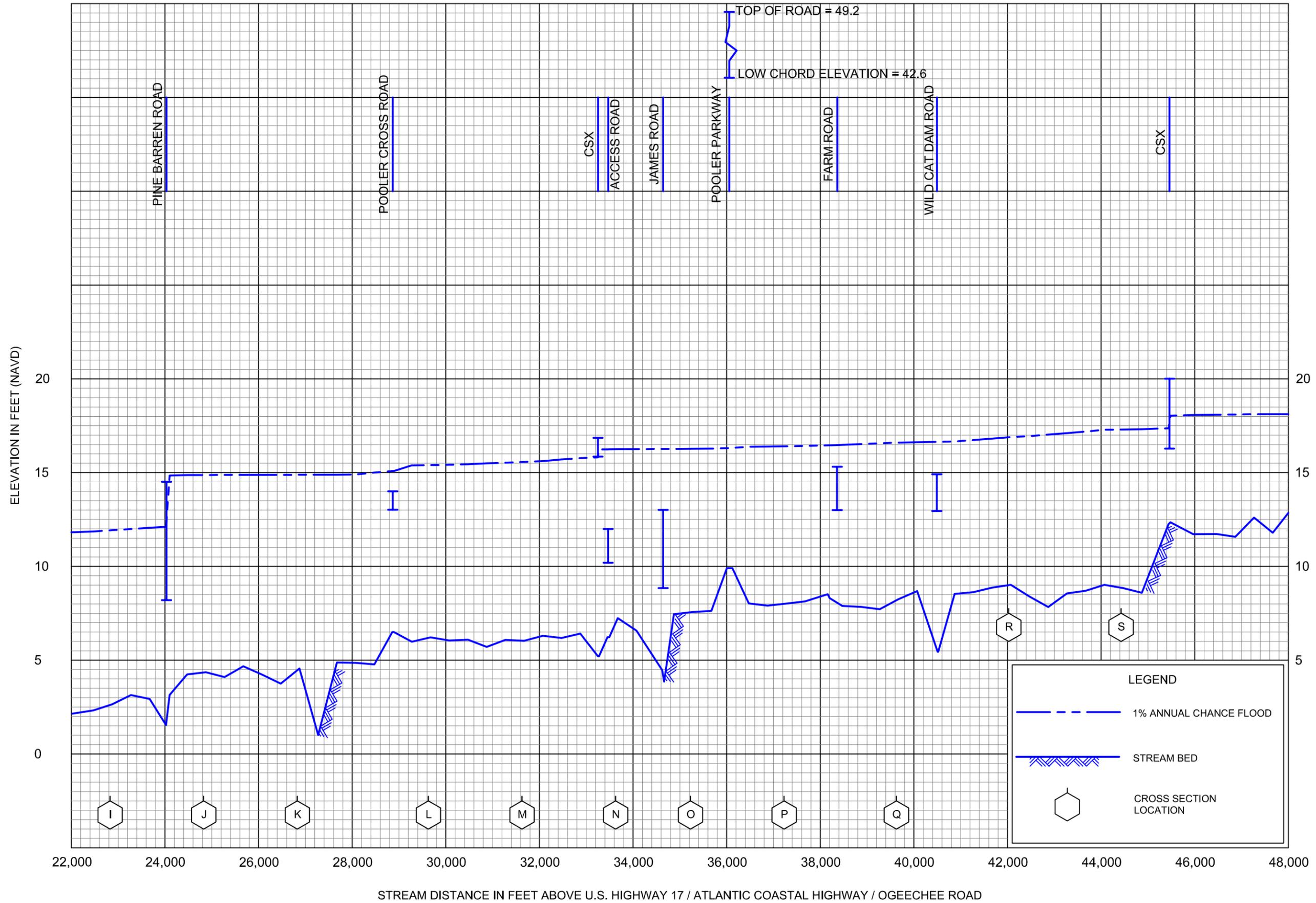


STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH COLONIAL OAKS CANAL TRIBUTARY NO. 1

FLOOD PROFILES

COLONIAL OAKS CANAL TRIBUTARY NO. 1.1

FEDERAL EMERGENCY MANAGEMENT AGENCY
 CHATHAM COUNTY, GA
 AND INCORPORATED AREAS

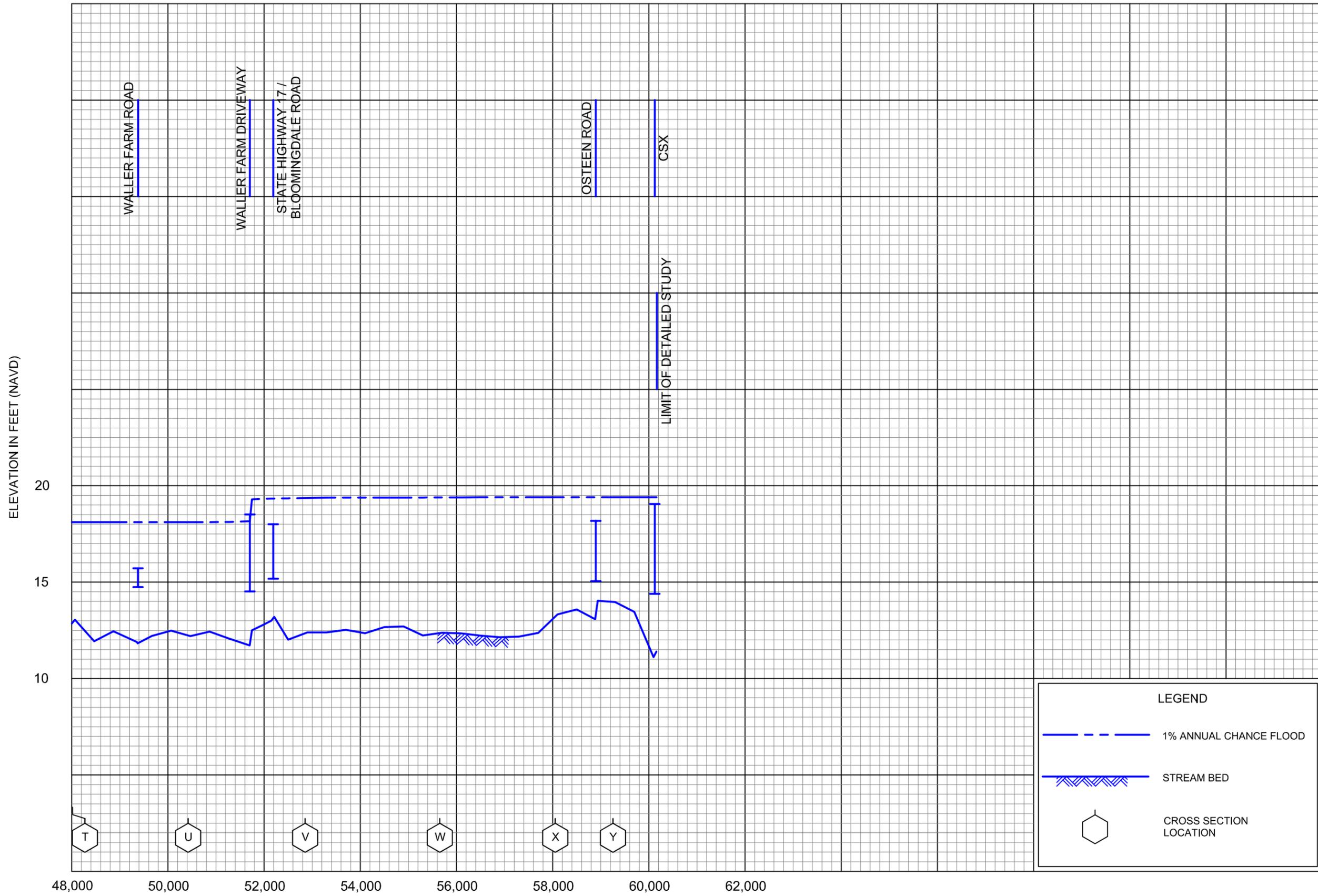


FLOOD PROFILES

HARDIN CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA
AND INCORPORATED AREAS



LEGEND

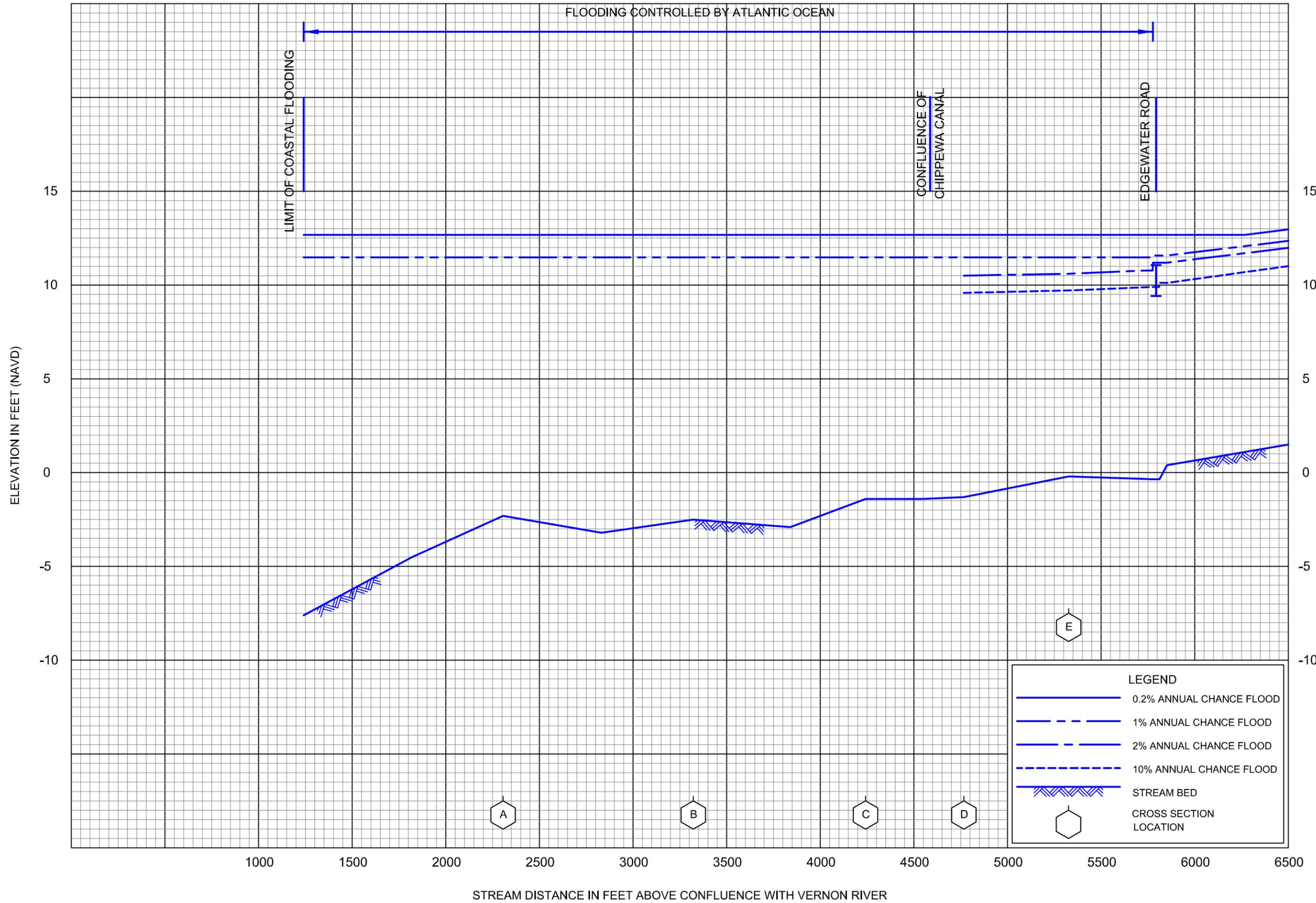
-  1% ANNUAL CHANCE FLOOD
-  STREAM BED
-  CROSS SECTION LOCATION

FLOOD PROFILES

HARDIN CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA
AND INCORPORATED AREAS

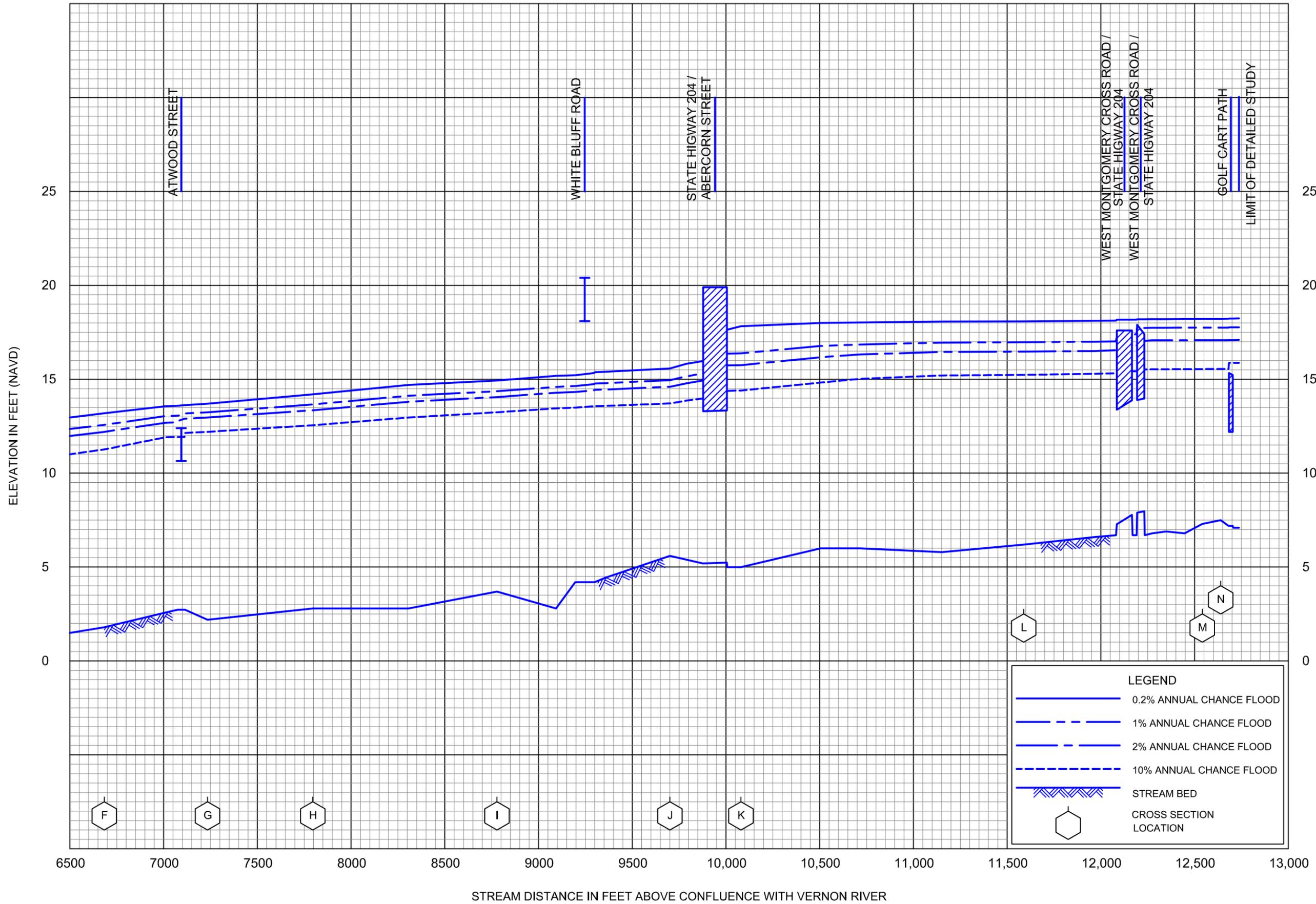


FLOOD PROFILES

HARMON CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

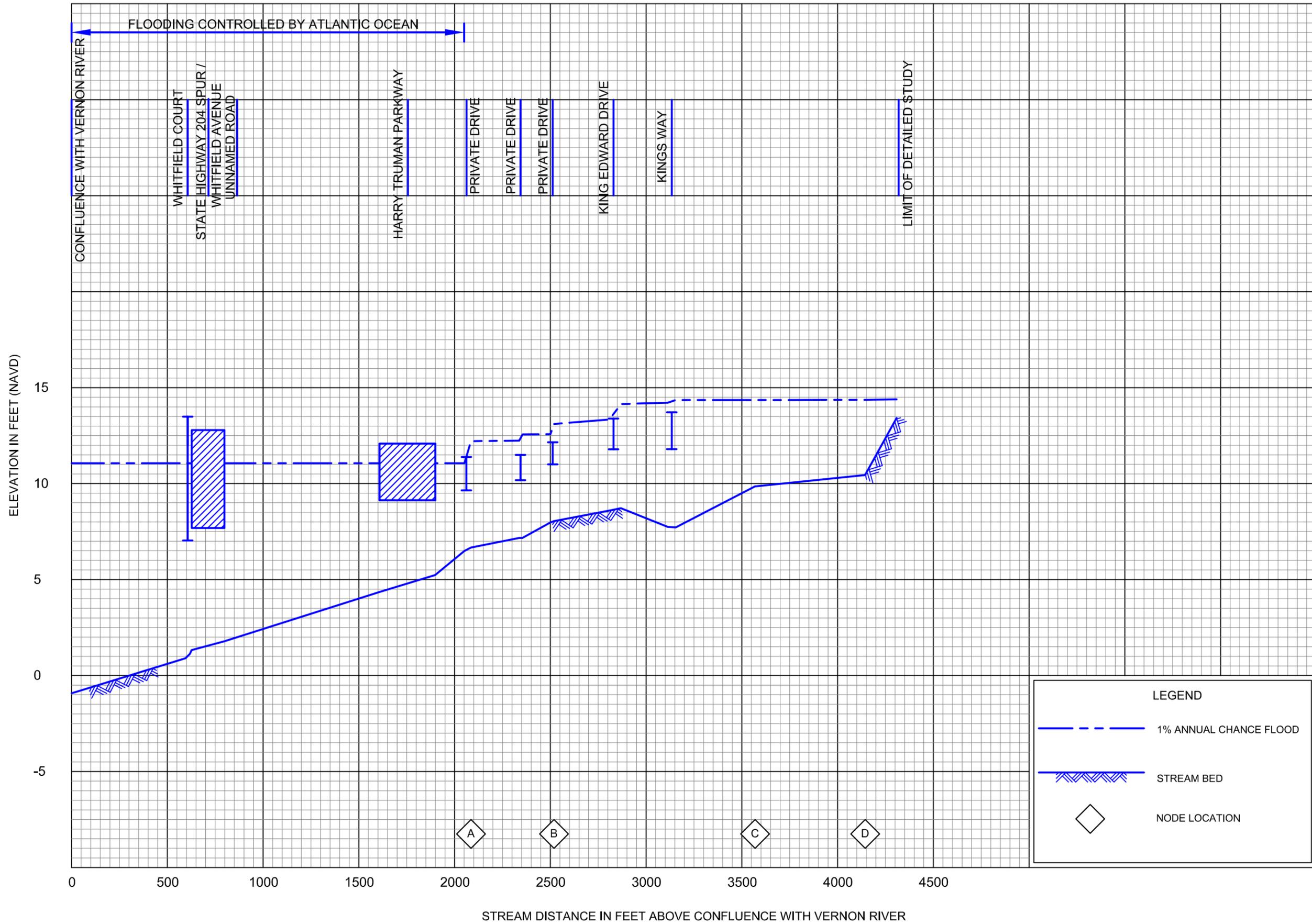
CHATHAM COUNTY, GA
AND INCORPORATED AREAS



FLOOD PROFILES

HARMON CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY
 CHATHAM COUNTY, GA
 AND INCORPORATED AREAS



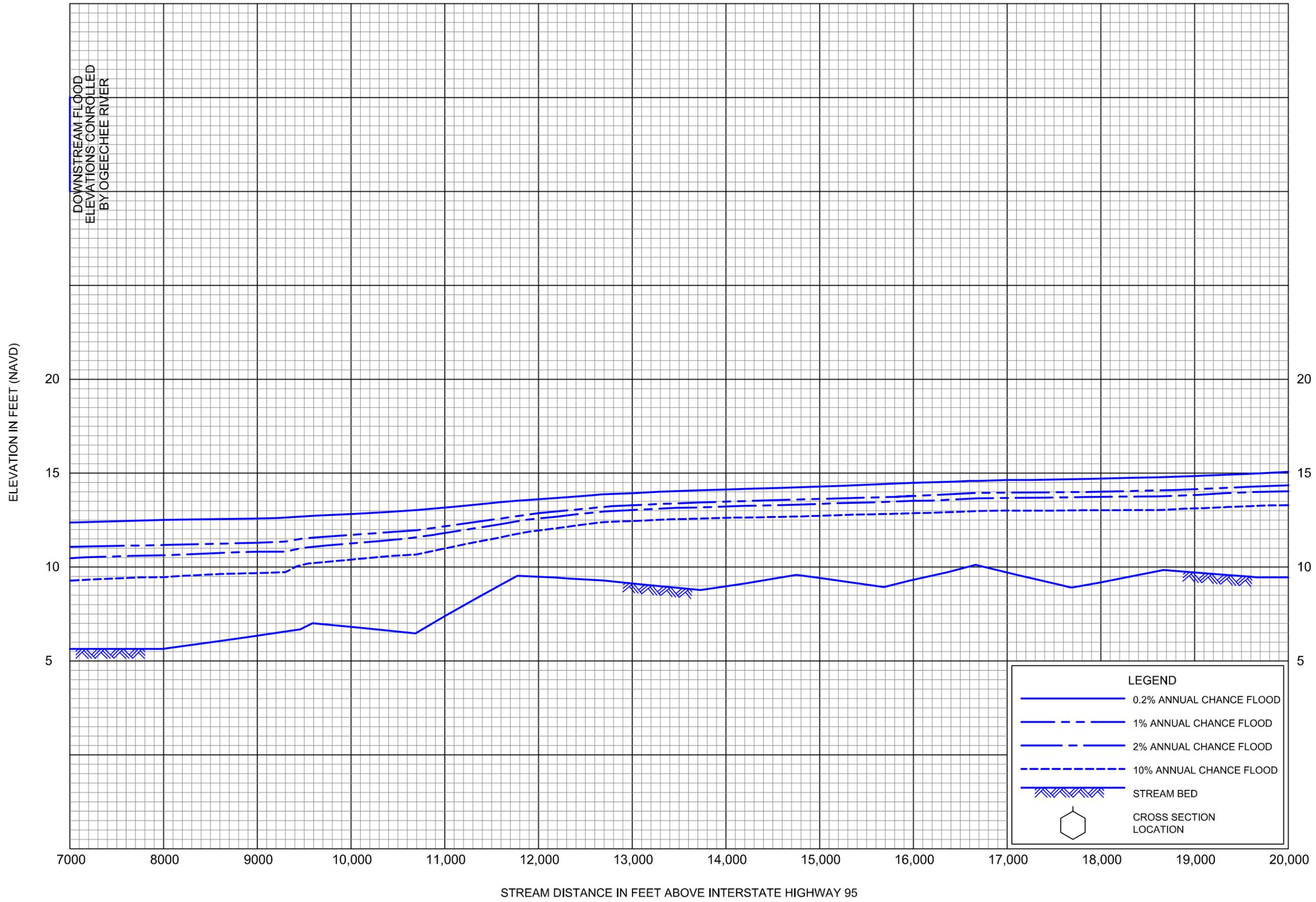
FLOOD PROFILES

KINGSWAY CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA

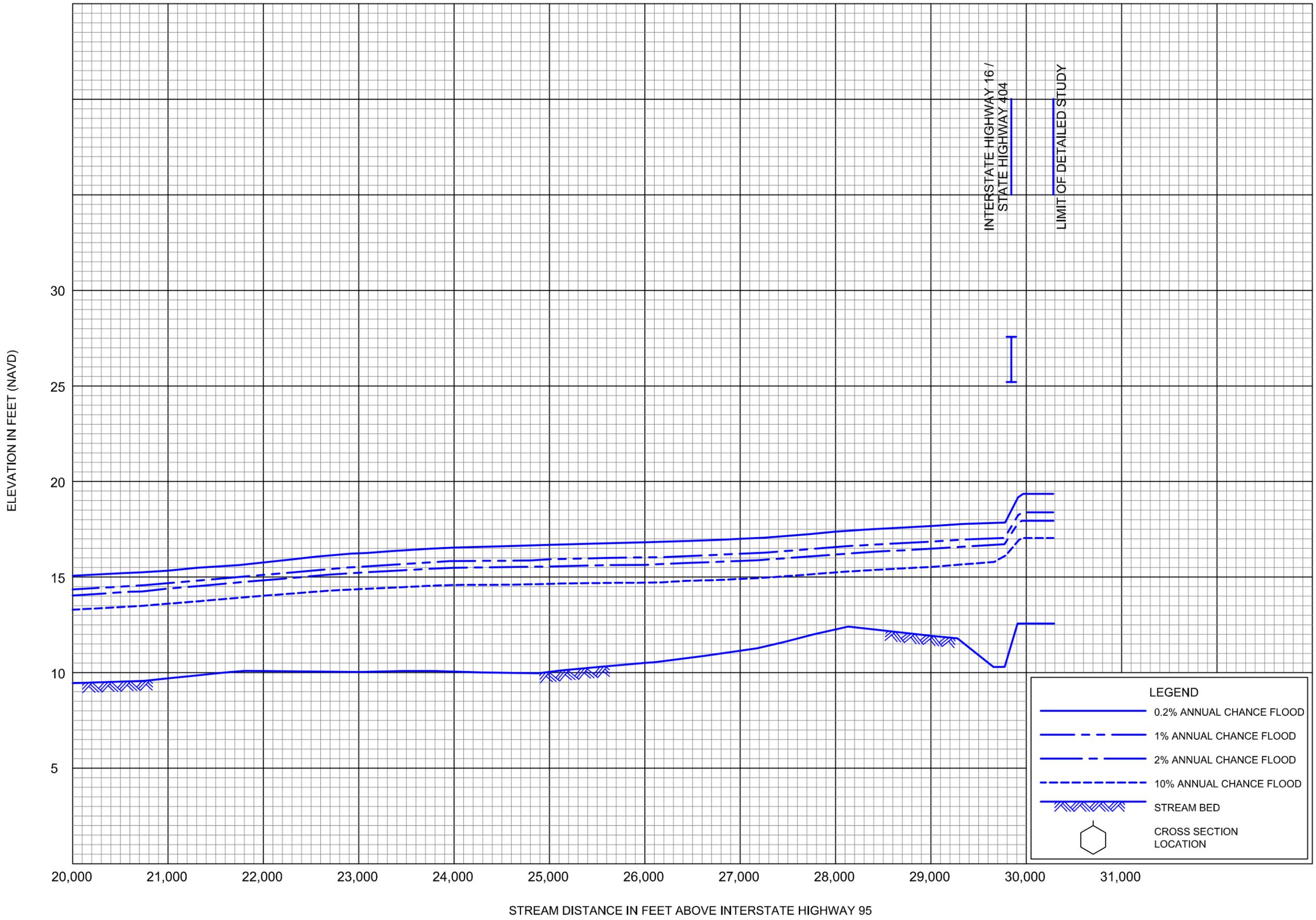
AND INCORPORATED AREAS



FLOOD PROFILES

LITTLE OGEECHEE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
 CHATHAM COUNTY, GA
 AND INCORPORATED AREAS



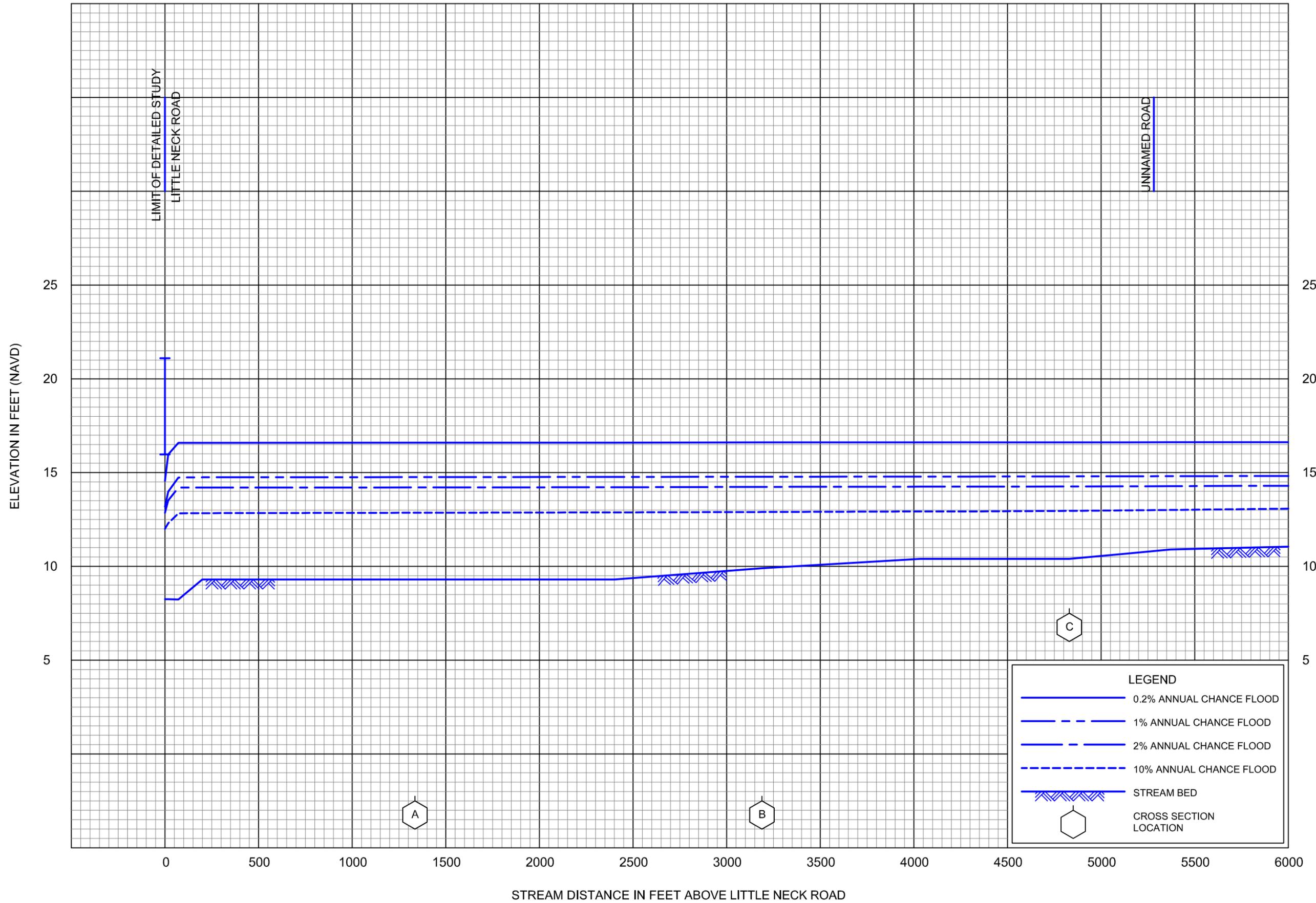
FLOOD PROFILES

LITTLE OGEECHEE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA

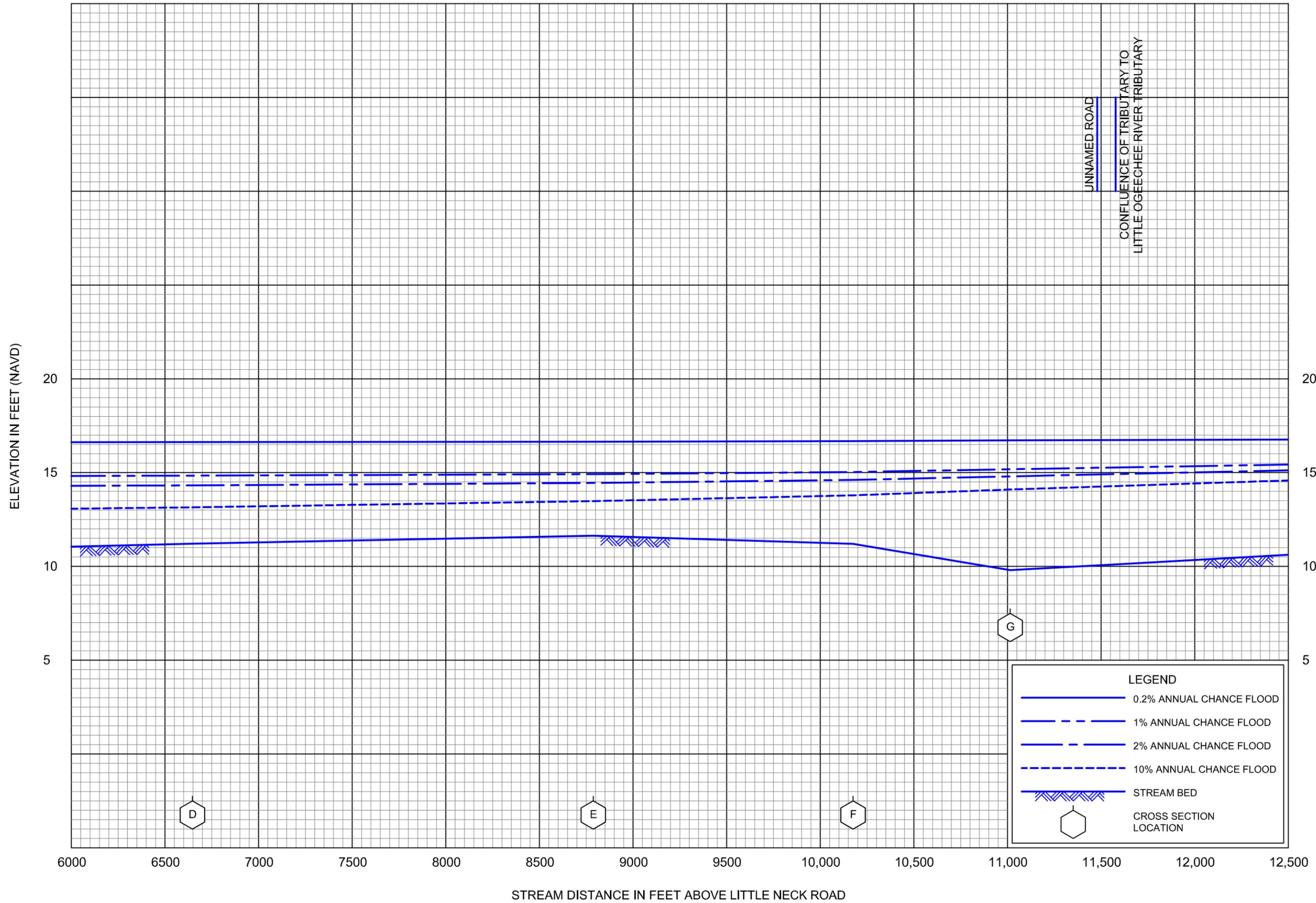
AND INCORPORATED AREAS



FLOOD PROFILES

LITTLE OGEECHEE RIVER TRIBUTARY

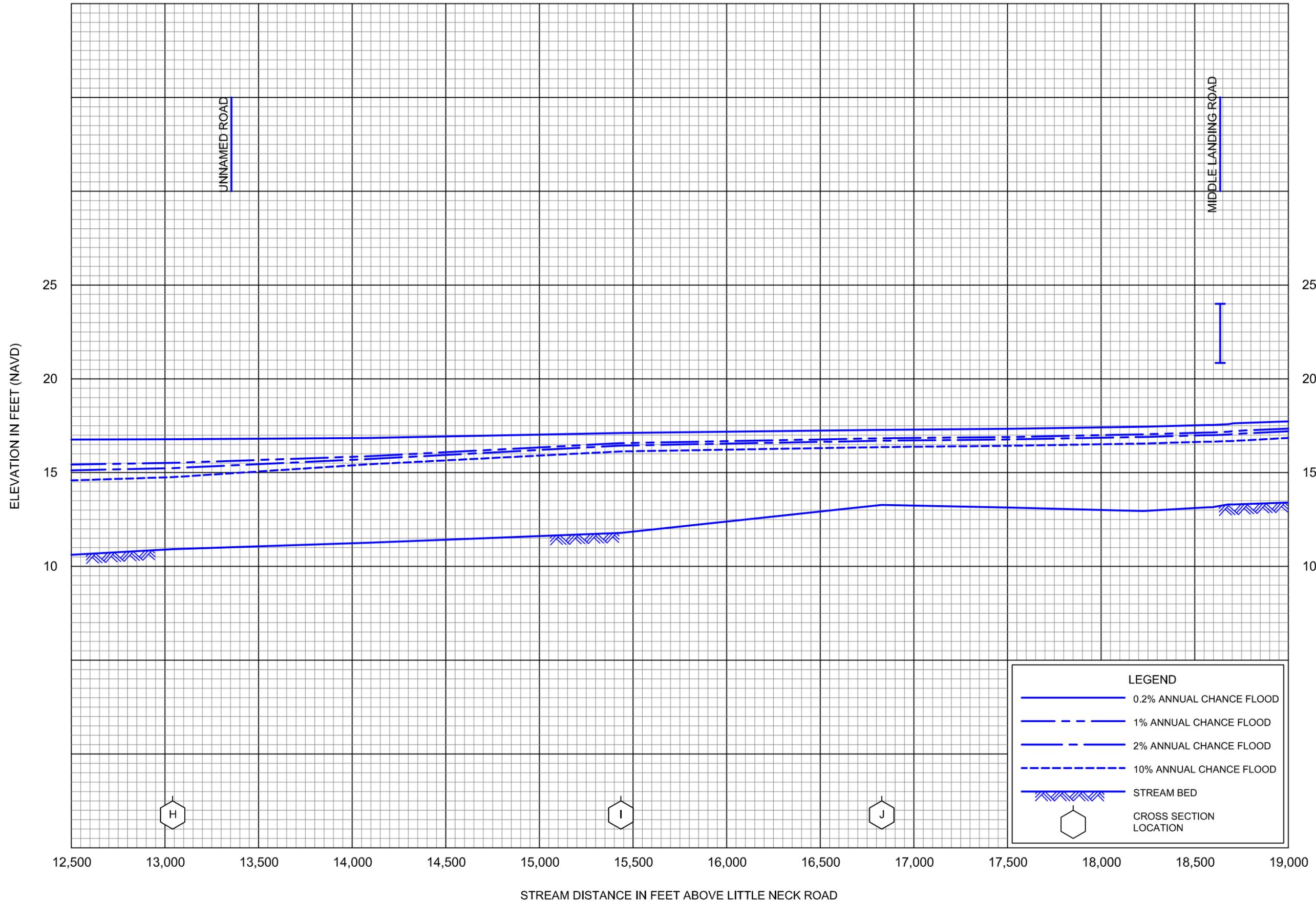
FEDERAL EMERGENCY MANAGEMENT AGENCY
 CHATHAM COUNTY, GA
 AND INCORPORATED AREAS



FLOOD PROFILES

LITTLE OGEECHEE RIVER TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY
 CHATHAM COUNTY, GA
 AND INCORPORATED AREAS



FLOOD PROFILES

LITTLE OGEECHEE RIVER TRIBUTARY

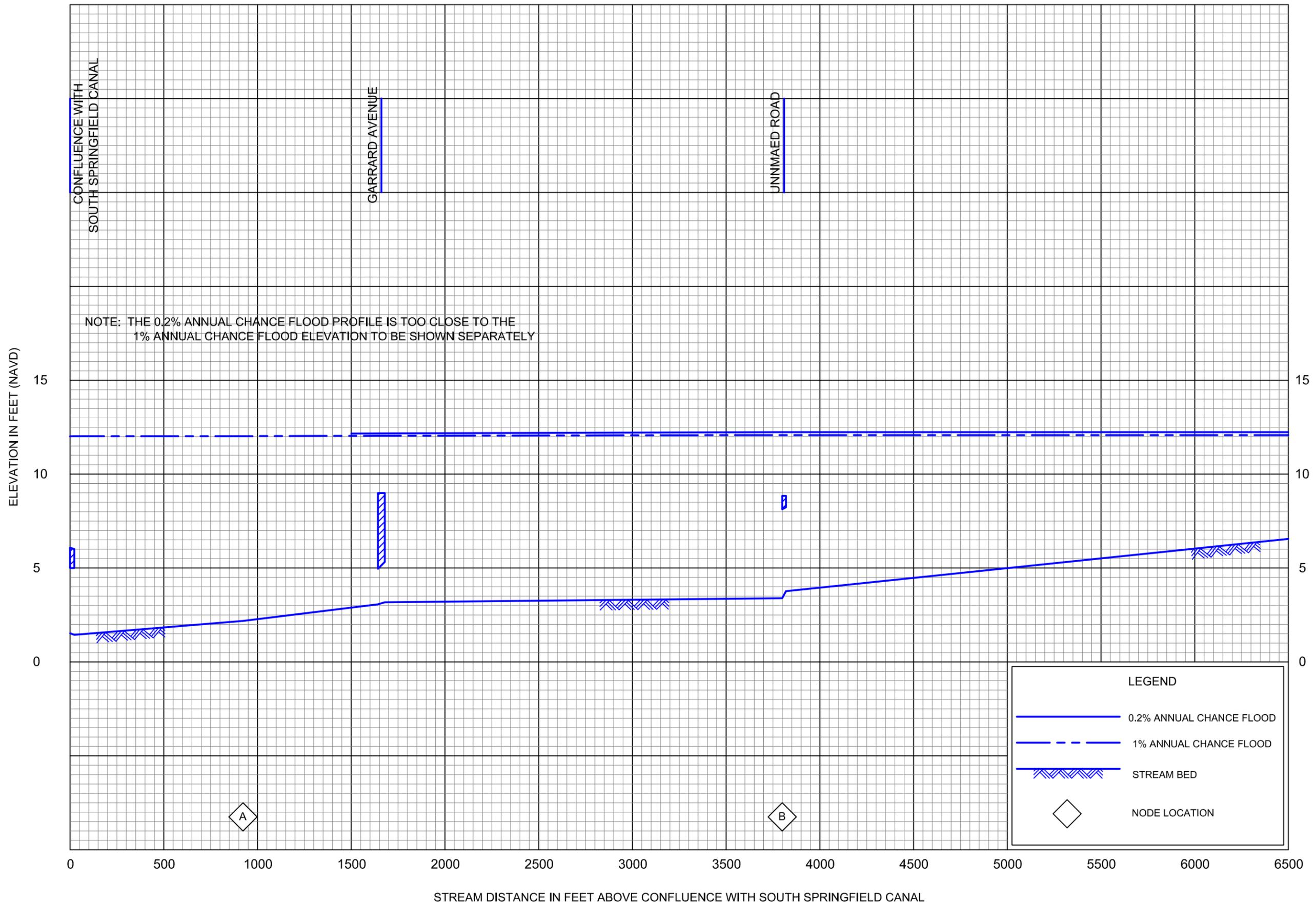
FEDERAL EMERGENCY MANAGEMENT AGENCY
 CHATHAM COUNTY, GA
 AND INCORPORATED AREAS



FLOOD PROFILES

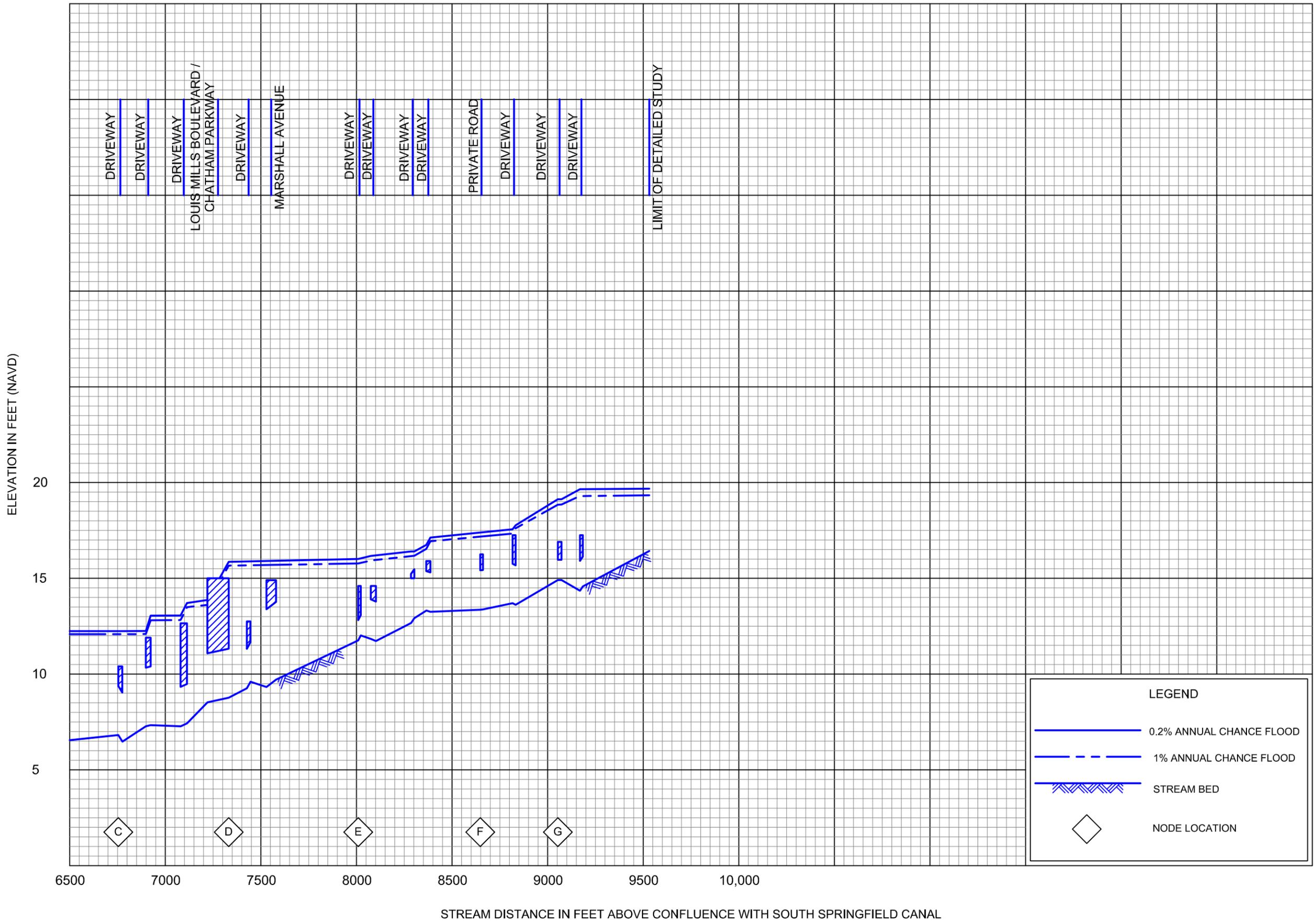
LITTLE OGEECHEE RIVER TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY
 CHATHAM COUNTY, GA
 AND INCORPORATED AREAS



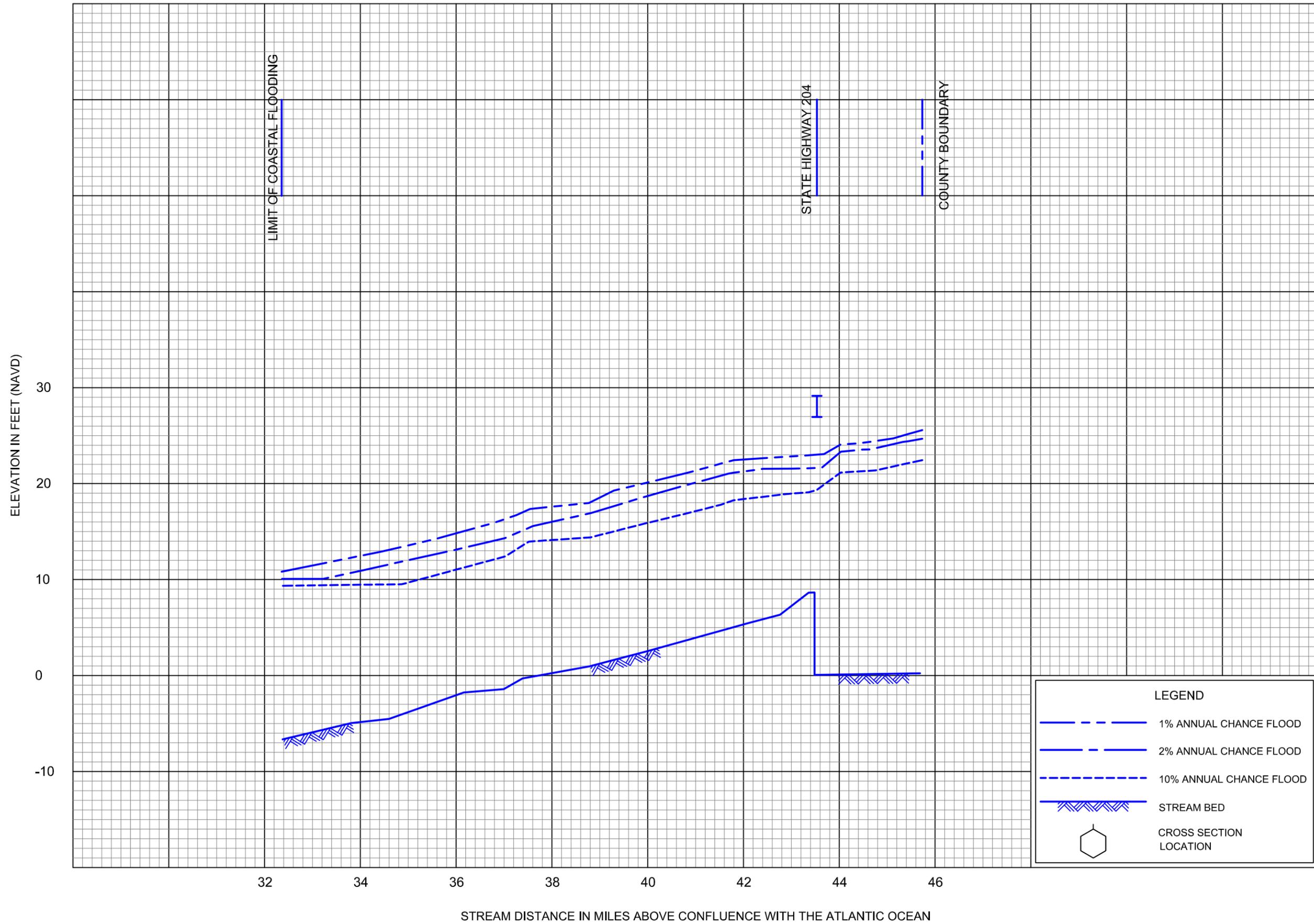
FLOOD PROFILES
LOUIS MILLS BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY
CHATHAM COUNTY, GA
AND INCORPORATED AREAS



FLOOD PROFILES
LOUIS MILLS BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY
CHATHAM COUNTY, GA
AND INCORPORATED AREAS



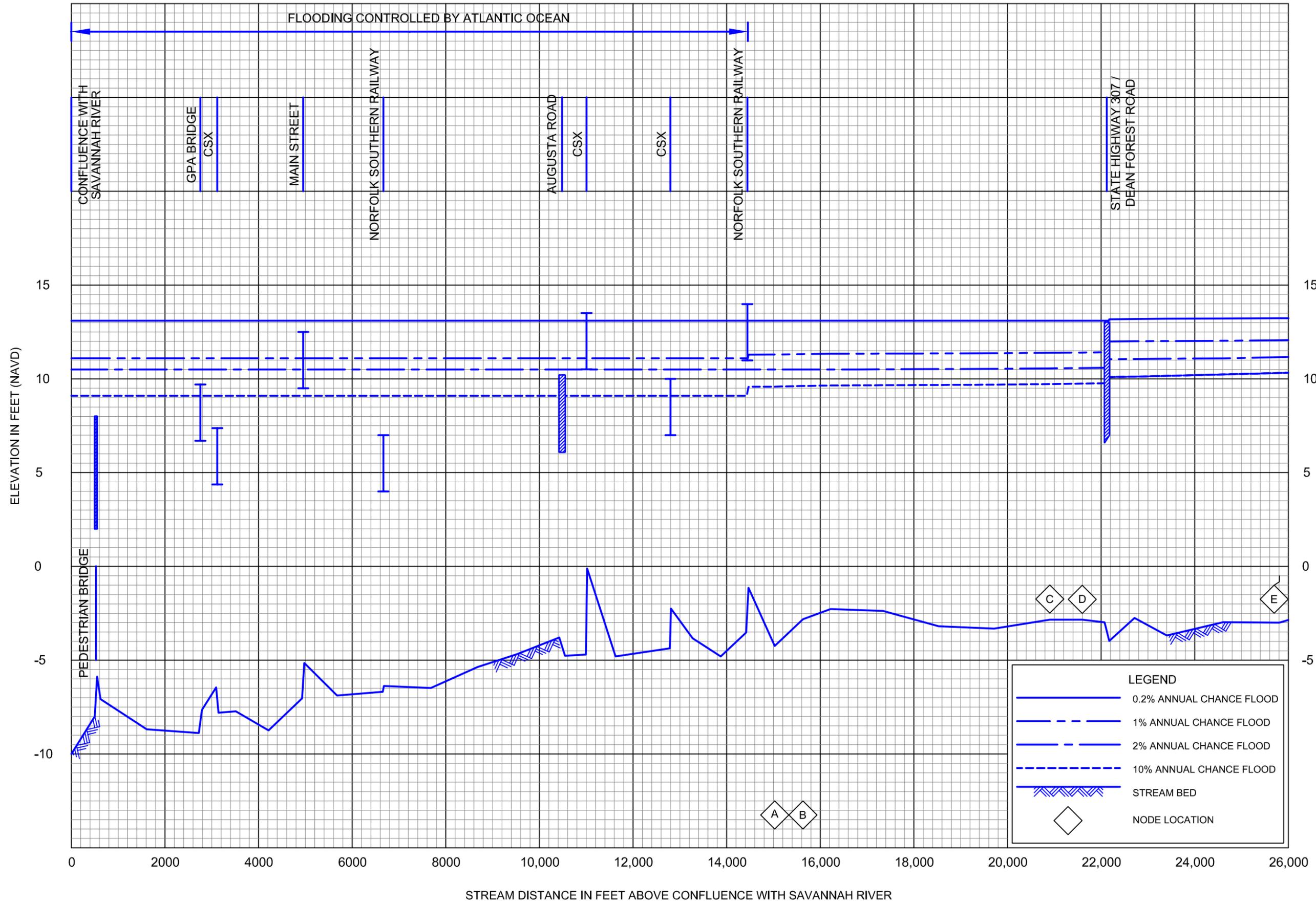
FLOOD PROFILES

OGEECHEE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA

AND INCORPORATED AREAS

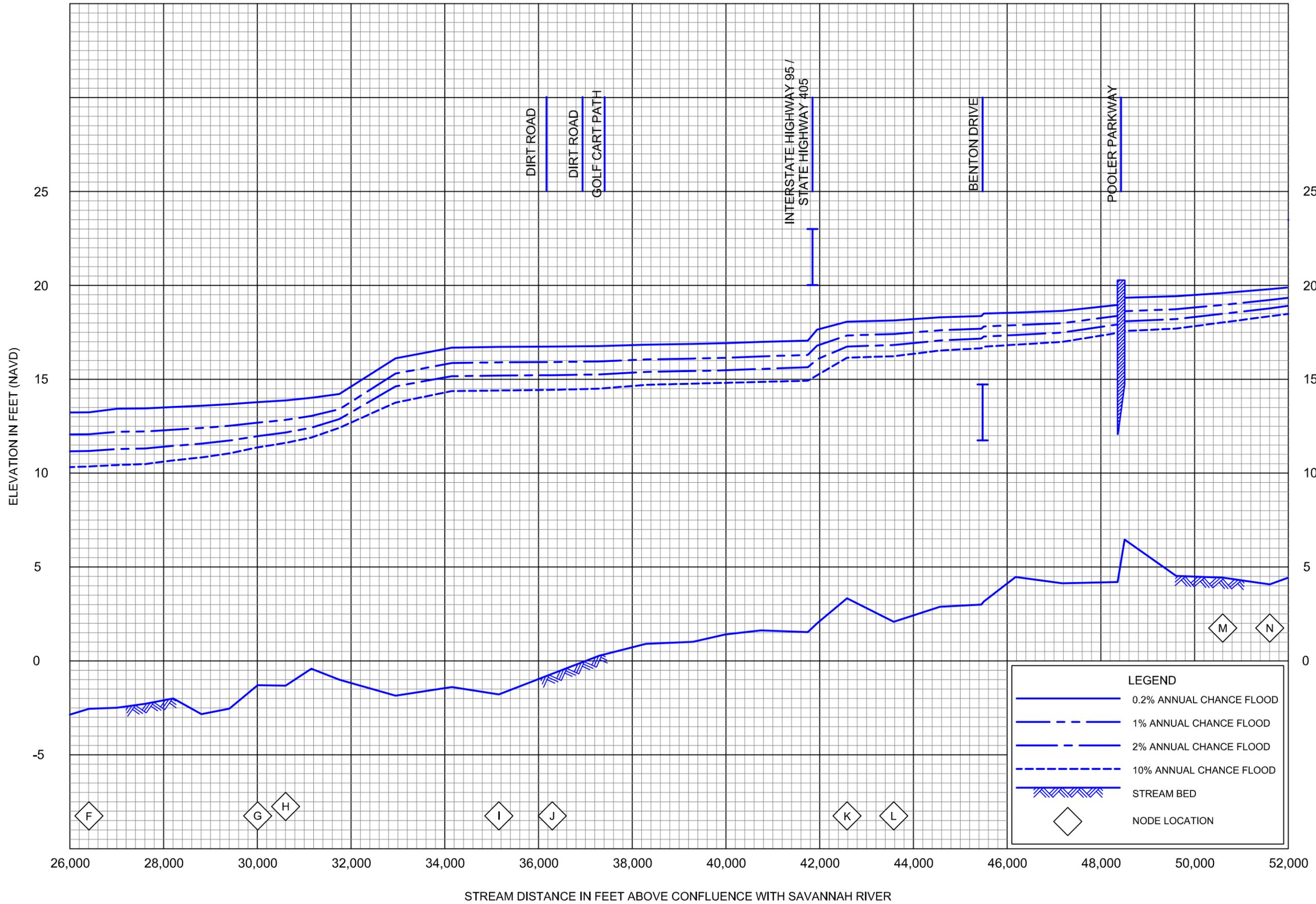


FLOOD PROFILES

PIPE MAKERS CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA
AND INCORPORATED AREAS

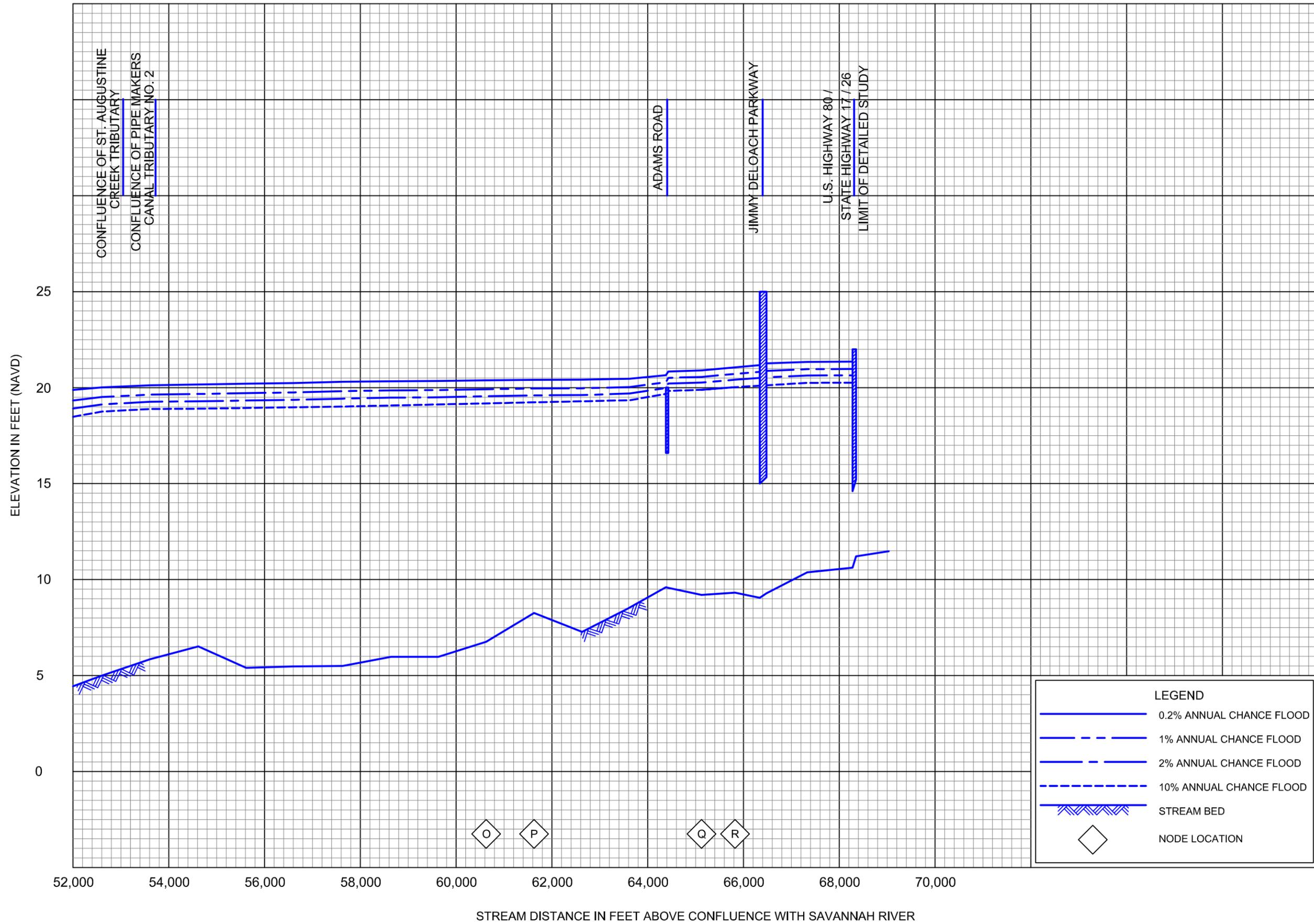


FLOOD PROFILES

PIPE MAKERS CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA
AND INCORPORATED AREAS



CONFLUENCE OF ST. AUGUSTINE CREEK TRIBUTARY
 CONFLUENCE OF PIPE MAKERS CANAL TRIBUTARY NO. 2

ADAMS ROAD

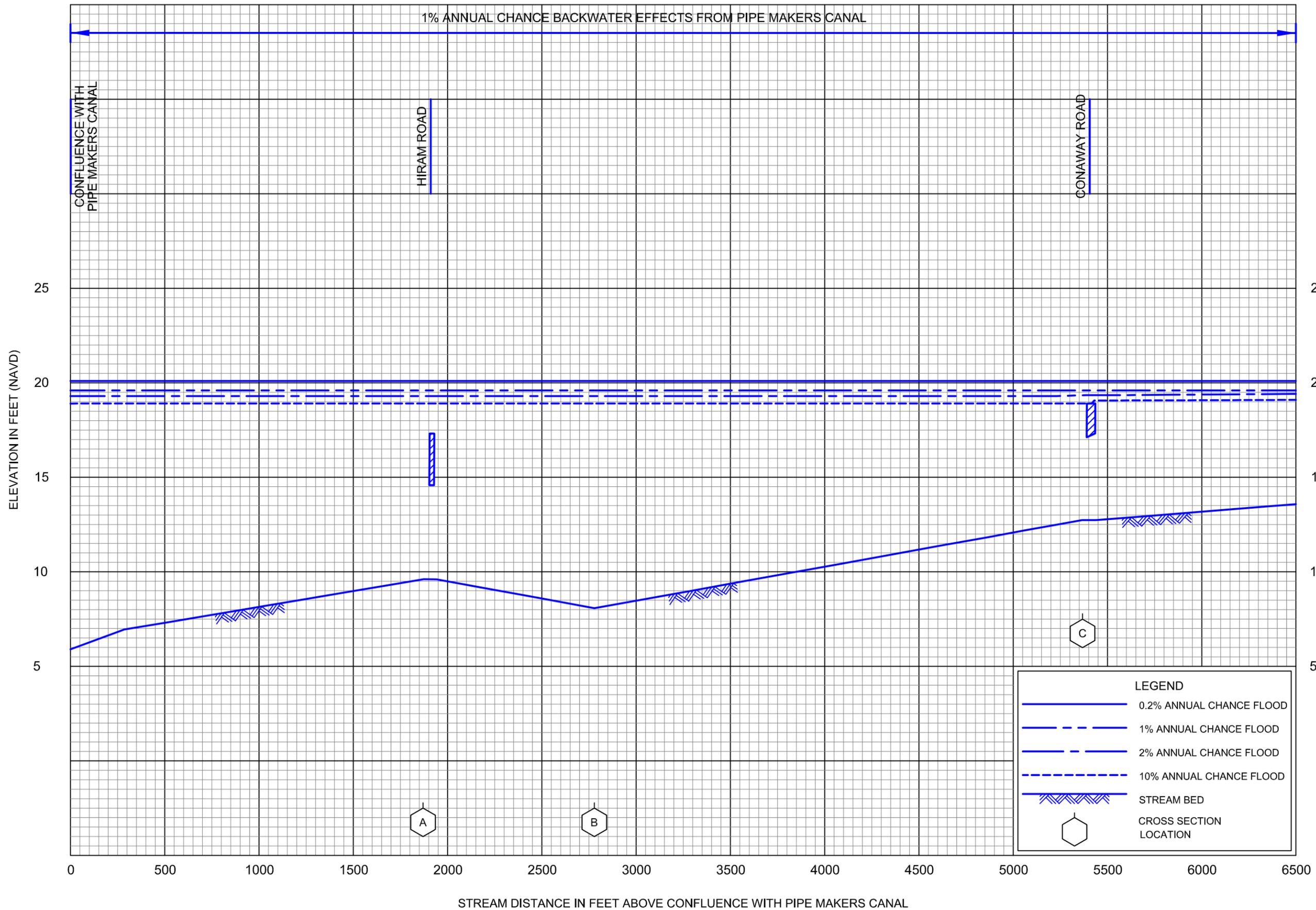
JIMMY DELOACH PARKWAY

U.S. HIGHWAY 80 / STATE HIGHWAY 17 / 26
 LIMIT OF DETAILED STUDY

O P Q R

FLOOD PROFILES
 PIPE MAKERS CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY
 CHATHAM COUNTY, GA
 AND INCORPORATED AREAS

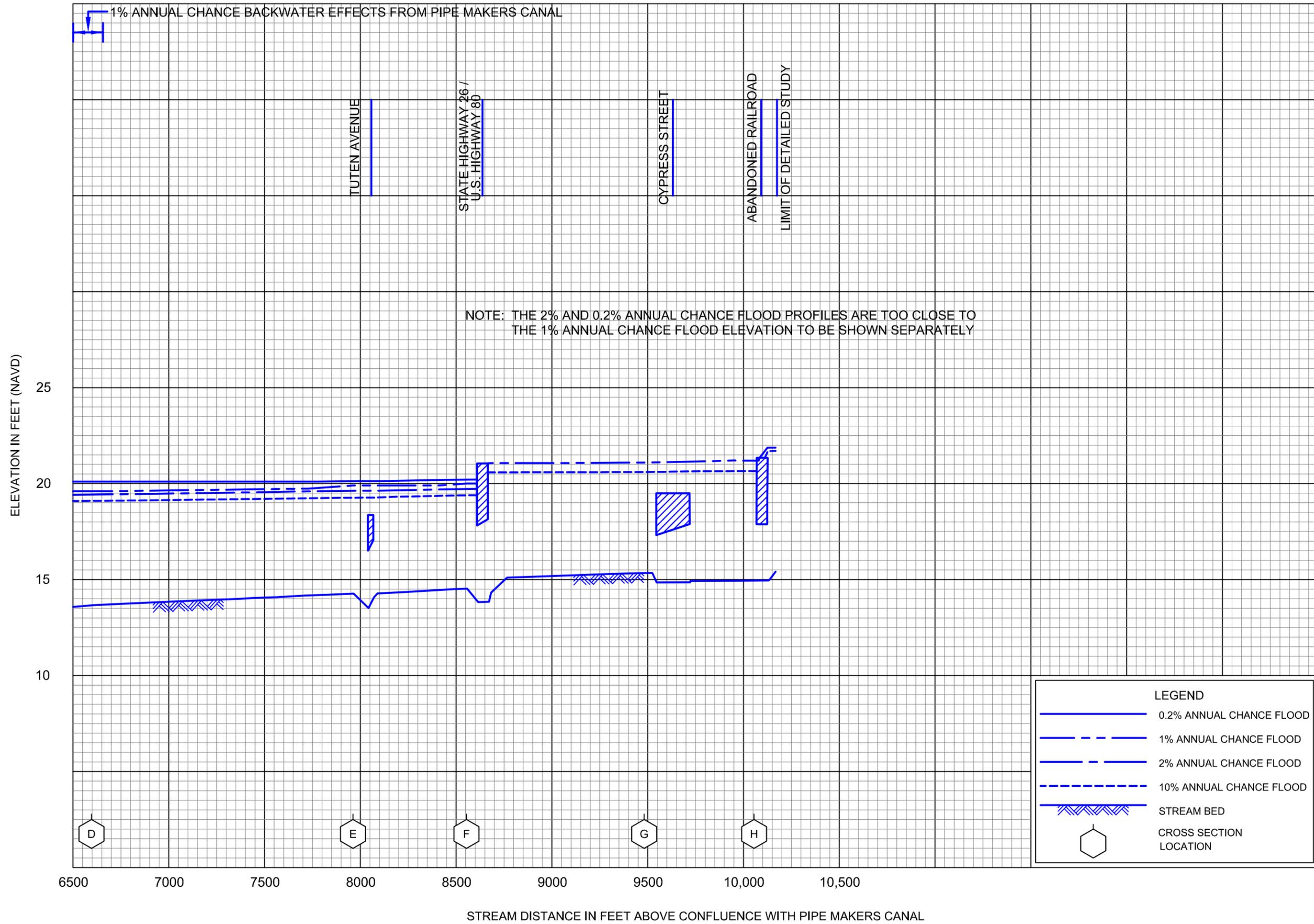


FLOOD PROFILES

PIPE MAKERS CANAL TRIBUTARY NO. 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

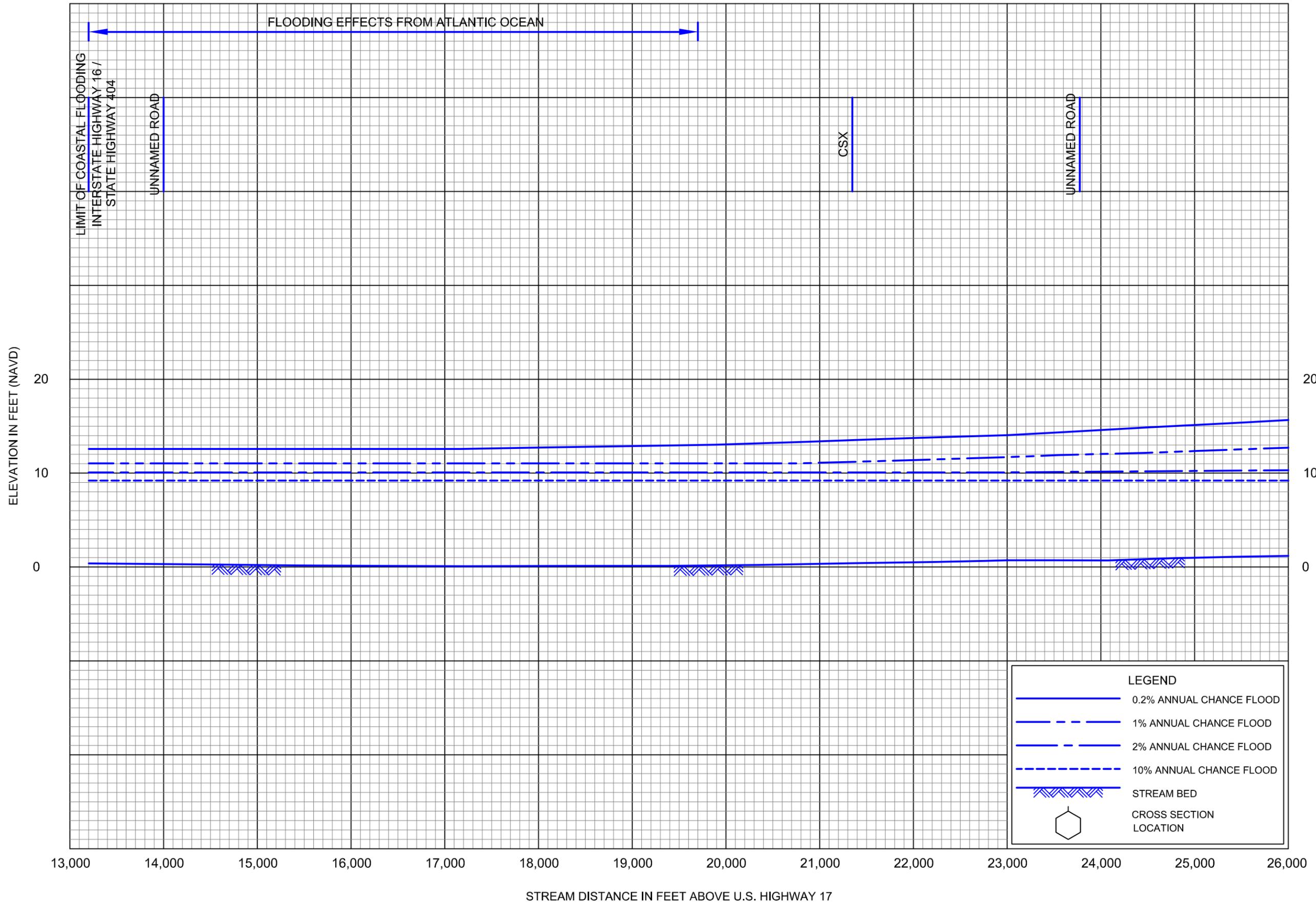
CHATHAM COUNTY, GA
AND INCORPORATED AREAS



FLOOD PROFILES

PIPE MAKERS CANAL TRIBUTARY NO. 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
 CHATHAM COUNTY, GA
 AND INCORPORATED AREAS

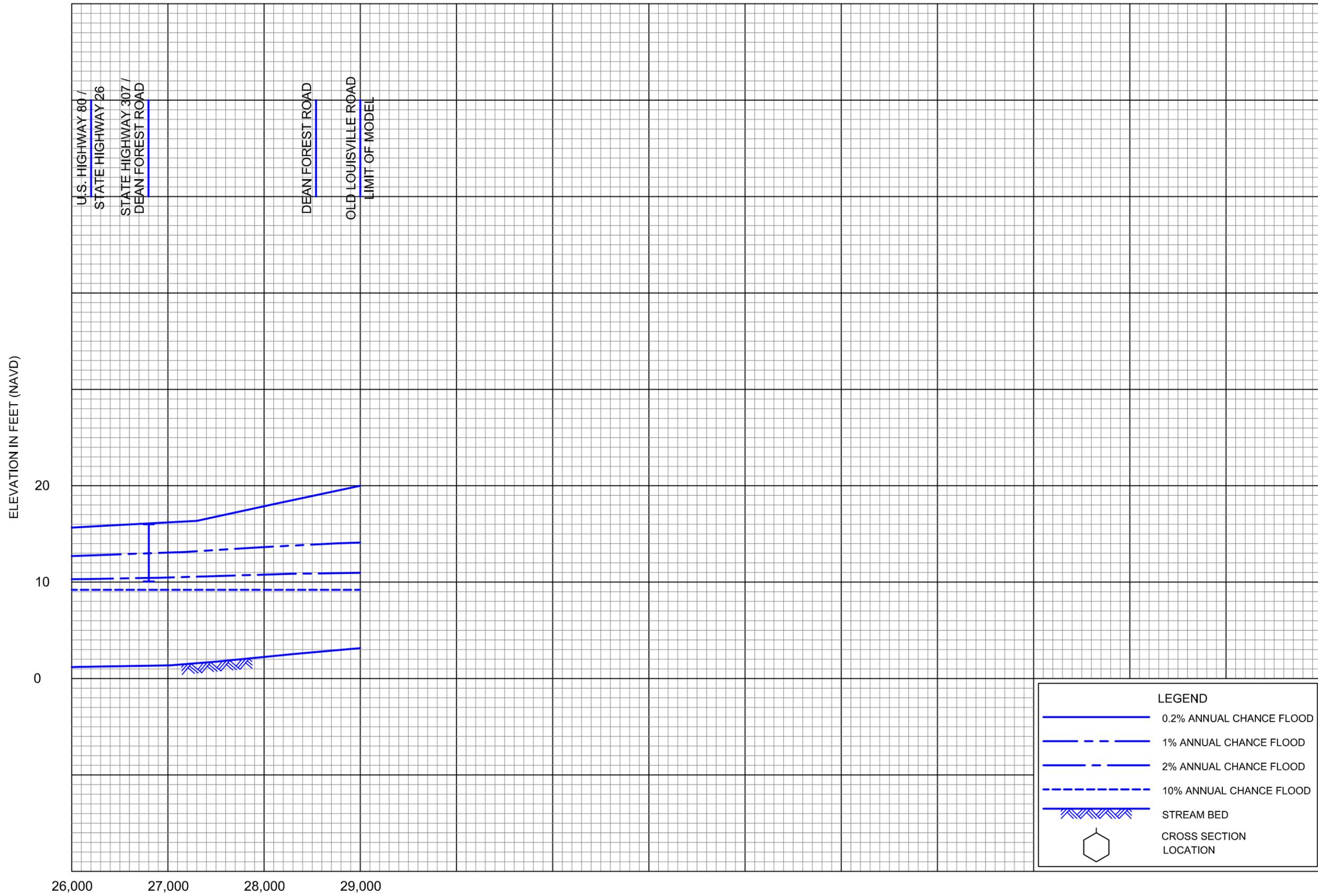


FLOOD PROFILES

SALT CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA
AND INCORPORATED AREAS



STREAM DISTANCE IN FEET ABOVE U.S. HIGHWAY 17

FLOOD PROFILES

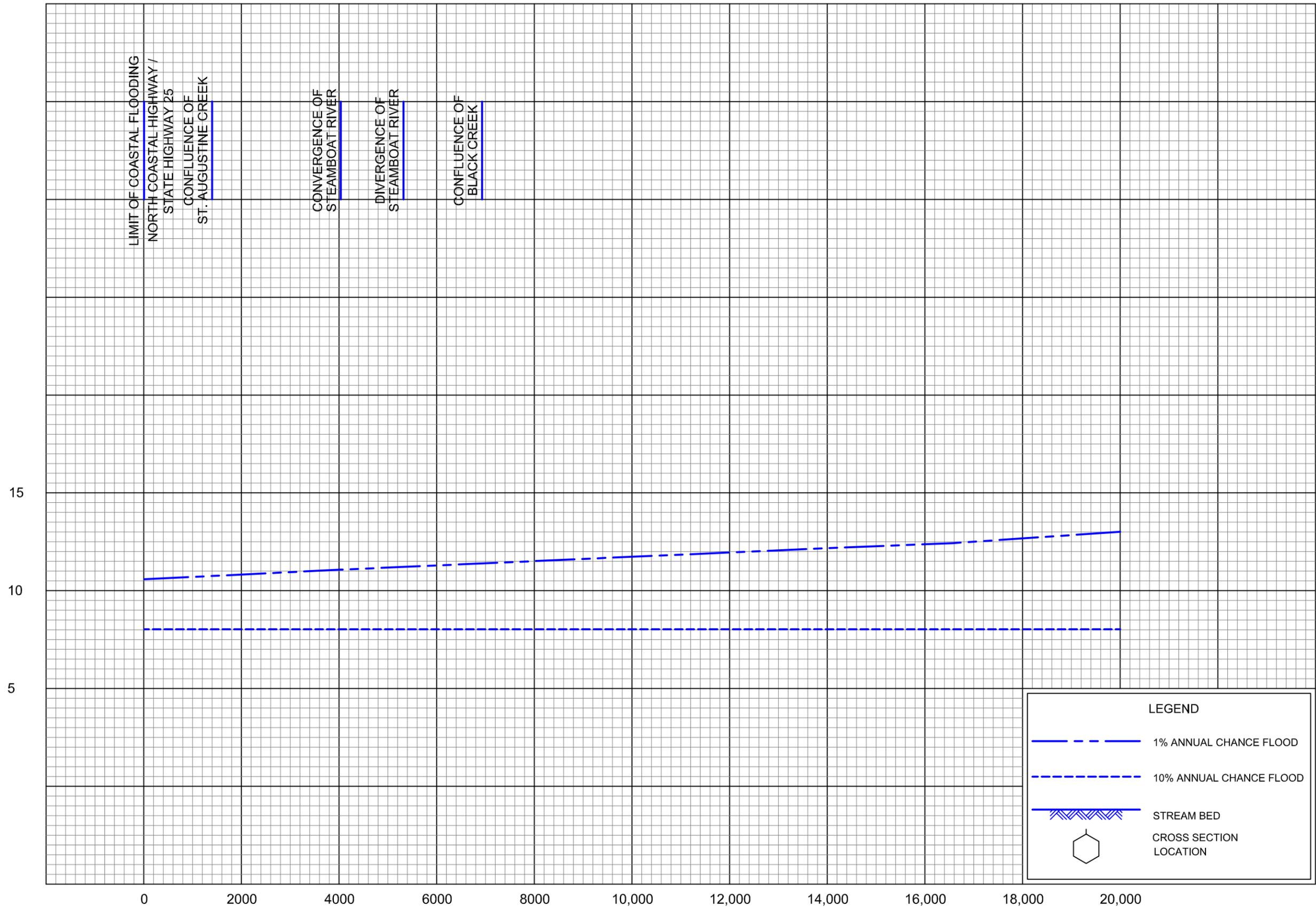
SALT CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA

AND INCORPORATED AREAS

ELEVATION IN FEET (NAVD)



LEGEND

- 1% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

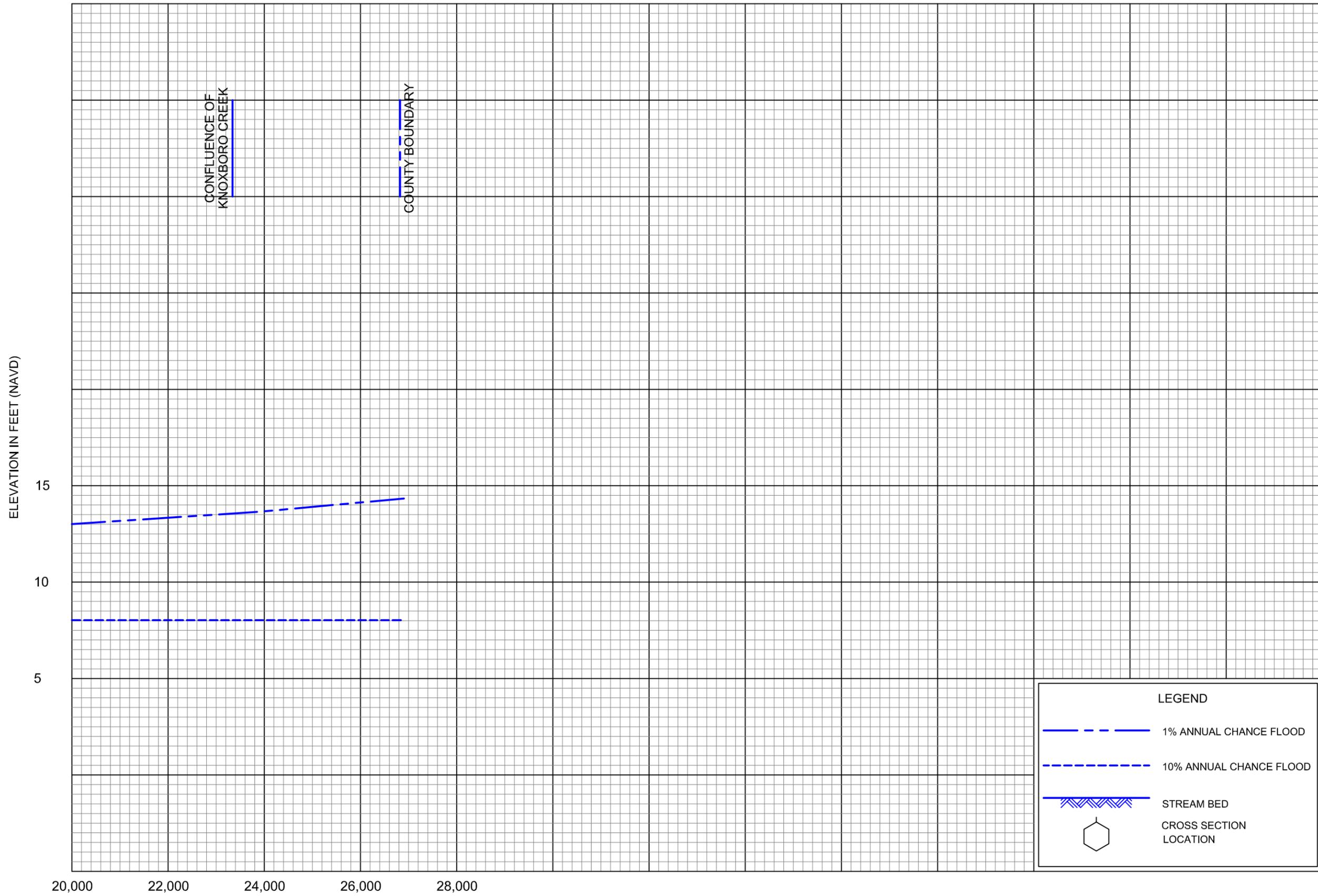
FLOOD PROFILES

SAVANNAH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA

AND INCORPORATED AREAS



LEGEND

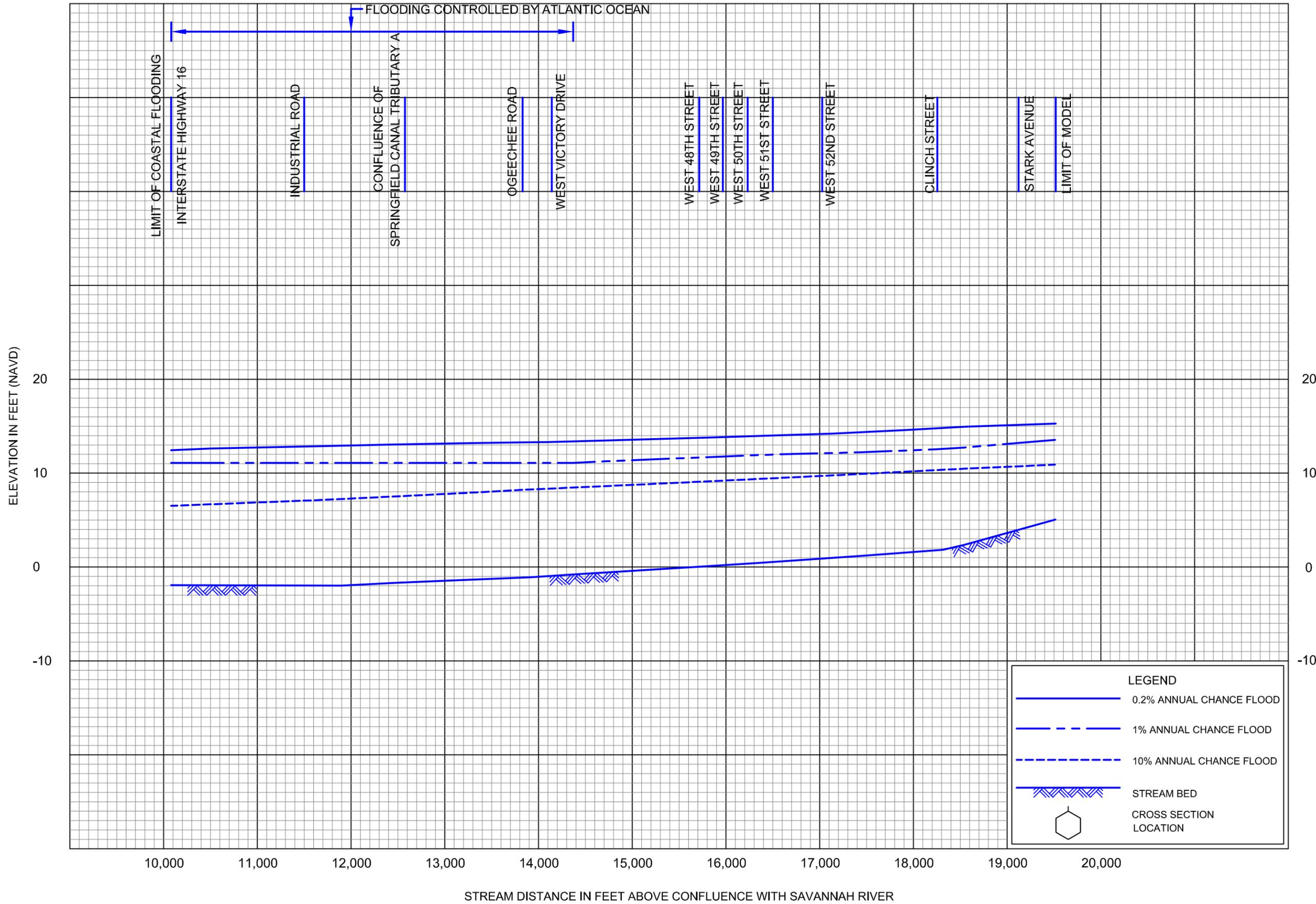
- 1% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

SAVANNAH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA
AND INCORPORATED AREAS

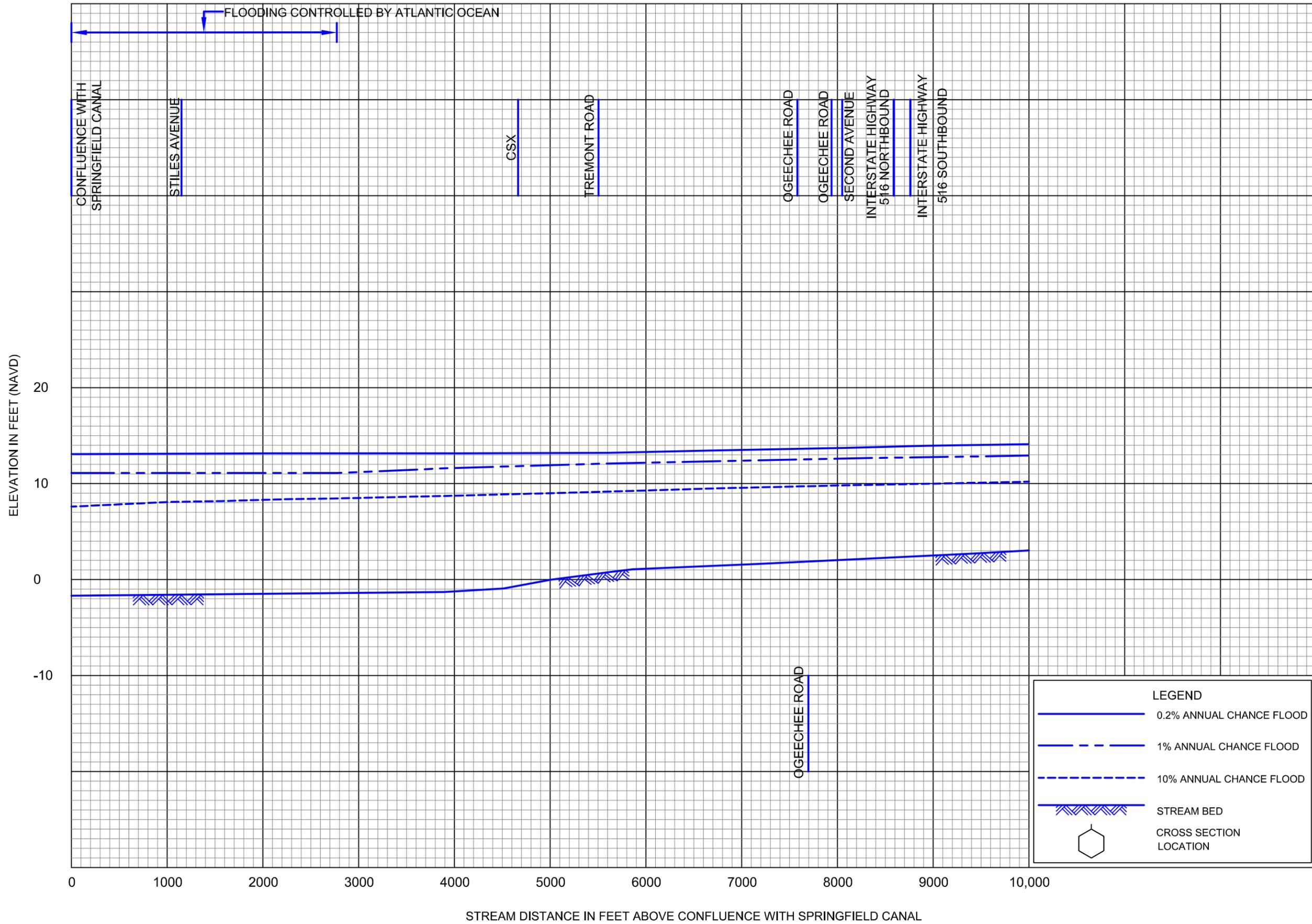


FLOOD PROFILES

SPRINGFIELD CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

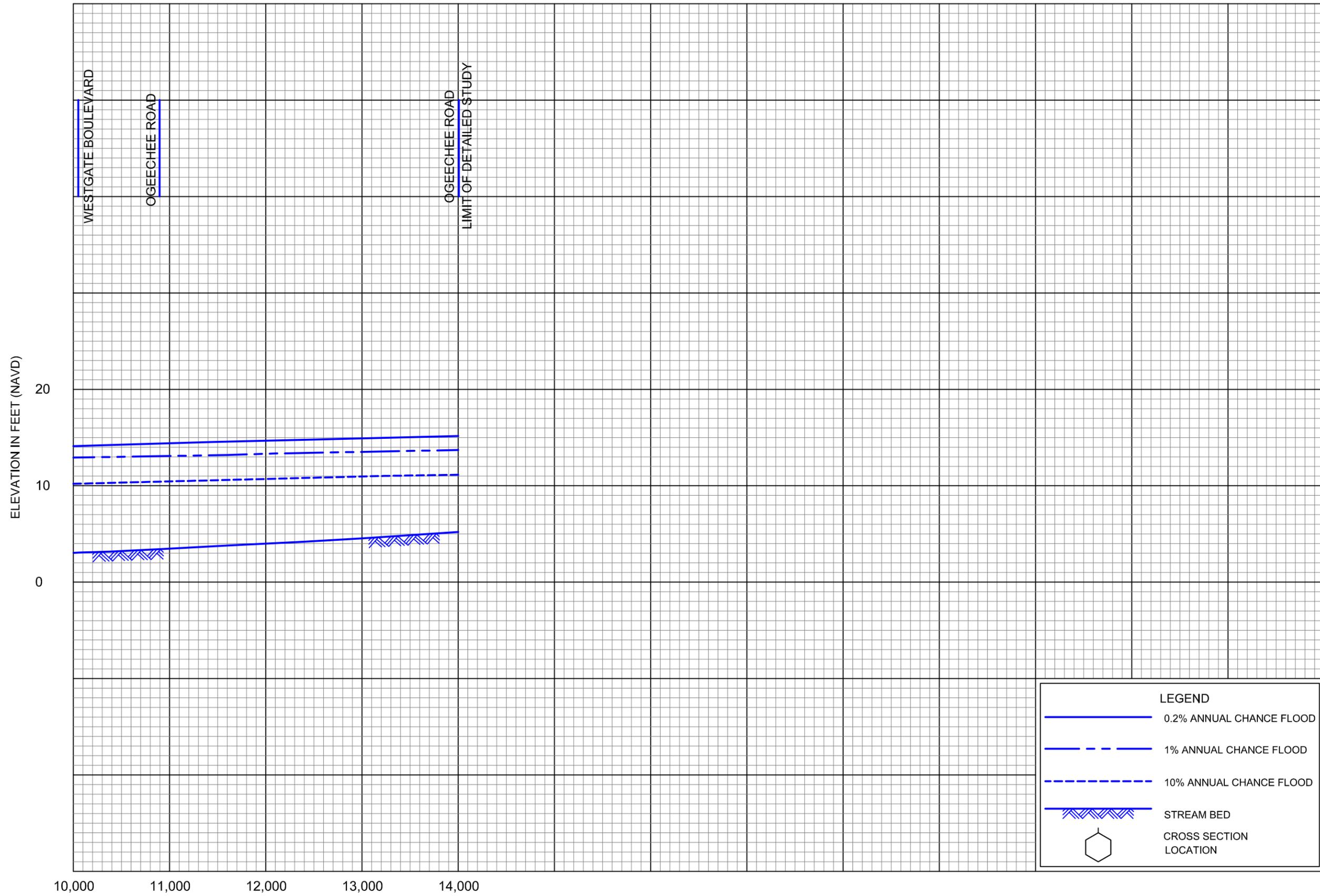
CHATHAM COUNTY, GA
AND INCORPORATED AREAS



FLOOD PROFILES

SPRINGFIELD CANAL TRIBUTARY A

FEDERAL EMERGENCY MANAGEMENT AGENCY
 CHATHAM COUNTY, GA
 AND INCORPORATED AREAS

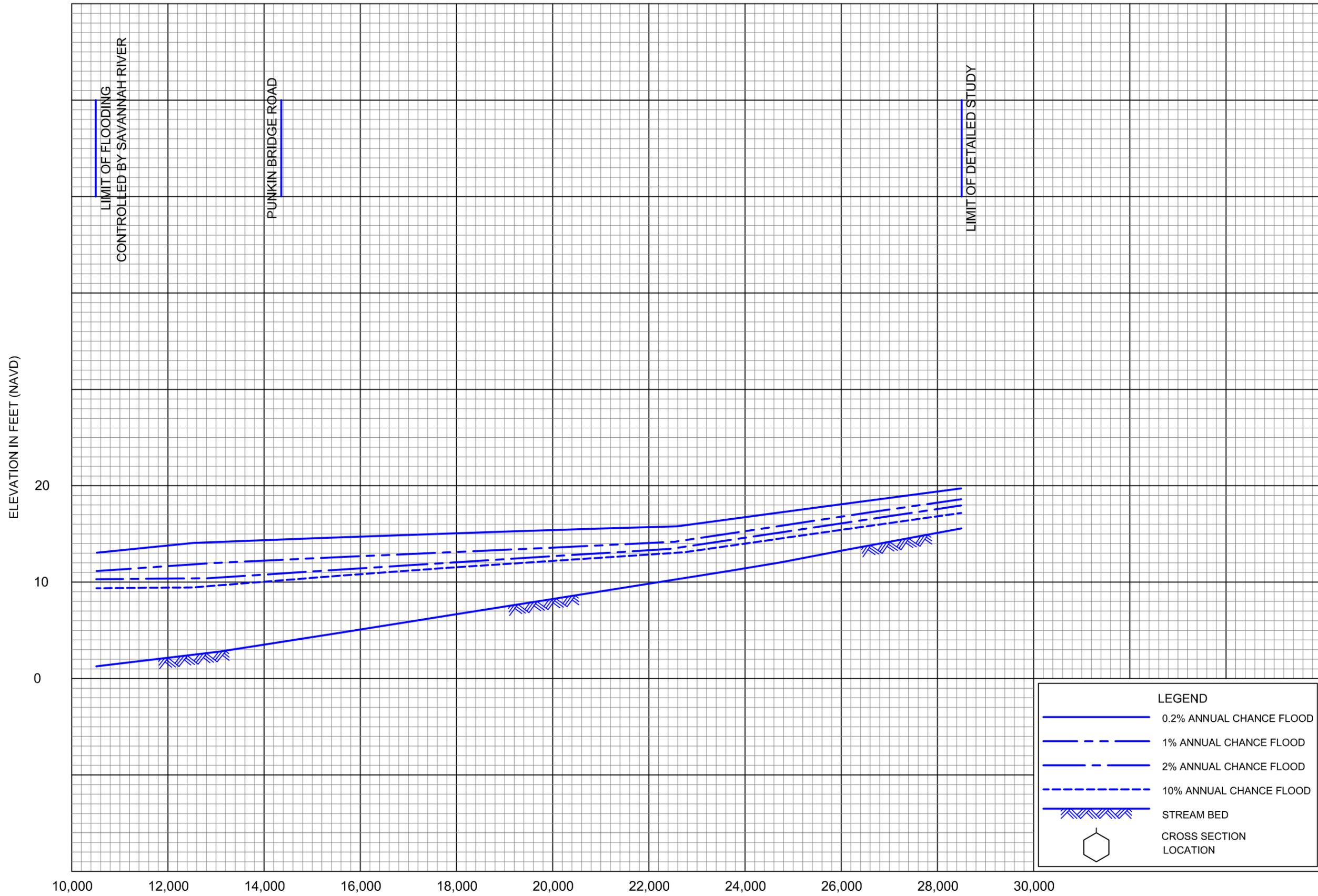


FLOOD PROFILES

SPRINGFIELD CANAL TRIBUTARY A

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHATHAM COUNTY, GA
AND INCORPORATED AREAS

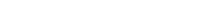


ELEVATION IN FEET (NAVD)

10,000 12,000 14,000 16,000 18,000 20,000 22,000 24,000 26,000 28,000 30,000

STREAM DISTANCE IN FEET ABOVE STATE HIGHWAY 21/AUGUSTA ROAD

LEGEND

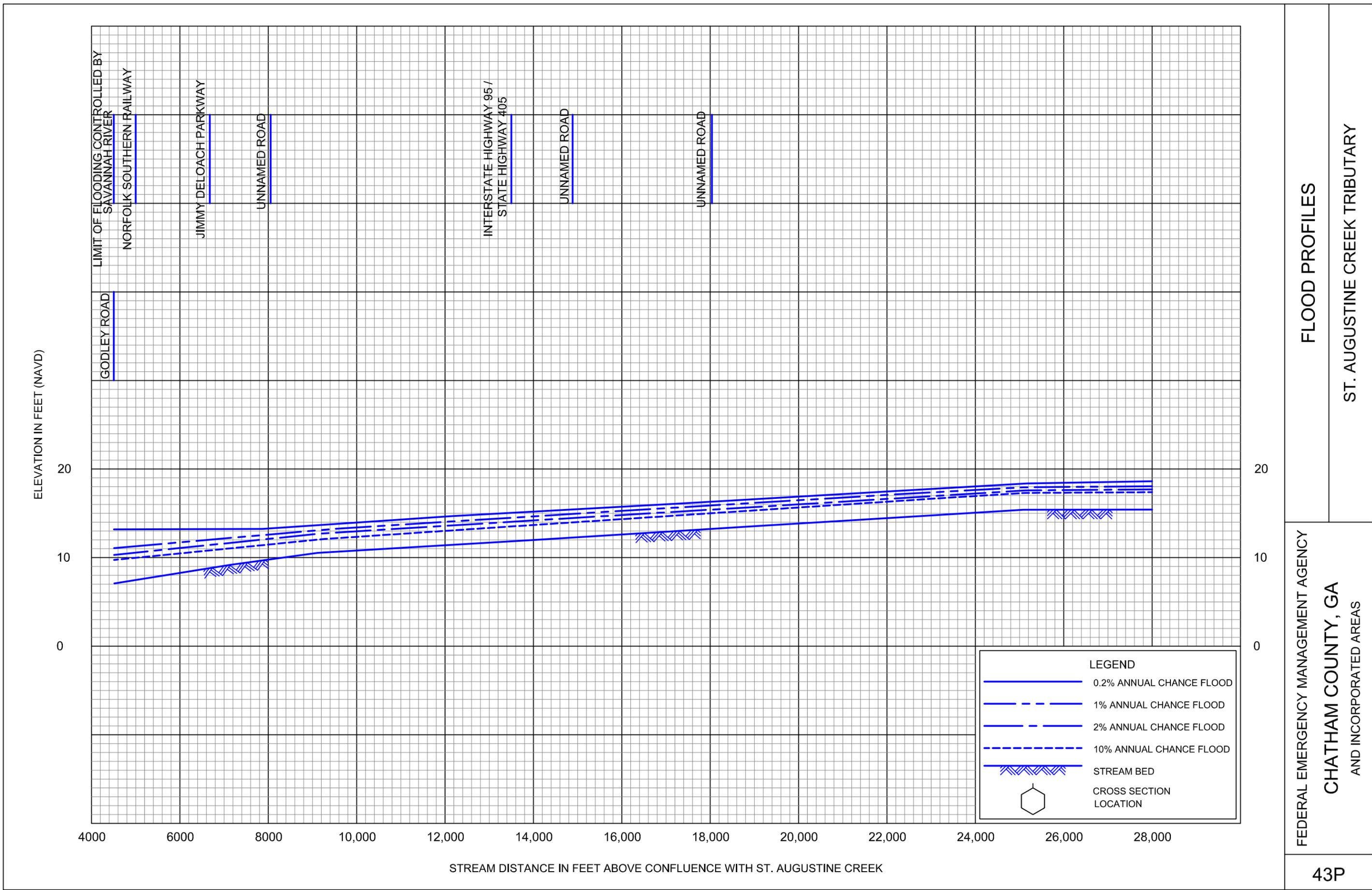
-  0.2% ANNUAL CHANCE FLOOD
-  1% ANNUAL CHANCE FLOOD
-  2% ANNUAL CHANCE FLOOD
-  10% ANNUAL CHANCE FLOOD
-  STREAM BED
-  CROSS SECTION LOCATION

FLOOD PROFILES

ST. AUGUSTINE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

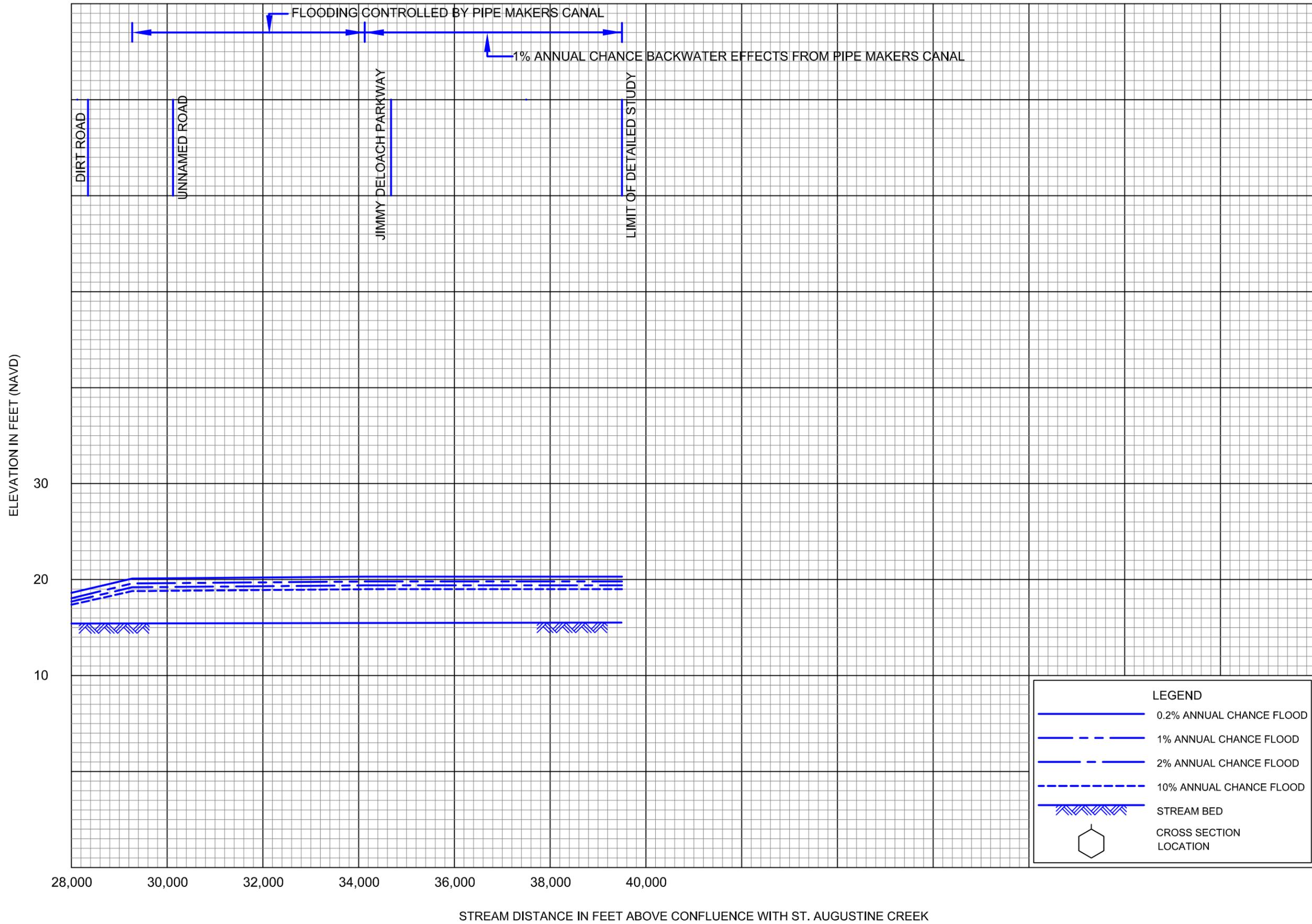
CHATHAM COUNTY, GA
AND INCORPORATED AREAS



FLOOD PROFILES

ST. AUGUSTINE CREEK TRIBUTARY

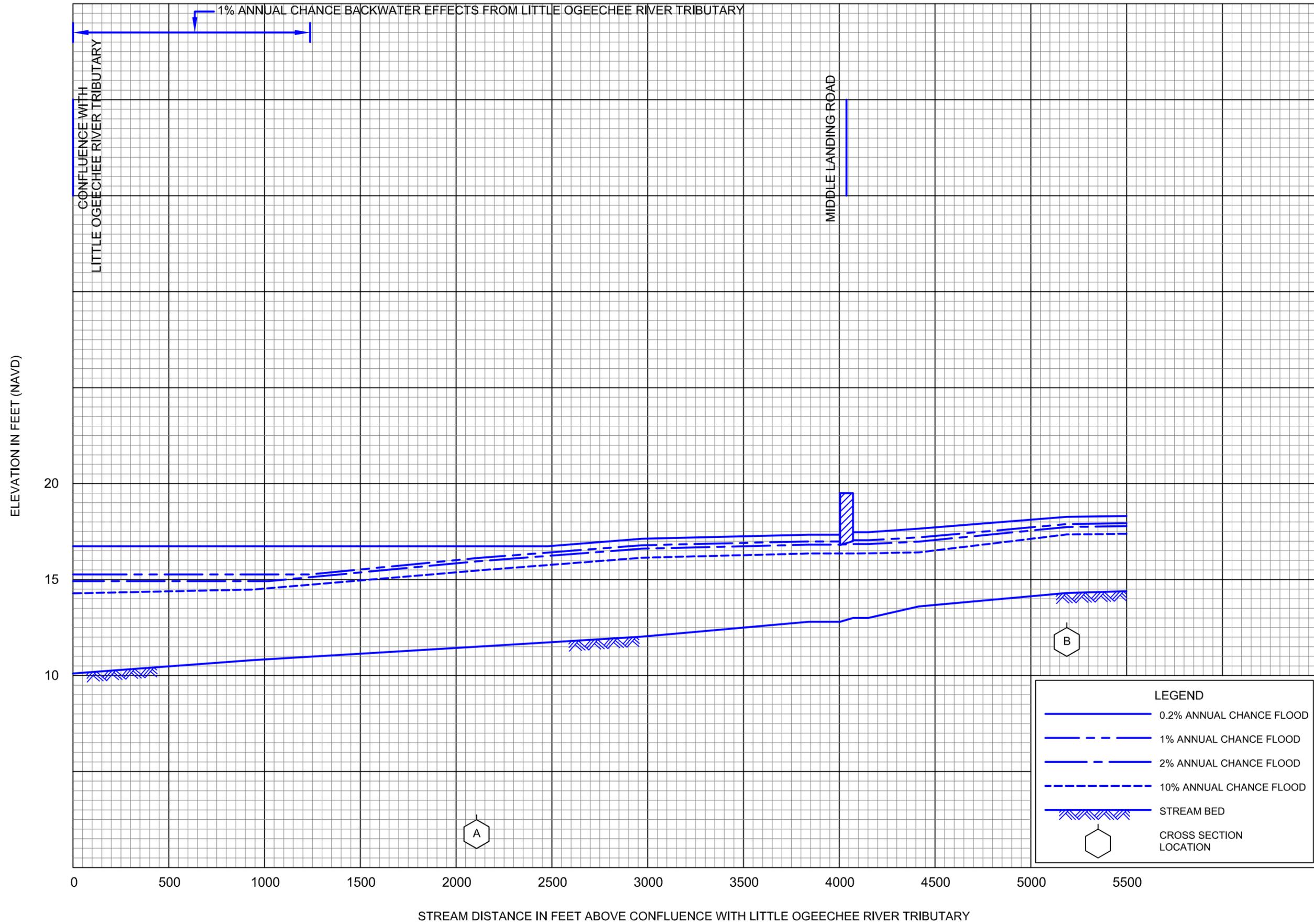
FEDERAL EMERGENCY MANAGEMENT AGENCY
 CHATHAM COUNTY, GA
 AND INCORPORATED AREAS



FLOOD PROFILES

ST. AUGUSTINE CREEK TRIBUTARY

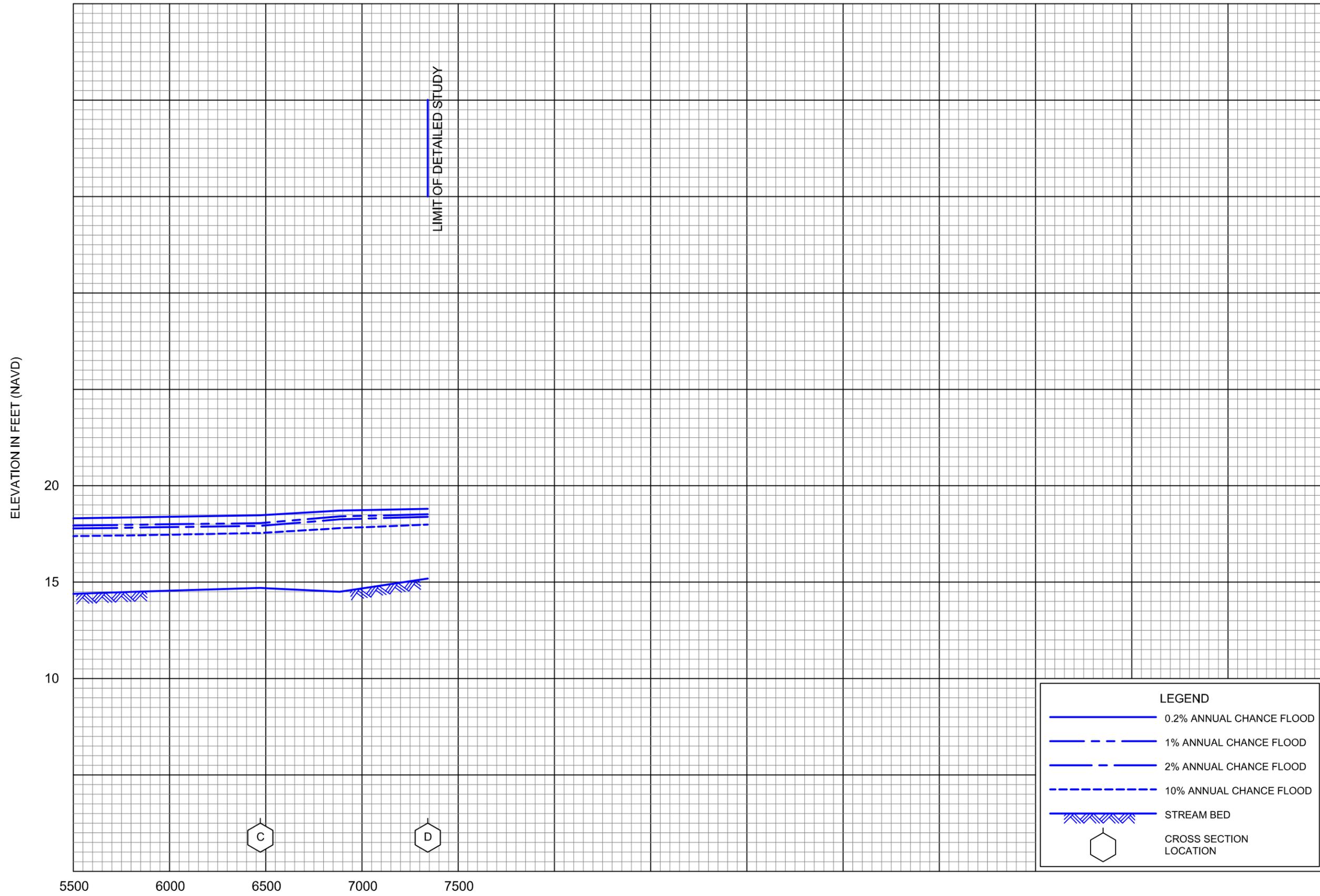
FEDERAL EMERGENCY MANAGEMENT AGENCY
 CHATHAM COUNTY, GA
 AND INCORPORATED AREAS



FLOOD PROFILES

TRIBUTARY TO LITTLE OGEECHEE RIVER TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY
CHATHAM COUNTY, GA
 AND INCORPORATED AREAS



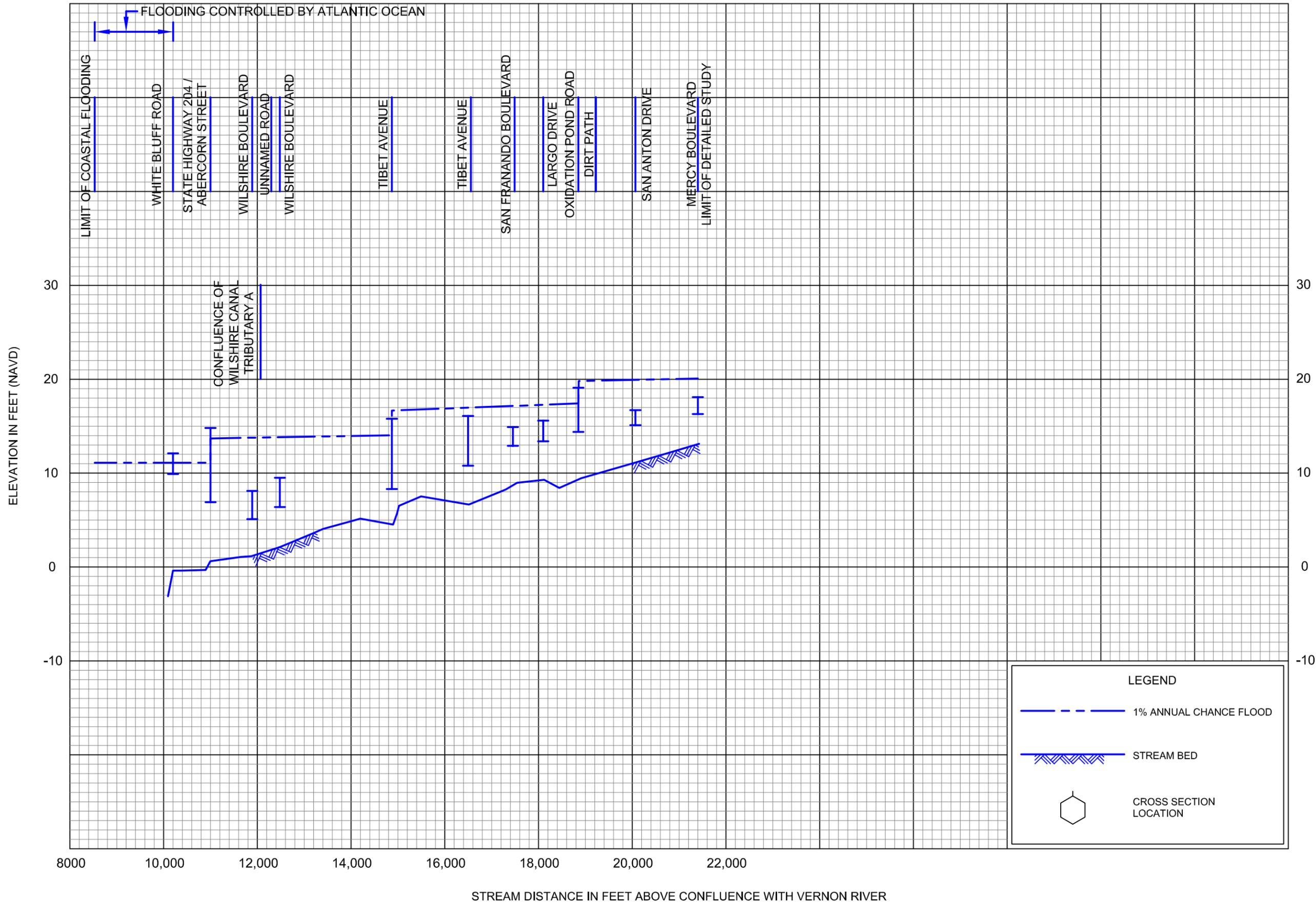
LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

TRIBUTARY TO LITTLE OGEECHEE RIVER TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY
CHATHAM COUNTY, GA
 AND INCORPORATED AREAS

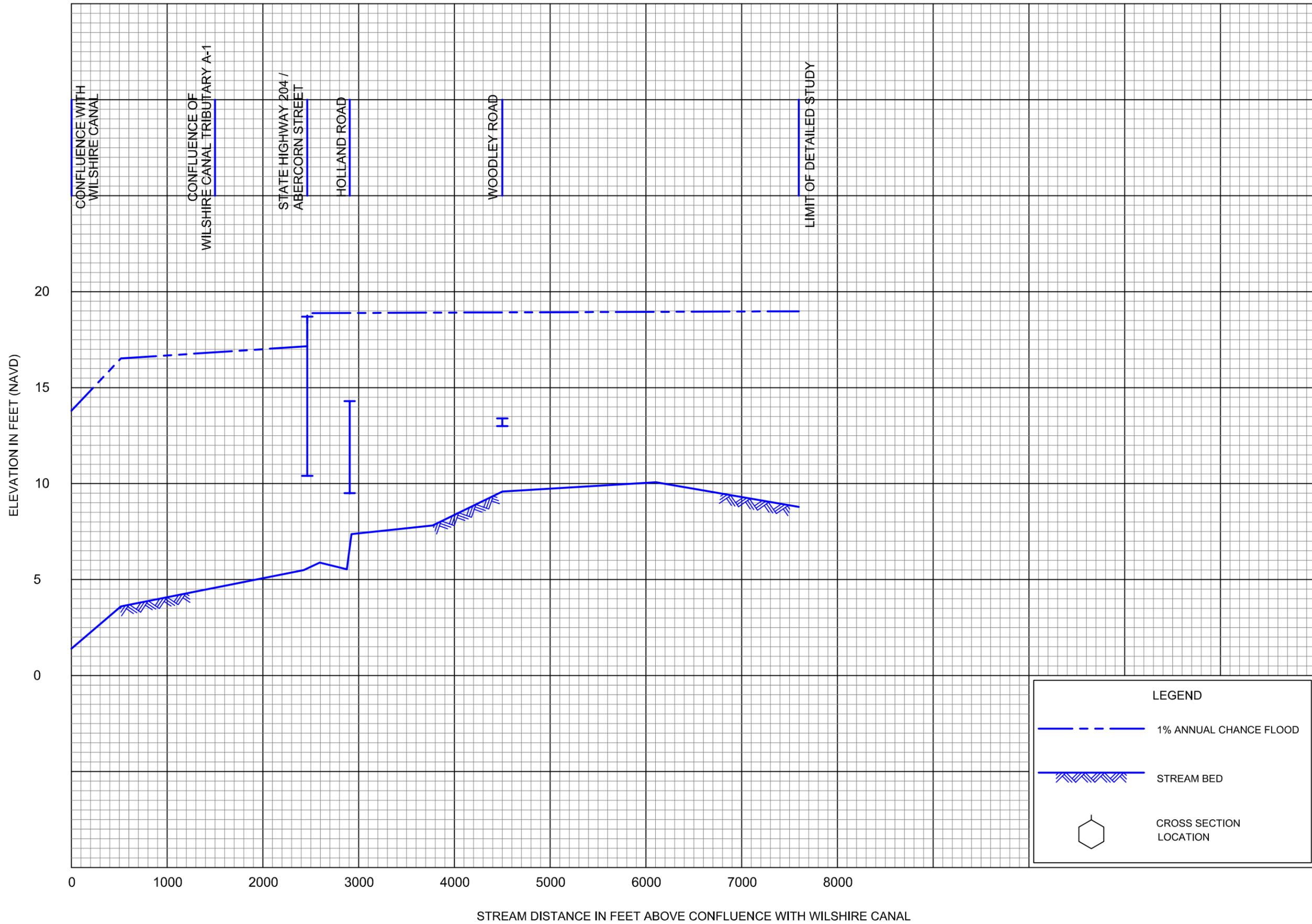


LEGEND

-  1% ANNUAL CHANCE FLOOD
-  STREAM BED
-  CROSS SECTION LOCATION

FEDERAL EMERGENCY MANAGEMENT AGENCY
CHATHAM COUNTY, GA
 AND INCORPORATED AREAS

FLOOD PROFILES
 WILSHIRE CANAL



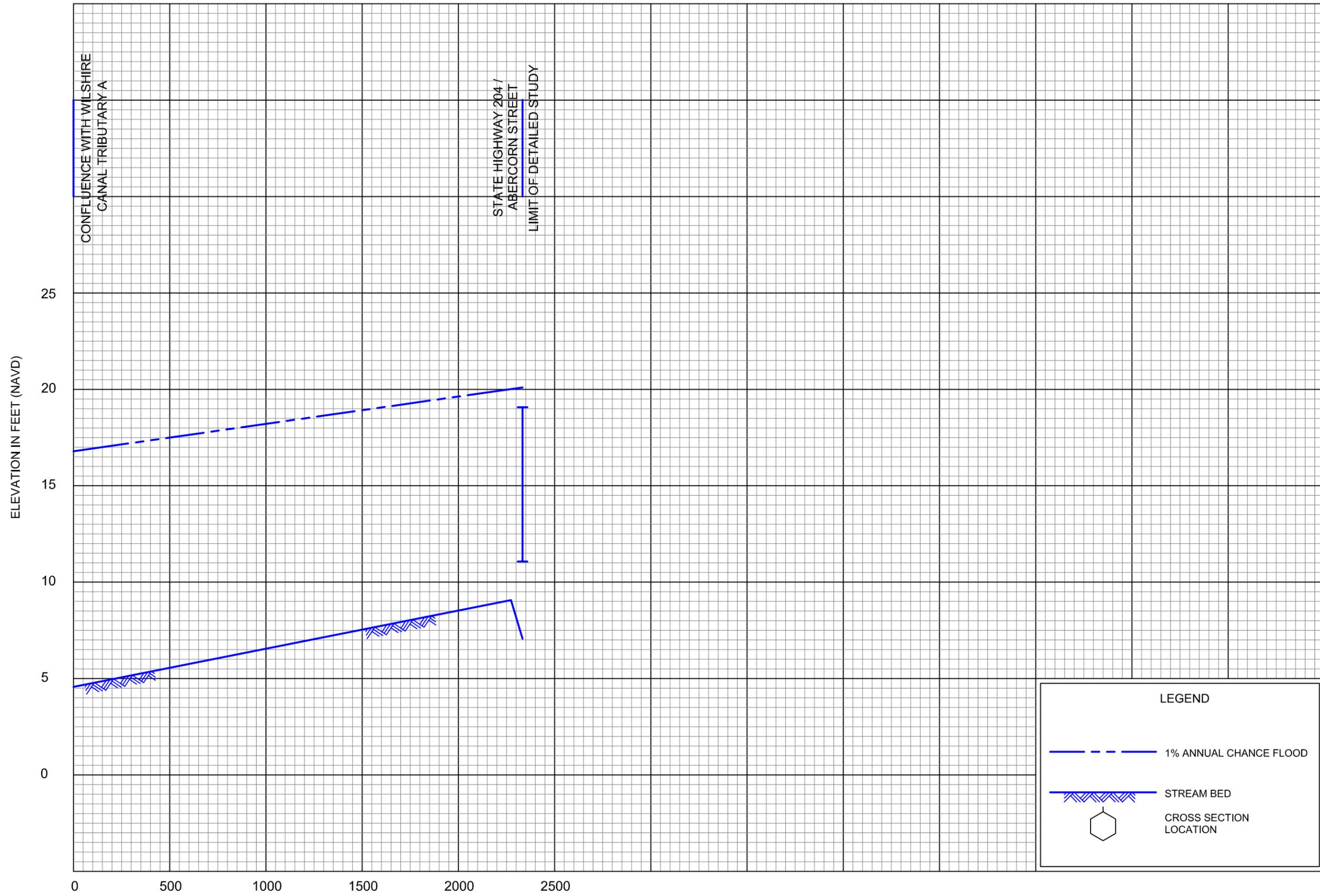
LEGEND

-  1% ANNUAL CHANCE FLOOD
-  STREAM BED
-  CROSS SECTION LOCATION

FLOOD PROFILES

WILSHIRE CANAL TRIBUTARY A

FEDERAL EMERGENCY MANAGEMENT AGENCY
CHATHAM COUNTY, GA
 AND INCORPORATED AREAS



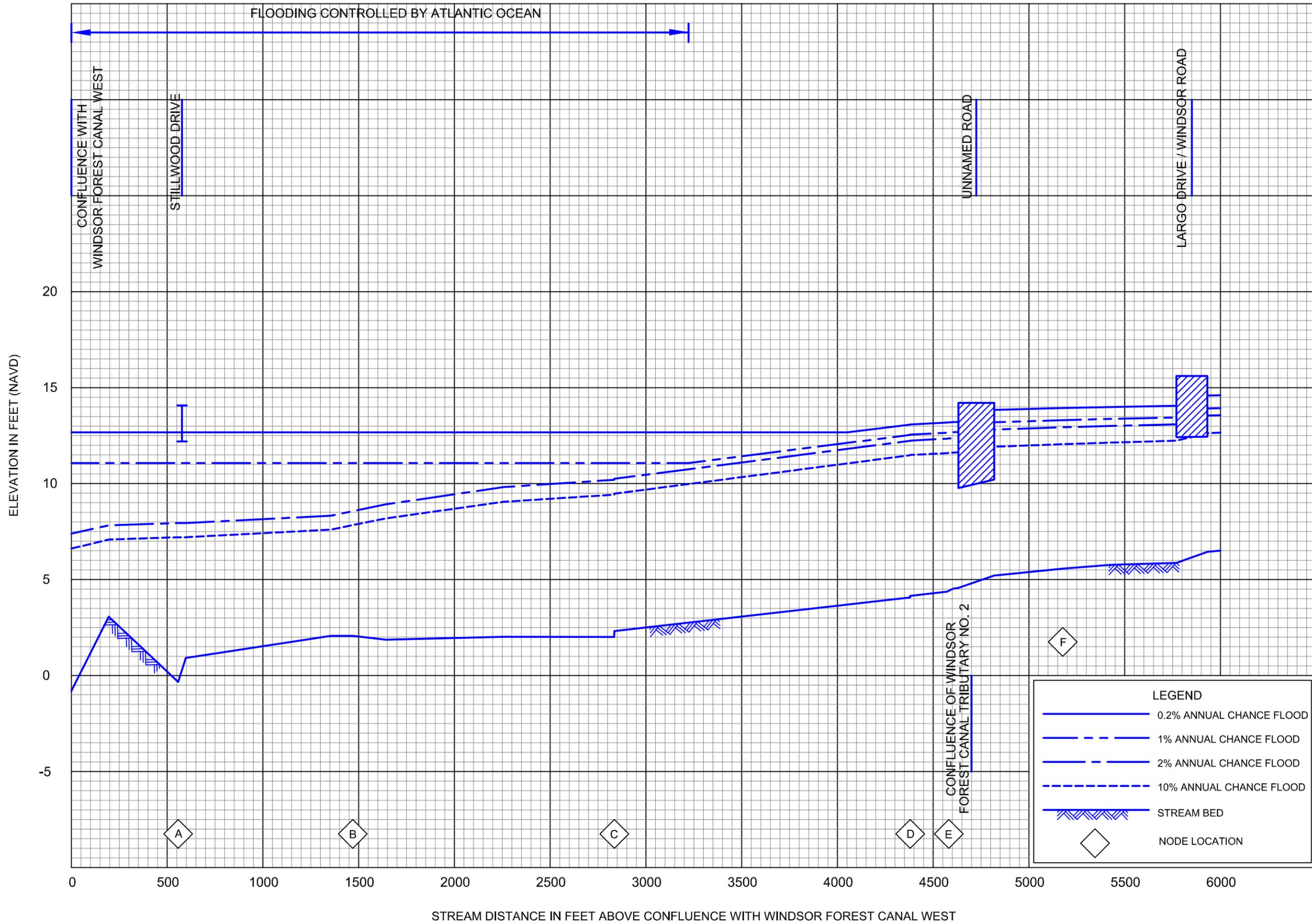
LEGEND

-  1% ANNUAL CHANCE FLOOD
-  STREAM BED
-  CROSS SECTION LOCATION

FLOOD PROFILES

WILSHIRE CANAL TRIBUTARY A-1

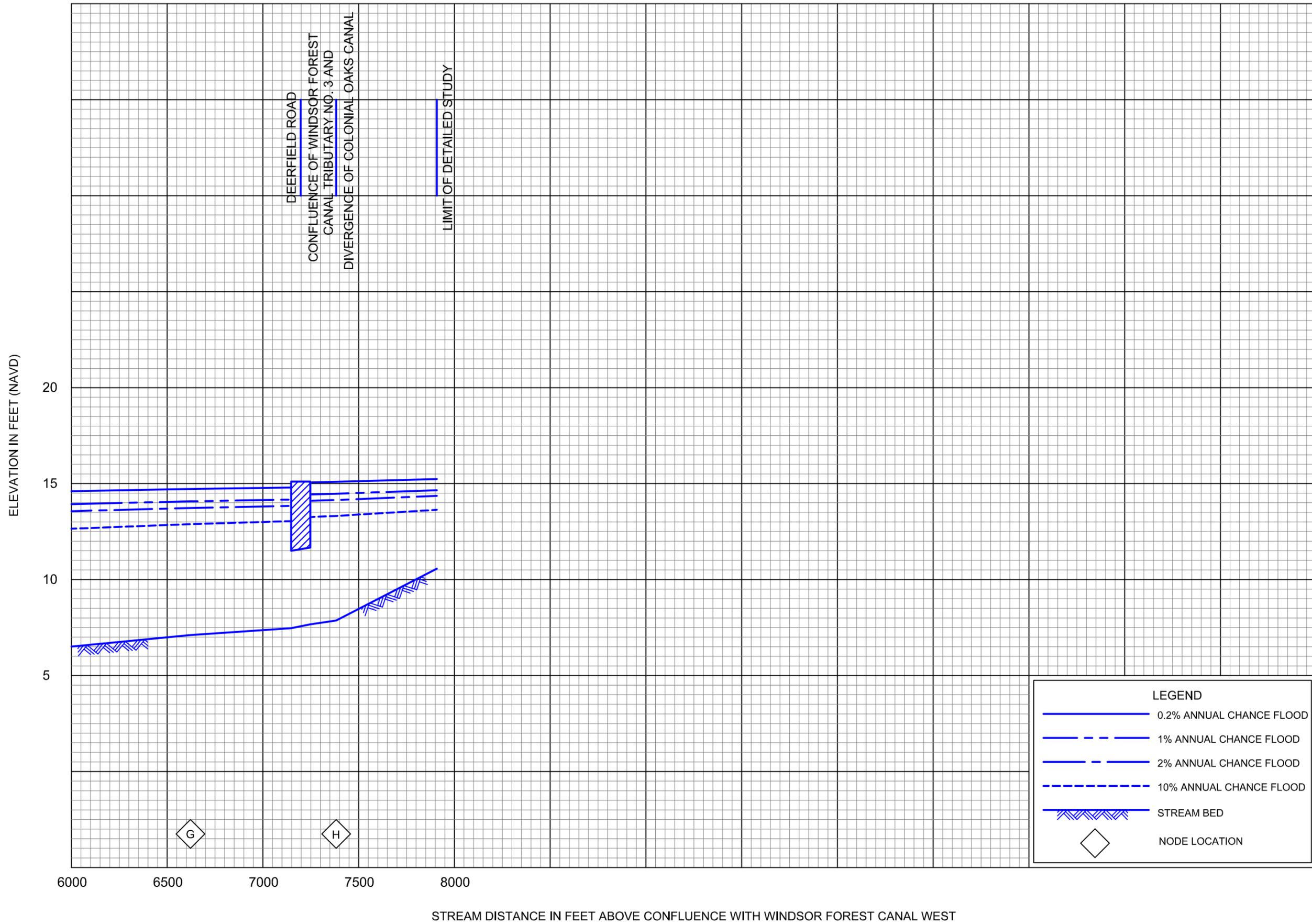
FEDERAL EMERGENCY MANAGEMENT AGENCY
CHATHAM COUNTY, GA
 AND INCORPORATED AREAS



FLOOD PROFILES

WINDSOR FOREST CANAL EAST

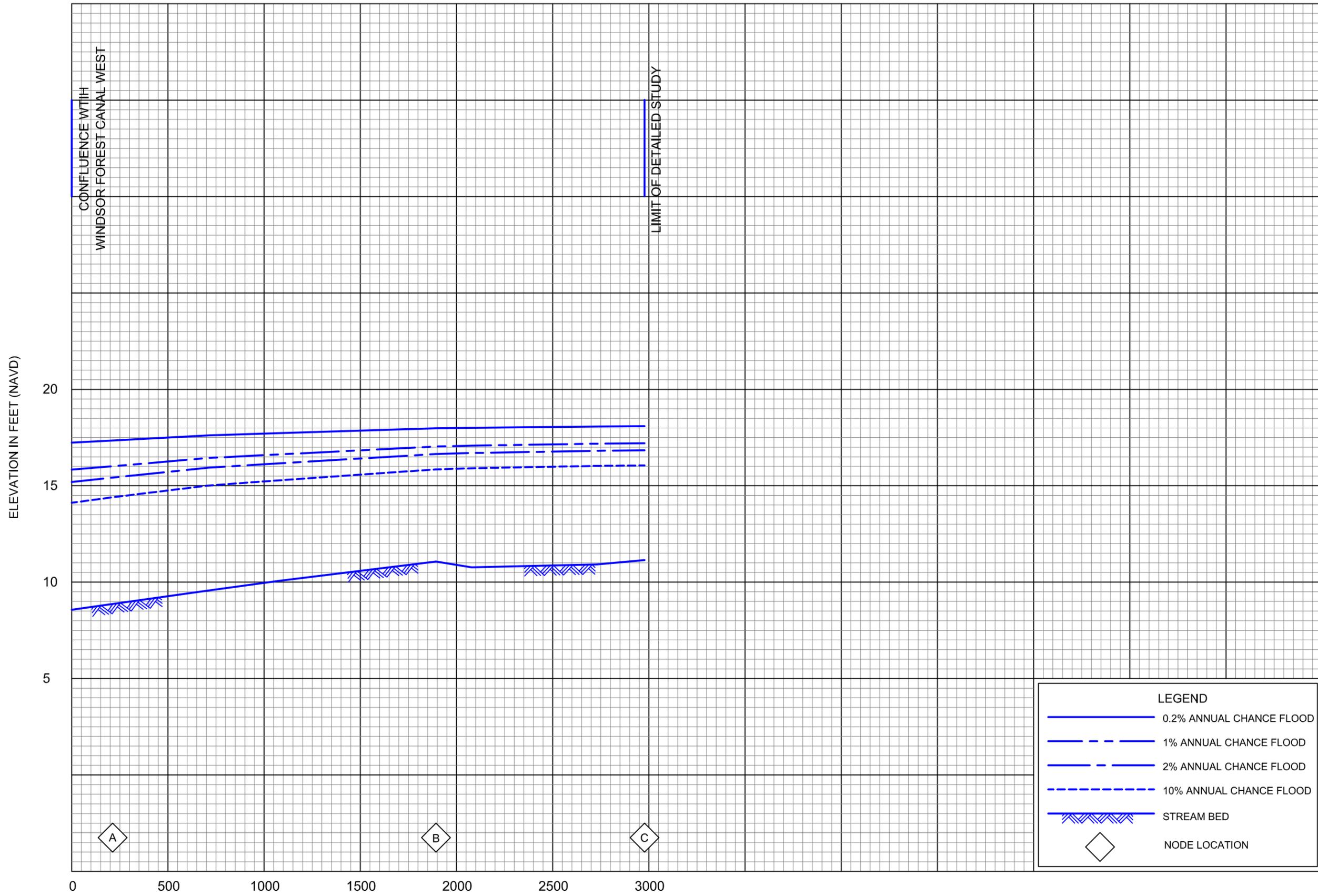
FEDERAL EMERGENCY MANAGEMENT AGENCY
CHATHAM COUNTY, GA
AND INCORPORATED AREAS



FLOOD PROFILES

WINDSOR FOREST CANAL EAST

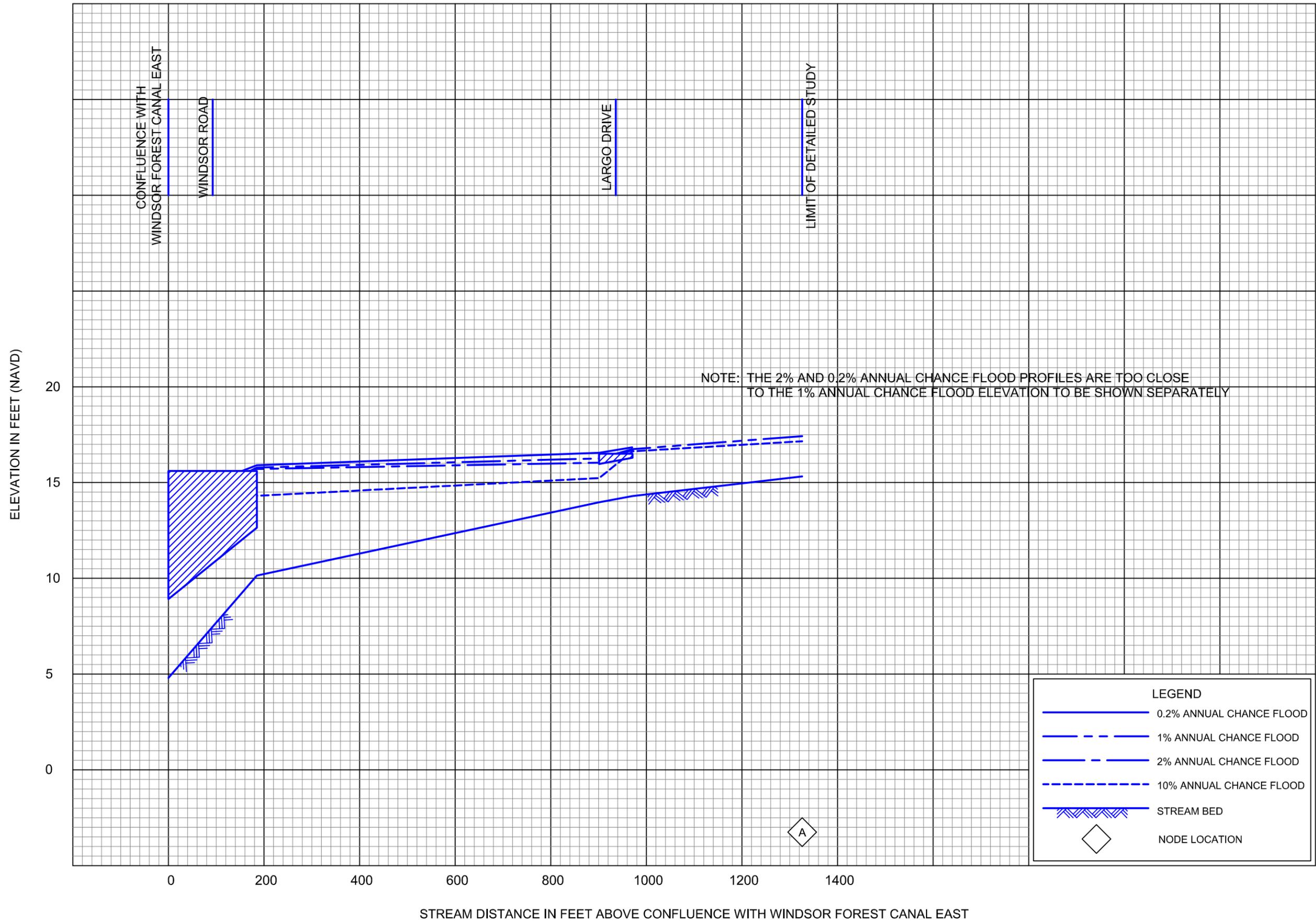
FEDERAL EMERGENCY MANAGEMENT AGENCY
 CHATHAM COUNTY, GA
 AND INCORPORATED AREAS



FLOOD PROFILES

WINDSOR FOREST CANAL TRIBUTARY

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WINDSOR FOREST CANAL TRIBUTARY NO. 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
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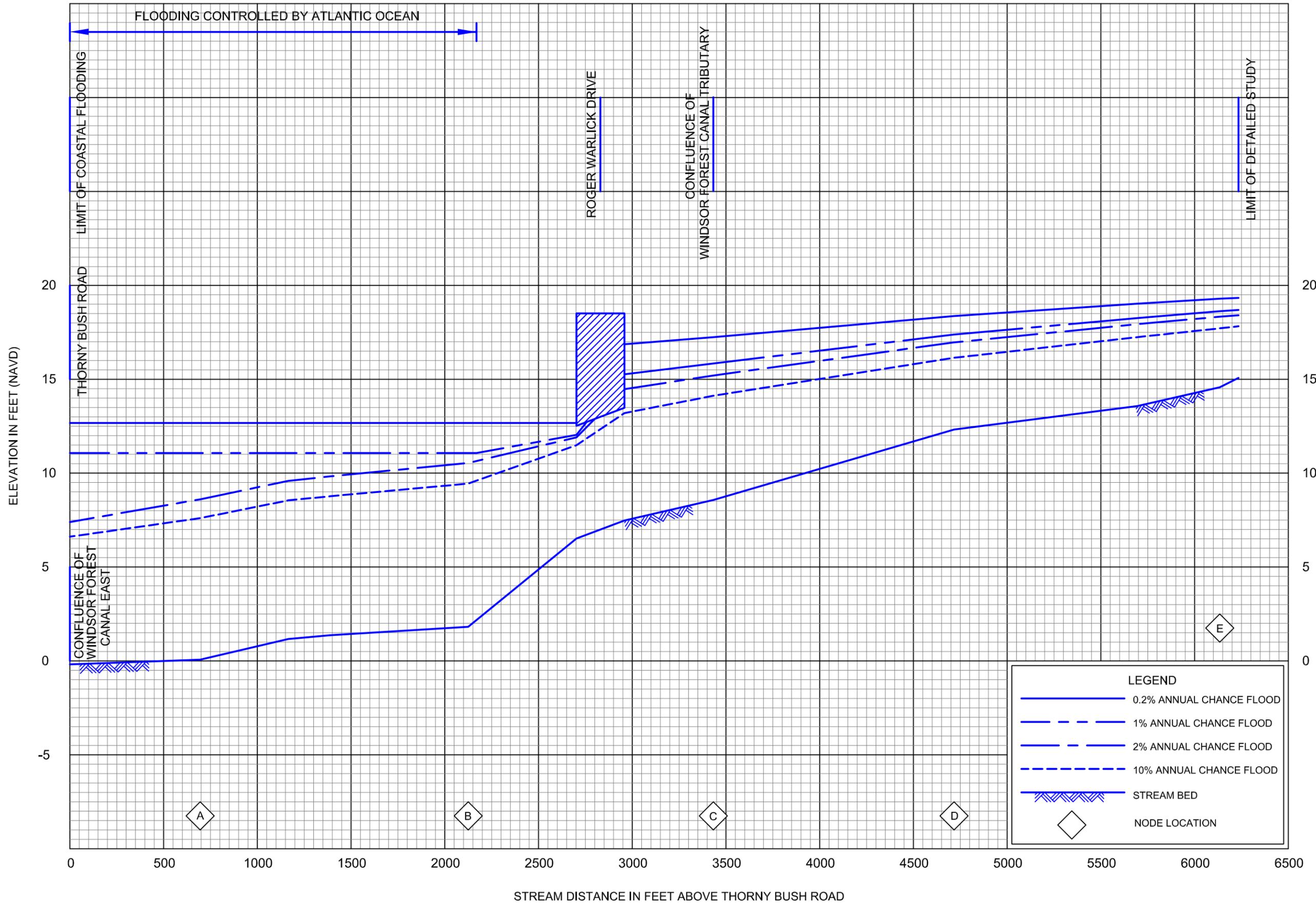


STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH WINDSOR FOREST CANAL EAST AND COLONIAL OAKS CANAL

FLOOD PROFILES

WINDSOR FOREST CANAL TRIBUTARY NO. 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
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FLOOD PROFILES

WINDSOR FOREST CANAL WEST

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