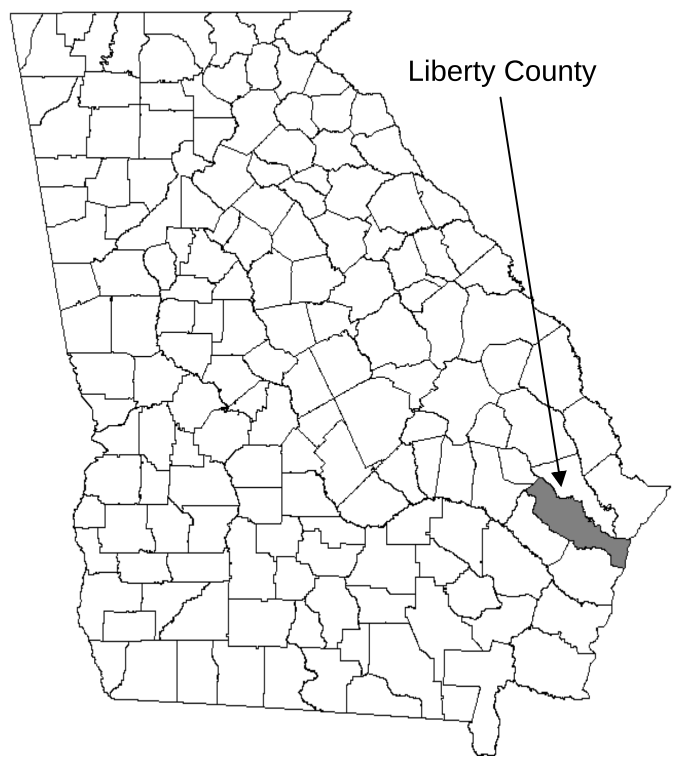
FLOOD INSURANCE STUDY

LIBERTY COUNTY, GEORGIA

AND INCORPORATED AREAS



Community Name	*Community Number*
ALLENHURST, TOWN OF	130350
FLEMINGTON, CITY OF	130124
GUMBRANCH, CITY OF	130610
HINESVILLE, CITY OF	130125
LIBERTY COUNTY (UNINCORPORATED AREAS)	130123
MIDWAY, CITY OF	130351
RICEBORO, CITY OF	130126
WALTHOURVILLE, CITY OF	130459

Effective: September 26, 2008

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
13179CV000A

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 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:

Old Zone(s)	New Zone
Al 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
LIBERTY 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 Liberty County, including the Cities of Flemington, Gumbranch, Hinesville, Midway, Riceboro, and Walthourville; the Town of Allenhurst; and the unincorporated areas of Liberty County (referred to collectively herein as Liberty 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 report, as compiled from their previously printed FIS reports, are shown below:

Flemington, City of:	The hydrologic and hydraulic analyses for Alligator Canal, Goshen Canal, Mallard Canal, and Peacock Creek for the original FIS report dated May 17, 1982, were prepared by Post, Buckley, Schuh & Jernigan, Inc., for the Federal Insurance Administration (FIA), under Contract No. H-4778 (FIA, 1982). The work was completed in June 1980. The revised hydrologic and hydraulic analyses for Peacock Creek for the first revision, dated September 30, 1988 (FEMA, 1988), were prepared by the U.S. Army Corps of Engineers (USACE), Savannah District.
Hinesville, City of:	The hydrologic and hydraulic analyses for Mill Creek, Mill Creek Tributary No. 2, Peacock Creek, and Peacock Creek Tributary No. 1 for the original FIS report dated February 4, 1987 (FEMA, 1987), were prepared by Post, Buckley, Schuh & Jernigan, Inc., for FEMA, under Contract No. EMW-4-4232. The work was completed in January 1984.
Liberty County (Unincorporated Areas):	The hydrologic and hydraulic analyses for Cay Creek, Goshen Canal, Mill Creek, and Peacock Creek for the original FIS report dated June 1, 1983 (FEMA, 1983), were completed by Post, Buckley, Schuh & Jernigan, Inc., for FEMA, under Contract No. H-4778. The work was completed in May 1980.

Midway, City of:	The hydrologic and hydraulic analyses for Cay Creek for the original FIS report dated March 30, 1981 (FIA, 1981a), were prepared by Post, Buckley, Schuh & Jernigan, Inc., for the FIA, under Contract No. H-4778. The work was completed in April 1980.
Riceboro, City of:	The hydrologic and hydraulic analyses for Riceboro Creek for the original FIS report dated May 4, 1981 (FIA, 1981b), were prepared by Post, Buckley, Schuh & Jernigan, Inc., for the FIA, under Contract No. H-4778. The work was completed in April 1980.

This Countywide FIS Report

For this countywide FIS, streams restudied by approximate methods and redelineation of floodplain boundaries for streams studied by approximate methods was performed by PBS&J, for the Georgia Department of Natural Resources (DNR), under Contract No. EMA-2006-CA-5615, with FEMA. The work was completed in June 2007.

Base map information shown on the Flood Insurance Rate Map (FIRM) was provided for Liberty County by ImageAmerica, dated 2006 and captured at a resolution of six inches. The projection used in the preparation of this map is State Plane Georgia East (FIPS Zone 1001), and the horizontal datum used is the North American Datum of 1983.

1.3 Coordination

Precountywide Analyses

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. A final meeting is held with representatives from FEMA, the community, and the study contractor to review the results of the study.

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

Community	FIS Date	Initial Meeting	Final Meeting
Flemington, City of	May 17, 1982 September 30, 1988	May 1978 *	May 5, 1981 *
Hinesville, City of	February 4, 1987	*	February 13, 1986
Liberty County (Unincorporated Areas)	June 1, 1983	May 1978	December 12, 1982
Midway, City of	March 3, 1981	May 1978	August 28, 1980
Riceboro, City of	May 4, 1981	May 1978	August 28, 1980

* Data not available

This Countywide FIS Report

For this countywide FIS, a scoping meeting was held on September 30, 2004, at the Coastal Georgia Regional Development Center, and attended by representatives of Liberty County, the Georgia DNR, and PBS&J. The purpose of this meeting was to discuss the scope of the countywide FIS.

The results of the study were reviewed at the final meeting held on November 15, 2007, and attended by representatives of PBS&J, Liberty County, and the Georgia DNR. 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 Liberty 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 through the time of the study.

Precountywide Analyses

The potential for flooding due to open coast surge wave was studied, and the added effect of wind induced waves was also examined. The effects of flooding due to ponding were not considered.

Streams that were studied by detailed methods are indicated in Table 1. The limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2).

Table 1 - Streams Studied by Detailed Methods

Alligator Canal	Mill Creek Tributary No. 2
Cay Creek	Peacock Creek
Goshen Canal	Peacock Creek Tributary No. 1
Mallard Canal	Riceboro Creek
Mill Creek	

This Countywide FIS Report

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 the North American Vertical Datum of 1988 (NAVD). In addition, the Universal Transverse Mercator, State Plane coordinates, previously referenced to the North American Datum of 1927, are now referenced to the North American Datum of 1983.

Existing areas studied by detailed methods were redelineated as part of this countywide revision. LIDAR-generated contour intervals of two feet were obtained and used to update floodplain boundaries with the latest available data (Laser Mapping Specialists Inc., 2006).

Also, existing areas studied by approximate methods were redelineated using the new two foot contours as part of this countywide FIS. In addition, areas restudied by approximate methods were selected with priority given to all known flood hazards and areas of projected development or proposed construction through June 2007. The streams restudied by approximate methods are presented in Table 2.

Table 2 - Streams Studied by Approximate Methods

Stream	Reach Description
Cay Creek	From approximately 11,000 feet downstream of Cay Creek Road to CSX railroad
Porter Creek	From approximately 6,450 feet downstream of Cay Creek Road to approximately 3,200 feet upstream of CSX railroad

Table 2 - Streams Studied by Approximate Methods (*Continued*)

Stream	Reach Description
Porter Creek Tributary No. 2	From the confluence with Porter Creek to approximately 2,430 feet upstream of Ernie Drive
Riceboro Creek	From approximately 880 feet upstream of U.S. Highway 17/State Highway 25/South Coastal Highway to approximately 3,100 feet upstream of Dunlevie Road
Riceboro Creek Tributary No. 6	From approximately 5,550 feet downstream of Dunlevie Road to approximately 2,750 feet upstream of Dunlevie Road
Riceboro Creek Tributary No. 7	From the confluence with Riceboro Creek to approximately 1,840 feet upstream of West Oglethorpe Highway/U.S. Highway 84/State Highway 38
Taylors Creek	From approximately 23,200 feet downstream of State Highway 119/144 to the county boundary
Riceboro Creek	From approximately 880 feet upstream of U.S. Highway 17/State Highway 25/South Coastal Highway to approximately 3,100 feet upstream of Dunlevie Road

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

LOMC	Case Number	Date Issued	Project Identifier
LOMR	97-04-001P	12/01/1997	Horse Creek Waterfield Subdivision
LOMR	01-04-571P	05/15/2002	McDonald Ridge Subdivision

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.

Community	Old Name	New Name
Flemington, City of	Peacock Canal	Peacock Creek

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 Liberty County.

2.2 Community Description

Liberty County is located in the eastern coastal plains region of the State of Georgia. The county is bordered by the Atlantic Ocean to the east, McIntosh and Long Counties to the south, Evans County to the east, Bryan County to the north, and Tatnall County to the northwest. The total land area contained within the county limits is approximately 514 square miles. Liberty County is approximately 38 miles southwest of Savannah, 200 miles southeast of Atlanta, and 120 miles northwest of Jacksonville, Florida. According to the U.S. Census Bureau, in 2006 the population for Liberty County and its incorporated areas was 62,571 (U.S. Census Bureau, 2006). Since 1990, Liberty County has experienced a population increase of 1.2%.

The climate in this area is warm and temperate to subtropical. Mean summer and winter temperatures range from 83 degrees Fahrenheit (°F) in July to 52°F in January. Annual average precipitation of the region is 48 inches. Most of the precipitation occurs in the summer months (The Weather Channel, 2007).

The South Newport River forms the boundary between Liberty and McIntosh Counties. It flows in an eastward direction, where it empties into Sapelo Sound. Water levels and flows in the South Newport River are significantly affected by tides. At the lower limit of the study, the South Newport River has a drainage area of approximately 160 square miles. The South Newport River was studied in detail from Sapelo Sound upstream to its intersection with State Highway 25/U.S. Highway 17.

The Peacock Creek/North Newport River system and a tributary, Goshen Canal, are studied in detail. The detailed analysis of Peacock Creek extends from Interstate Highway 95 upstream to the Hinesville city limits. Goshen Canal is studied from its confluence with Peacock Creek to the Flemington city limits. Two smaller tributaries flow into the Peacock Creek/North Newport River system near the lower limits of the detailed study. One of these tributaries is Riceboro Creek and another tributary is Cay Creek. Riceboro Creek is studied in detail from its confluence with Peacock Creek to the Riceboro city limits. The detailed study of Cay Creek extends from the CSX railroad to the Midway city limits. The Peacock Creek/North Newport River system flows in a southeasterly direction toward the coast.

In the coastal area, the channels of the rivers cut across tidal marshlands of approximately two feet elevation (NAVD). These tidal floodplains are bounded by higher ground of approximately nine feet elevation (NAVD) or greater. In the vicinity of their downstream limits of study, as evident on the U.S. Geological Survey (USGS) 7.5 minute topographic maps, the floodplains become much wider. There are a series of sounds (main channels) and a network of tributaries (USGS, various dates).

The U.S. Department of Agriculture Soil Conservation Service (SCS) has published a general Soil Map for Liberty County (SCS, undated). In the tidal floodplain area, the predominant soil association is Tidal Marsh-Capers. Further inland, the predominant associations in the floodplains are Bayou-Rains-Portsmouth and Swamp-Johnston. Both associations consist of poorly drained soils.

For the higher ground, the predominant soils in the area near the coast are sandy. Further inland, predominant soils are those with medium textured subsoils. Permeabilities here range from good to poor (SCS, undated).

In the coastal floodplain areas, vegetation consists of long grasses. In the higher ground there are numerous bushes and trees. Inland along the rivers, the vegetation of the floodplain becomes progressively more dense, with bushes and trees appearing.

2.3 Principal Flood Problems

The geographic location of Liberty County along the Atlantic Ocean places it in the hurricane path from storms originating in this warm tropical area of the Atlantic Ocean, Carribean Sea, and the Gulf of Mexico. During the last century, the county has escaped the direct path of a hurricane, but has felt the effects of some.

A 1970 Environmental Science Service Administration (ESSA) document identified two storms affecting Liberty County. On August 31, 1964, Hurricane Cleo produced some side effects caused by heavy rains and winds, but resulted in no casualties, and no extensive damage was reported. Hurricane Dora produced similar effects in September 1964 (ESSA, 1970).

2.4 Flood Protection Measures

The Coastal Area Planning and Development Commission (CAPDC) has developed a document titled Areawide Land Use Plan – Non-Metropolitan Coastal Area (CAPDC, 1978). Its coverage is Liberty County and seven other counties. It defines flood-prone areas as those inundated by a 1-percent-annual-chance flood. The document states that only new development that can sustain periodic flooding or that will not create public burdens should be encouraged to locate in flood-prone areas. Examples given of activities that are well suited for floodplain locations include recreation and agriculture, with necessary incidental structures. A map of strategic development areas in the land use plan (CAPDC, 1978) shows “major” development concentrated along a band stretching through the cities of Flemington, Hinesville, Allenhurst, and Walthourville (that is, along State Highway 119 and State Highway 38/U.S. Highway 82). Only “minor” development activity is projected in areas closer to the coast.

The Zoning ordinance for Liberty County, from March 1975, deals with land subject to flooding. It states that no building or mobile home shall be moved into or constructed in a flood-prone area unless the first floor elevation is one foot above the highest elevation at that location expected to be flooded in a 1-percent-annual-chance flood.

Subdivision regulations for the City of Hinesville were published in 1978. The regulations state that an adequate drainage system (including necessary open ditches pipes, culverts, storm sewers, intersectional drains, drop inlets, bridges, and other necessary appurtenances) shall be installed by the subdivider. The regulations also state that the Hinesville Planning Board shall not approve a subdivision where the soil conditions have proven to not be suitable for the development proposed. Further, no portion of a subdivision shall be approved that is subject to inundation by a 1-percent-annual-chance flood or less, unless such portion of the subdivision is filled or otherwise protected to raise the elevation to at least the 1-percent-annual-chance flood elevation

The City of Midway Subdivision Regulations (CAPDC, 1975a), state that no portion of a subdivision shall be approved which is subject to the 1-percent-annual-chance flood. The regulations contain standards for flood–prone area uses. These indicate that construction of buildings, utilities, and waste disposal systems shall be located and constructed so as to minimize flooding damage. This requires adequate drainage to reduce exposure to flood damage.

The regulations have additional standards dealing with fill, structures, and storage of material and equipment. Finally, the regulations require that an adequate drainage system (including necessary open ditches, pipes, culverts, storm sewers, intersectional drains, drop inlets, bridges, and other necessary appurtenances) shall be installed by the subdivider according to plans and specifications approved by the County Health Department (CAPDC, 1975a).

Subdivision regulations for the City of Riceboro were published in March 1975. The regulations state that no portion of subdivision shall be approved which is subject to inundation by a flood of 1-percent-annual-chance frequency, if it fails to meet certain conditions. These conditions consist of construction standards for flood-prone areas, use of fill, structures (temporary or permanent), and storage of material and equipment (CAPDC, 1975b).

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.

Pre-Countywide Analysis

For all streams studied by detailed methods, Alligator Canal, Cay Creek, Goshen Canal, Mallard Canal, Mill Creek, Peacock Creek, and Riceboro Creek, discharge-frequency relationships for riverine flooding were based on the Regional Analysis as outlined in the USGS publication Open-File Report 76-511, titled *Flood Frequency Analysis for Small Natural Stream in Georgia* (USGS, 1976). This regional analysis is based on statistical computations of discharge records at various sites in Georgia, regressed against basin characteristics. The 0.2-percent-annual-chance discharge values were extrapolated from the lower frequency floods. Peak discharge-drainage area relationships for Liberty County are shown in Table 3.

Table 3 - Summary of Discharges

		Peak Discharges (cubic feet per second)			
Flooding Source and Location	Drainage Area (square miles)	10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
ALLIGATOR CANAL					
Approximately 1,620 feet upstream of confluence with Goshen Canal	2.8	400	620	720	1,000
Approximately 1,620 feet upstream of Old Hines Road	2.0	330	500	590	820

Table 3 - Summary of Discharges (*Continued*)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
CAY CREEK					
Upstream of the confluence with Peacock Creek	8.4	760	1,190	1,410	1,970
Approximately 3,045 feet Highway 84/State Highway 38/East Oglethorpe Highway	1.7	300	460	530	730
GOSHEN CANAL					
Upstream of confluence with Peacock Creek	8.4	760	1,190	1,410	1,970
Approximately 5,300 feet upstream of U.S. Highway 84/State Highway 38/East Oglethorpe Highway	10.3	860	1,350	1,600	2,240
Just below Old Hines Road	9.5	820	1,280	1,520	2,120
MALLARD CANAL					
Approximately 430 feet upstream of the confluence with Alligator Canal	0.8	190	290	340	460
Just below U.S. Highway 84/ State Highway 38/East Oglethorpe Highway	0.4	130	190	220	300
MILL CREEK					
Just above 18th Street	18.4	1,204	1,906	2,269	3,150
Approximately 3,925 feet upstream of Fort Stewart Railway	13.1	990	1,550	1,840	2,600
Just downstream of the confluence of Mill Creek Tributary No. 2	10.1	850	1,330	1,570	2,000
Just upstream of the confluence of Mill Creek Tributary No. 2	8.7	740	1,220	1,440	1,800
MILL CREEK TRIBTARY NO. 2					
Just upstream of the confluence with Mill Creek	1.4	260	410	470	590
PEACOCK CREEK					
At confluence with North Newport River	65.5	2,550	4,080	4,920	7,000
Downstream of the confluence of Cay Creek	65.1	2,540	4,070	4,900	6,970
Downstream of the confluence of Riceboro Creek	56.2	2,330	3,720	4,480	6,300
Upstream of the confluence of Riceboro Creek	48.8	2,140	3,420	4,110	5,800
At USGS Gage	31.5	1,650	2,630	3,150	4,400
Downstream of the confluence of Goshen Canal	26.4	1,490	2,370	2,830	3,950

Table 3 - Summary of Discharges (*Continued*)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
PEACOCK CREEK (continued)					
Upstream of the confluence of Goshen Canal	18.0	1,190	1,880	2,240	3,100
Approximately 2,150 feet upstream of the confluence of Goshen Canal	13.9	1,020	1,610	1,910	2,700
Downstream of the confluence of Peacock Creek Tributary No. 1	7.1	690	1,080	1,270	1,790
Upstream of the confluence of Peacock Creek Tributary No. 1	4.6	530	830	970	1,220
Approximately 2,980 feet downstream of U.S. Highway 84/State Highway 38/State Highway 196/Oglethorpe Highway	3.0	410	640	750	1,040
Approximately 905 feet upstream of Joseph Martin Drive	1.0	220	330	380	530
PEACOCK CREEK TRIBUTARY NO. 1					
Just upstream of the confluence with Peacock Creek	2.5	370	580	670	940
RICEBORO CREEK					
Approximately 210 feet upstream of the confluence with Peacock Creek	6.9	680	1,060	1,250	1,750
Approximately 1,220 feet upstream of U.S. Highway 17/State Highway 25/ South Coastal Highway	6.0	620	970	1,150	1,600

Cay Creek, North Newport River, Peacock Creek, and Riceboro Creek are also subject to flooding due to hurricane tides. The frequency of hurricane tides at the open coast (at the mouth of St. Catherines Sound) was computed from statistical analysis of the results of the computer program TTSURGE (FIA, 1978) The resultant tide frequency relationship for the coastal area near the mouth of St. Catherines Sound is summarized in Table 4. Tidal water levels in that area were routed inland by means of the Inland Routing Model (See Section 3.2).

Table 4 - Summary of Tidal Elevations

Flooding Source and Location	Elevation (feet*) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Coast of Georgia				
Mouth of St. Catherines Sound	9.8	11.9	13.6	14.0

*North American Vertical Datum of 1988

Most other rivers under detailed study are also subject to flooding due to hurricane tides. The determination of inundation caused by passage of a hurricane storm surge was approached by the Joint Probability Method (ESSA, 1970). The storm populations were described by probability distributions of five parameters that influence surge heights. These were 1) central pressure depression (which measure intensity of the storm), 2) radius to maximum winds, 3) forward speed of the storm, 4) shoreline crossing point, and 5) crossing angle. These characteristics were described statistically based on an analysis of observed storms in the vicinity of Liberty County. (U.S. Weather Bureau, 1959; National Weather Service, 1975; National Climatic Center, date unknown; Cry, 1965; and National Weather Service, 1974). A summary of the parameters used for the Liberty County area is presented in Table 5.

Table 5 - Parameter Values for Surge Elevation Computations

	P	PP	F	PF	R	PR	A	PA	D	FN
Exiting	960	0.10	7	0.40	12	0.34	42.0	0.6	10[1]	0.0012
Storms	980	0.17	11	0.35	20	0.27	82.0	0.4	50[1]	0.0028
			15	0.25	28	0.39			90[1]	0.0029
									130[1]	0.0023
Parallel	960	0.10	7	0.36	12	0.34			15[2]	0.036
Storms	980	0.17	11	0.32	20	0.28			45[2]	0.060
			15	0.32	28	0.38				
Entering	960	0.10	7	0.34	12	0.34	-65.5	0.53	10[1]	.00190
Storms	980	0.17	11	0.27	20	0.27	-91.0	0.47	50[1]	.00127
			15	0.39	28	0.39			90[1]	.00090
									130[1]	.00075

[1]Distance storm crossing point from the City of Savannah in Nautical Miles
[2]Distance from shore in Nautical Miles

P = Central Pressure (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 measured from coast (North) (degrees)
PA = Probability of storm with A Value
D = Distance from shore (NM)
FN = Frequency of storm occurrence/year

The determination of maximum wave crest elevations associated with the 10- and 1-percent-annual-chance events was approached by the method recommended by the National Academy of Sciences (National Academy of Sciences, 1977). Further details are included in Section 3.3 of this study.

This Countywide FIS Report

For the approximate study streams listed in Table 2, peak flows were determined using the rural regression equations for Georgia (Stamey and Hess, 1993).

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 (Table 7). If the elevation on the FRIM is higher than the elevation shown in the table, a wave height, wave runup and/or wave setup component likely exists, in which case, the higher elevation should be used for construction and/or floodplain management purposes.

Precountywide FIS Reports

Cross sections for the backwater analyses were obtained from aerial photographs flown in March 1979, at a scale of 1:4,800 (Abrams Aerial Survey Corporation, 1979). The below-water sections were obtained by field measurement. All bridges, dams, and culverts were field checked to obtain elevation data and structural geometry.

Cross sections were field surveyed in the restudied areas of Mill Creek and Mill Creek Tributary No. 2 to assess the impact of channel modifications and realignment on flood elevations and floodway boundaries.

For areas of riverine flooding, water surface elevations (WSELs) of floods of the selected recurrence intervals were computed using the USACE's Hydrologic Engineering Center (HEC) HEC-2 computer program (HEC, 1984). Flood profiles were drawn (where required) showing computed WSELs for floods of the selected recurrence intervals. Starting WSELs were calculated using the slope-area method, except for Riceboro Creek. The starting WSEL for Riceboro Creek was the estimate for a 1-percent-annual-chance tide.

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).

Channel roughness factors (Mannings "n") used in the hydraulic computations were estimated based on field inspection and calibrated using available data from adjacent studies. The Manning's "n" values for all detailed studied streams are listed in Table 6.

Table 6 - Manning's "n" Values

Stream	Channel "n"	Overbank "n"
Alligator Canal	0.015 - 0.050	0.200
Cay Creek	0.050	0.200
Goshen Canal	0.015	0.200
Mallard Canal	0.015 - 0.050	0.200
Mill Creek	0.012 - 0.050	0.100 - 0.200
Mill Creek Tributary No. 2	0.040	0.100
Peacock Creek	0.012	0.200
Peacock Creek Tributary No. 1	0.012 - 0.050	0.200
Riceboro Creek	0.050	0.200

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.

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.

Frequencies of hurricane tides at the open coast were computed from a statistical analysis of the results of the computer program TTSURGE (FIA, 1978). This model was used to simulate the coastal surge generated by any chosen storm (that is, any combination of the five storm parameters defined previously). Performing such simulations for a large number of storms, each of known total probability, permits the establishment of the frequency distribution of surge height as a function of coastline location. These distributions incorporate the large scale surge behavior but do not include an analysis of the added effects associated with much finer scale wave phenomena such as wave heights, setup, or runup. The astronomic tide for the region is then statistically combined with the computed storm surge to yield recurrence intervals of total water level (National Academy of Sciences, 1977).

The numerical grid used in the TTSURGE program was 416 nautical miles by 165 nautical miles, with a mesh spacing of 8 nautical miles along the y-axis (parallel to the coast) and 5 nautical miles along the x-axis (perpendicular to the coast).

Routing of hurricane tides inland through Sapelo Sound/South Newport River, St. Catherines Sound/North Newport River/Peacock Creek, Medway/Laurel River/Jerico River, and Riceboro Creek was conducted using the Inland Routing Model (Harleman, 1976). The Inland Routing Model is an adaption of an existing model to the specific conditions in the Georgia coastal area. The model has been calibrated against recorded water elevations produced by two hurricanes making landfall near Savannah, Georgia.

The computed stillwater flood elevations for Liberty County are tabulated in Table 7.

This Countywide FIS Report

For the approximate study streams listed in Table 2, cross section data was obtained from two foot contours derived from a LiDAR generated digital terrain model (Laser Mapping Specialists Inc., 2006). Roads were modeled as weirs, using elevations from the topography. The studied streams listed in Table 2 were modeled using HEC-RAS Version 3.1.3 (HEC, 2004).

3.3 Wave Height Analysis

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in the National Academy of Sciences report (National Academy of Sciences, 1997). This method is based on the following 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 may be diminished 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. The third major concept is that wave height

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/ SAPELO SOUND	18	6.6	10.6	12.6	17.1	VE	20-15
		6.6	10.6	12.6	17.1	AE	14-13
		6.5	10.9	13.1	16.7	VE	15
		6.5	10.9	13.1	16.7	AE	14-13
	19	6.5	10.9	13.1	16.7	VE	20-16
		6.5	10.9	13.1	16.7	AE	15-13
		6.7	10.4	12.1	17.5	VE	15-14
		6.7	10.4	12.1	17.5	AE	14-12
	20	6.5	10.9	13.1	16.7	VE	20-15
		6.5	10.9	13.1	16.7	AE	14-13
		6.7	10.4	12.1	17.5	VE	15
		6.7	10.4	12.1	17.5	AE	14-12
	21	6.5	10.9	13.1	16.7	VE	20-15
		6.5	10.9	13.1	16.7	AE	14-13
		6.7	10.4	12.1	17.5	VE	16-15
		6.7	10.4	12.1	17.5	AE	13-12

[1]Includes the effects of wave action, where applicable
[2]Due to map scale limitations, BFEs shown on the FIRM may represent average elevation for the zone depicted

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY 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/ SAPELO SOUND	22	6.5	10.9	13.1	17.1	VE	20-15
		6.5	10.9	13.1	17.1	AE	14-13
		6.4	11.1	13.6	16.5	VE	17-15
		6.4	11.1	13.6	16.5	AE	15-14
		6.3	11.4	14.1	16.1	VE	18-16
		6.3	11.4	14.1	16.1	AE	15-14
	23	6.5	10.9	13.1	17.1	VE	20-15
		6.5	10.9	13.1	17.1	AE	15-13
	24	6.5	10.9	13.1	17.1	VE	20-15
		6.4	11.1	13.6	16.5	VE	18-15
		6.4	11.1	13.6	16.5	AE	15-14
	25	6.4	11.1	13.6	16.5	VE	21-16
		6.4	11.1	13.6	16.5	AE	15-14

[1]Includes the effects of wave action, where applicable

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

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY 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/ ST. CATHERINE SOUND	26	6.5 * * *	11.1 * * *	13.6 13.1 12.1 10.1	16.5 * * *	VE AE AE AE	21-16 15-14 13-12 11-10
ST. CATHERINE SOUND/RICEBORO CREEK	N/A	7.7	9.6	10.1	11.9	AE	10
ST. CATHERINE SOUND/NEWPORT RIVER	N/A	7.1	9.4	10.1	11.9	AE	13-10
ST. CATHERINE SOUND/CAY CREEK	N/A	6.1	6.6	6.9	7.4	AE	7

[1]Includes the effects of wave action, where applicable

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

*Data not available

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA
AND INCORPORATED AREAS

TRANSECT DATA

ATLANTIC OCEAN

can be regenerated in open fetch areas due to transfer of wind energy to the water. This added energy is related to fetch length and depth.

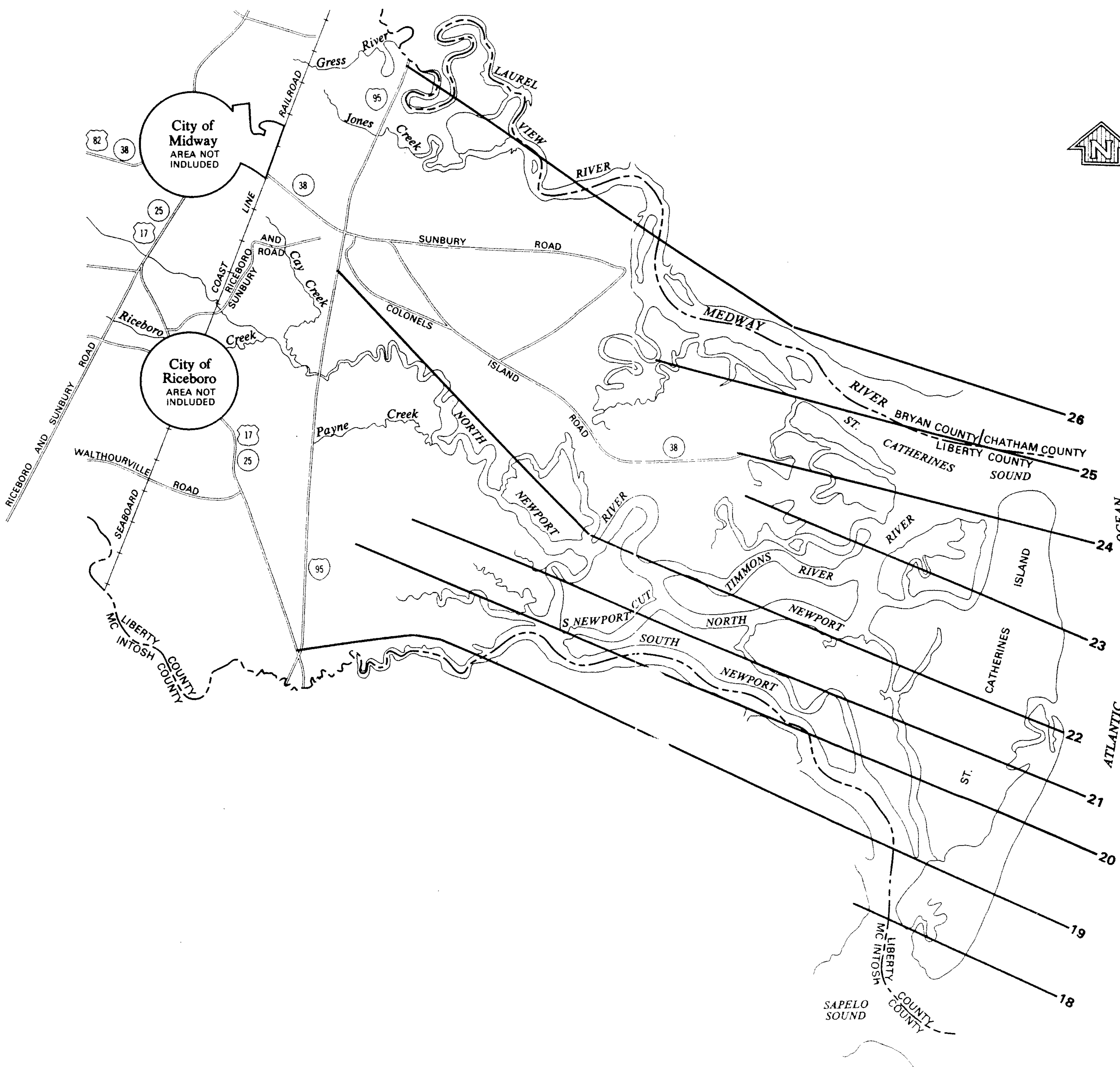
Wave heights were computed along transects (cross section lines) that were located along the coastal areas, as illustrated in Figure 1, in accordance with the Users Manual for Wave Height Analysis (FIA, 1981). Transects were located with consideration given to the physical and cultural characteristics 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 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 transects. Areas with a wave component 3-feet or greater were designated as velocity zones. Other areas subject to wave action were designated as A Zones with base flood elevations adjusted to include wave crest elevations.

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 diminished by obstructions, such as buildings, vegetation, and rising ground elevations and being increased by open, unobstructed wind fetches.

Actual wave conditions in Liberty County may not necessarily include all the situations illustrated in Figure 2. Figure 3 is a sample transect reflecting actual conditions in Liberty County.

Data for the model grid systems and for the wave height calculations were obtained from USGS quadrangle sheets (USGS, various dates) and NOAA nautical charts. The results of this study are considered accurate until local topography, vegetation, or cultural development undergo any minor changes.



TRANSECT LOCATION MAP

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

(UNINCORPORATED AREAS)

FIGURE 1

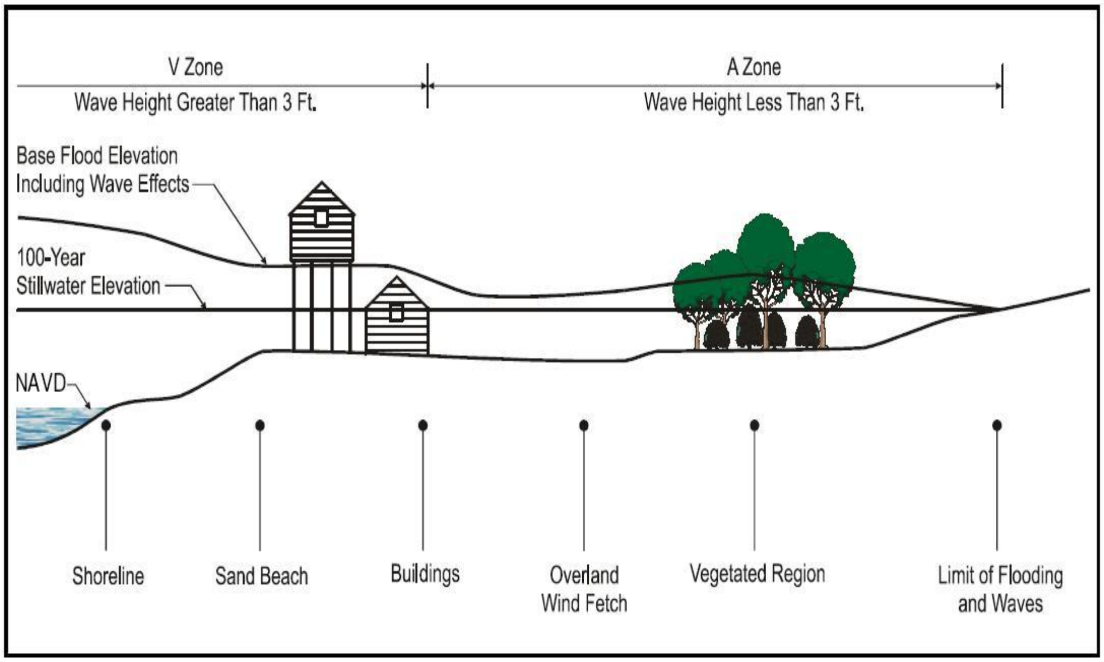
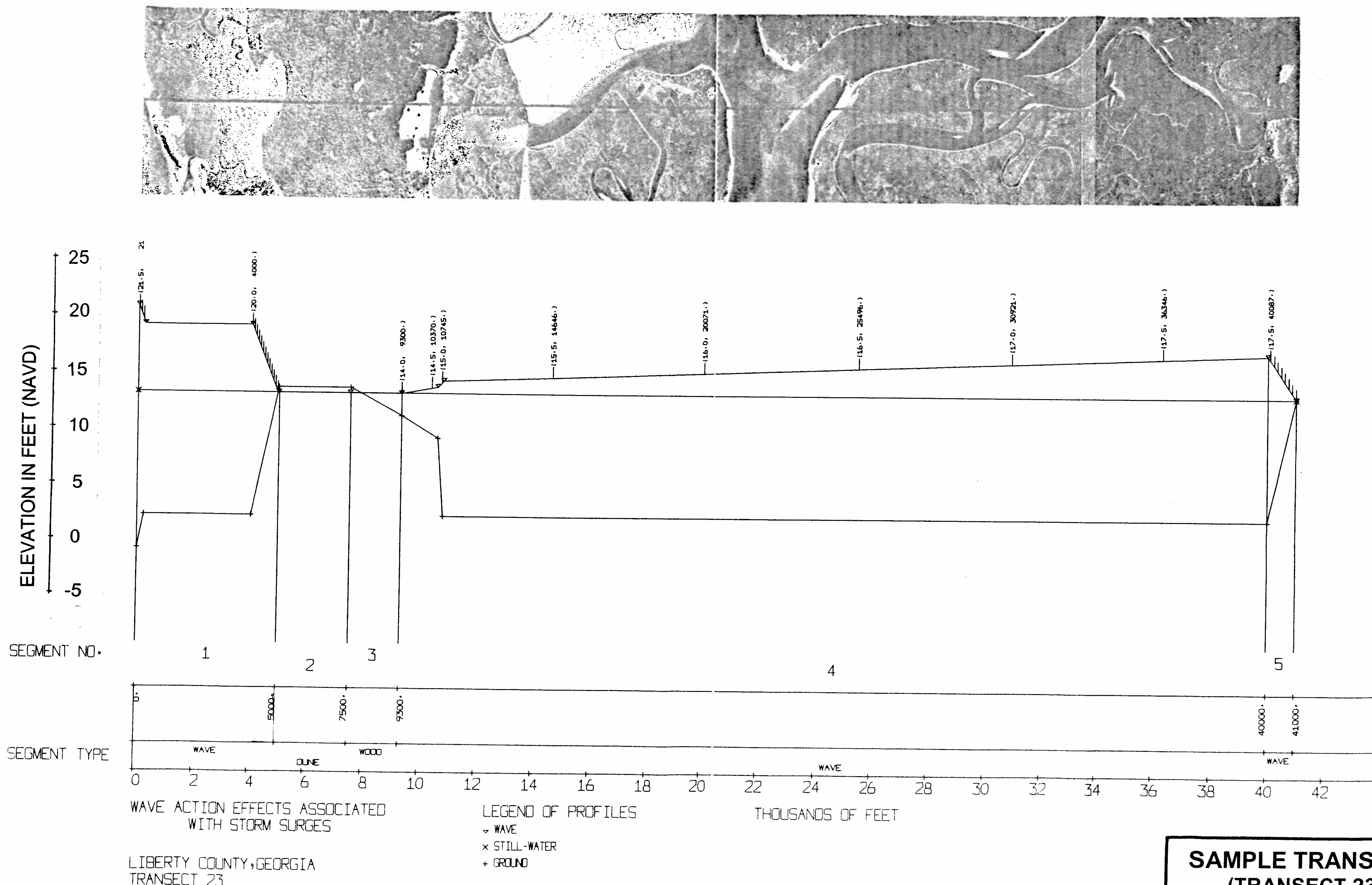


Figure 2 - Transect Schematic

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 NGVD. With the finalization of 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 Base Flood Elevations (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 8.



SAMPLE TRANSECT
(TRANSECT 23)
FIGURE 3

Table 8 – Vertical Datum Conversion

Quad Name	Corner	Latitude	Longitude	Conversion from NGVD to NAVD
Glissons Millpond	SE	32.00	-81.75	-0.840
Willie	SE	32.00	-81.62	-0.889
Letford SW	SE	32.00	-81.50	-0.912
Glennville NE	SE	31.87	-81.75	-0.886
Taylors Creek	SE	31.88	-81.62	-0.955
Trinity	SE	31.88	-81.50	-0.988
Limerick NW	SE	31.88	-81.37	-0.978
Walthourville	SE	31.75	-81.63	-0.945
Hinesville	SE	31.75	-81.50	-0.971
Dorchester	SE	31.75	-81.38	-0.948
Limerick SE	SE	31.75	-81.25	-0.955
Riceboro	SE	31.62	-81.37	-0.978
Seabrook	SE	31.62	-81.25	-1.004
Saint Catherines Sound	SE	31.62	-81.13	-0.994
			Average:	-0.946

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, except for Riceboro Creek, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using two foot contours derived from LiDAR data (Laser Mapping Specialists Inc., 2006). For Riceboro Creek, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using topographic maps at a scale of 1:4,800 with a contour interval of 2 feet (Abrams Aerial Survey Corporation, 1979). Note that the flooding for Riceboro Creek is controlled by hurricane tides from the coast of Georgia.

For streams restudied by approximate methods presented in Table 2, and for redelineated areas studied by approximate methods, the 1-percent-annual-chance floodplain boundaries were delineated using two foot contours derived from LiDAR data (Laser Mapping Specialists Inc., 2006).

For areas studied by approximate methods comprised of swamplands, the 1-percent-annual-chance floodplain boundaries were delineated using topographic maps at a scale of 1:4,800 and 1:9,600 with a contour interval of 2 feet (Abrams Aerial Survey Corporation, 1979). In areas where photogrammetric topographic maps were not available, USGS quadrangle maps were used (USGS, various dates).

For the coastal zones, floodplain boundaries were delineated using the flood elevations determined at transects. Between transects, the 1-percent-annual-chance floodplain boundaries were interpolated using topographic maps at a scale of 1:4,800 and 1:9,600 with a contour interval of 2 feet (Abrams Aerial

Survey Corporation, 1979). In areas where photogrammetric topographic maps were not available, USGS quadrangle maps were used (USGS, various dates).

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.

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

4.2 Floodways

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

The floodways presented in this FIS report and on the FIRM 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 9). 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

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)
ALLIGATOR CANAL								
A	1,655	375	1,946	0.4	18.6	18.6	19.6	1.0
B	2,575	330	1,581	0.5	18.8	18.8	19.7	0.9
C	3,065	310	1,455	0.5	18.9	18.9	19.8	0.9
D	3,735	560	1,745	0.4	19.1	19.1	20.0	0.9
E	4,915	350	1,490	0.5	19.4	19.4	20.3	0.9
F	5,855	360	1,443	0.5	19.6	19.6	20.5	0.9
G	6,805	330	1,231	0.5	19.9	19.9	20.8	0.9
H	7,555	225	833	0.7	20.2	20.2	21.0	0.8
I	8,315	225	930	0.7	20.5	20.5	21.4	0.9

[1]Feet above confluence with Goshen Canal

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA
AND INCORPORATED AREAS

FLOODWAY DATA

ALLIGATOR 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)
CAY CREEK								
A	2,580	1,160	3,970	0.2	6.9	6.9	7.9	1.0
B	3,810	1,150	4,621	0.1	7.0	7.0	8.0	1.0
C	4,440	1,190	5,160	0.1	7.0	7.0	8.0	1.0
D	5,240	1,060	4,631	0.1	7.1	7.1	8.1	1.0
E	5,870	910	3,982	0.1	7.1	7.1	8.1	1.0
F	6,590	760	3,293	0.2	7.1	7.1	8.1	1.0
G	7,480	280	1,141	0.5	7.2	7.2	8.1	0.9
H	8,170	790	2,955	0.2	7.3	7.3	8.2	0.9
I	9,240	700	2,598	0.2	7.4	7.4	8.3	0.9
J	9,800	1,300	5,570	0.1	7.4	7.4	8.3	0.9

[1]Feet above CSX railroad

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA
AND INCORPORATED AREAS

FLOODWAY DATA

CAY CREEK

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)
GOSHEN CANAL								
A	400	1,965	5,333	0.4	16.5	12.4[2]	13.4	1.0
B	2,800	446	3,057	0.7	16.5	13.5[2]	14.2	0.7
C	4,777	734	2,158	1.0	16.5	14.3[2]	15.0	0.7
D	5,800	1,062	4,422	0.5	16.5	16.0[2]	16.6	0.6
E	7,273	1,261	5,382	0.4	17.1	17.1	17.7	0.6
F	9,683	320	2,126	1.1	17.5	17.5	18.2	0.7
G	10,933	460	3,016	0.7	17.7	17.7	18.5	0.8
H	12,233	700	3,413	0.7	18.0	18.0	18.9	0.9
I	14,073	1300	5,248	0.3	18.2	18.2	19.1	0.9
J	15,433	902	3,349	0.5	18.5	18.5	19.4	0.9
K	16,813	183	793	2.0	19.1	19.1	20.0	0.9
L	17,880	457	1,514	1.1	20.4	20.4	21.3	0.9
M	19,168	650	2,651	0.6	21.0	21.0	22.0	1.0
N	19,733	407	1,897	0.8	21.2	21.2	22.2	1.0

[1]Feet above confluence with Peacock Creek

[2]Elevation computed without consideration of backwater effects from Peacock Creek

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA
AND INCORPORATED AREAS

FLOODWAY DATA

GOSHEN 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)
MALLARD CANAL								
A	558	295	1,051	0.3	18.5	17.6[2]	18.6	1.0
B	1,078	365	1,424	0.2	18.6	17.7[3]	18.6	0.9
C	1,478	380	1,485	0.2	18.6	17.8[3]	18.7	0.9
D	1,898	390	1,358	0.2	18.6	17.8[3]	18.7	0.9
E	2,238	380	1,245	0.2	18.6	17.8[3]	18.8	1.0
F	2,578	390	1,428	0.2	18.6	17.8[3]	18.8	1.0
G	2,818	425	1,571	0.2	18.6	17.8[3]	18.8	1.0
H	3,138	590	1,613	0.2	18.6	17.9[3]	18.8	0.9

[1]Feet above confluence with Alligator Canal

[2]Elevation computed without consideration of flooding controlled by Alligator Canal

[3]Elevation computed without consideration of backwater effects from Alligator Canal

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA
AND INCORPORATED AREAS

FLOODWAY DATA

MALLARD 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)
MILL CREEK								
A	0	43	333	6.8	56.6	56.6	57.6	1.0
B	1,740	374	2,128	1.1	59.9	59.9	60.8	0.9
C	3,230	280	1,557	1.5	61.1	61.1	61.8	0.7
D	7,500	372	1,768	1.3	64.4	64.4	64.9	0.5
E	9,280	490	8,832	0.3	66.6	66.6	66.6	0.0
F	9,360	490	1,983	1.1	66.6	66.6	66.6	0.0
G	12,165	1,300	6,654	0.3	67.1	67.1	67.3	0.2
H	13,530	1,000	4,658	0.5	67.9	67.9	68.2	0.3
I	15,210	800	2,322	1.0	68.8	68.8	69.2	0.4
J	15,705	440	1,963	1.2	69.3	69.3	69.7	0.4
K	18,210	115	615	3.0	71.4	71.4	71.9	0.5
L	20,485	820	2,282	0.8	73.4	73.4	74.0	0.6
M	22,315	1,200	3,864	0.4	74.2	74.2	74.7	0.5
N	23,315	1,210	3,292	0.5	74.5	74.5	75.0	0.5
O	25,785	280	1,380	1.0	75.6	75.6	76.3	0.7
P	27,040	650	2,518	0.6	75.9	75.9	76.8	0.9

[1]Feet above 18th Street

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA
AND INCORPORATED AREAS

FLOODWAY DATA

MILL CREEK

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)
MILL CREEK TRIBUTARY NO. 2								
A	350	75	404	1.2	74.9	72.6[2]	73.4	0.8
B	1,375	45	289	1.6	75.6	74.5[2]	75.2	0.7
C	2,280	40	255	1.8	76.0	75.1[3]	75.7	0.6
D	2,735	40	154	3.1	76.0	75.1[3]	75.9	0.8
E	2,940	40	57	9.6	76.4	76.4	77.4	1.0
F	4,200	100	401	1.2	77.1	77.1	77.8	0.7
G	6,330	24	124	3.8	78.5	78.5	79.2	0.7
H	7,850	268	853	0.6	82.2	82.2	82.9	0.7
I	9,920	334	1,072	0.4	82.8	82.8	83.5	0.7

[1]Feet above confluence with Mill Creek

[2]Elevation computed without consideration of flooding controlled by Mill Creek

[3]Elevation computed without consideration of backwater effects from Mill Creek

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA
AND INCORPORATED AREAS

FLOODWAY DATA

MILL CREEK TRIBUTARY NO. 2

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)
PEACOCK CREEK								
A	26,900	1,160	8,332	0.5	10.1	10.1	11.1	1.0
B	28,700	2,319	11,178	0.4	10.8	10.8	11.7	0.9
C	31,150	2,537	10,029	0.4	11.3	11.3	12.2	0.9
D	32,650	2,487	17,762	0.2	11.5	11.5	12.4	0.9
E	34,100	2,438	16,453	0.2	11.5	11.5	12.4	0.9
F	36,150	1,734	11,601	0.4	11.7	11.7	12.6	0.9
G	38,150	1,394	8,206	0.5	11.9	11.9	12.8	0.9
H	39,000	1,520	9,574	0.4	12.1	12.1	13.0	0.9
I	40,100	1,582	8,324	0.5	12.3	12.3	13.2	0.9
J	42,100	1,526	6,475	0.6	12.8	12.8	13.7	0.9
K	44,325	1,160	8,468	0.5	14.4	14.4	14.6	0.2
L	46,100	1,607	10,680	0.4	14.5	14.5	14.8	0.3
M	47,100	1,752	10,280	0.4	14.6	14.6	14.9	0.3
N	50,140	1,992	14,166	0.3	14.9	14.9	15.3	0.4
O	52,270	1,460	10,030	0.4	15.1	15.1	15.5	0.4
P	52,770	1,185	9,535	0.4	15.1	15.1	15.5	0.4
Q	55,270	1,500	6,590	0.6	15.5	15.5	16.0	0.5
R	57,351	1,773	10,008	0.4	16.1	16.1	16.6	0.5
S	60,050	2,120	15,537	0.2	16.2	16.2	16.8	0.6
T	62,110	2,268	19,523	0.2	16.2	16.2	16.8	0.6

[1]Feet above Interstate Highway 95

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA
AND INCORPORATED AREAS

FLOODWAY DATA

PEACOCK CREEK

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)
PEACOCK CREEK (CONTINUED)								
U	64,273	3,019	17,706	0.2	16.4	16.4	17.0	0.6
V	66,020	1,406	10,280	0.1	16.5	16.5	17.1	0.6
W	68,145	1,251	8,041	0.2	16.5	16.5	17.1	0.6
X	70,095	979	6,029	0.2	16.5	16.5	17.1	0.6
Y	72,170	514	3,341	0.4	16.6	16.6	17.2	0.6
Z	72,320	493	3,265	0.4	16.6	16.6	17.2	0.6
AA	73,370	309	2,156	0.4	16.7	16.7	17.4	0.7
AB	75,145	430	2,675	0.4	16.9	16.9	17.6	0.7
AC	77,145	224	1,320	0.7	17.2	17.2	17.9	0.7
AD	78,645	127	821	1.2	18.0	18.0	18.8	0.8
AE	79,685	160	766	1.3	19.7	19.7	20.1	0.4
AF	80,545	828	1,700	0.4	20.2	20.2	20.8	0.6
AG	81,970	1,300	4,536	0.2	20.4	20.4	21.0	0.6
AH	83,470	850	3,710	0.2	22.9	22.9	23.1	0.2
AI	83,975	799	3,128	0.2	22.9	22.9	23.1	0.2
AJ	85,470	939	2,232	0.3	23.1	23.1	23.4	0.3
AK	86,720	533	1,418	0.5	23.3	23.3	23.8	0.5
AL	87,700	546	1,127	0.7	25.0	25.0	25.0	0.0
AM	88,500	307	919	0.8	25.4	25.4	26.0	0.6

[1]Feet above Interstate Highway 95

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA
AND INCORPORATED AREAS

FLOODWAY DATA

PEACOCK CREEK

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)
PEACOCK CREEK TRIBUTARY NO. 1								
A	250	31	157	4.3	16.7	12.2[2]	13.2	1.0
B	1,570	69	267	2.5	16.8	15.8[2]	16.6	0.8
C	3,050	45	235	2.9	18.4	18.4	19.0	0.6
D	4,500	241	560	1.2	20.2	20.2	21.1	0.9
E	6,400	541	1,752	0.4	21.2	21.2	22.2	1.0
F	6,900	485	1,456	0.5	21.4	21.4	22.4	1.0
G	8,300	384	909	0.7	22.6	22.6	23.2	0.6
H	9,900	24	72	9.3	29.8	29.8	29.8	0.0

[1]Feet above confluence with Peacock Creek
[2]Flooding controlled by Peacock Creek

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA
AND INCORPORATED AREAS

FLOODWAY DATA

PEACOCK CREEK TRIBUTARY NO. 1

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 4.

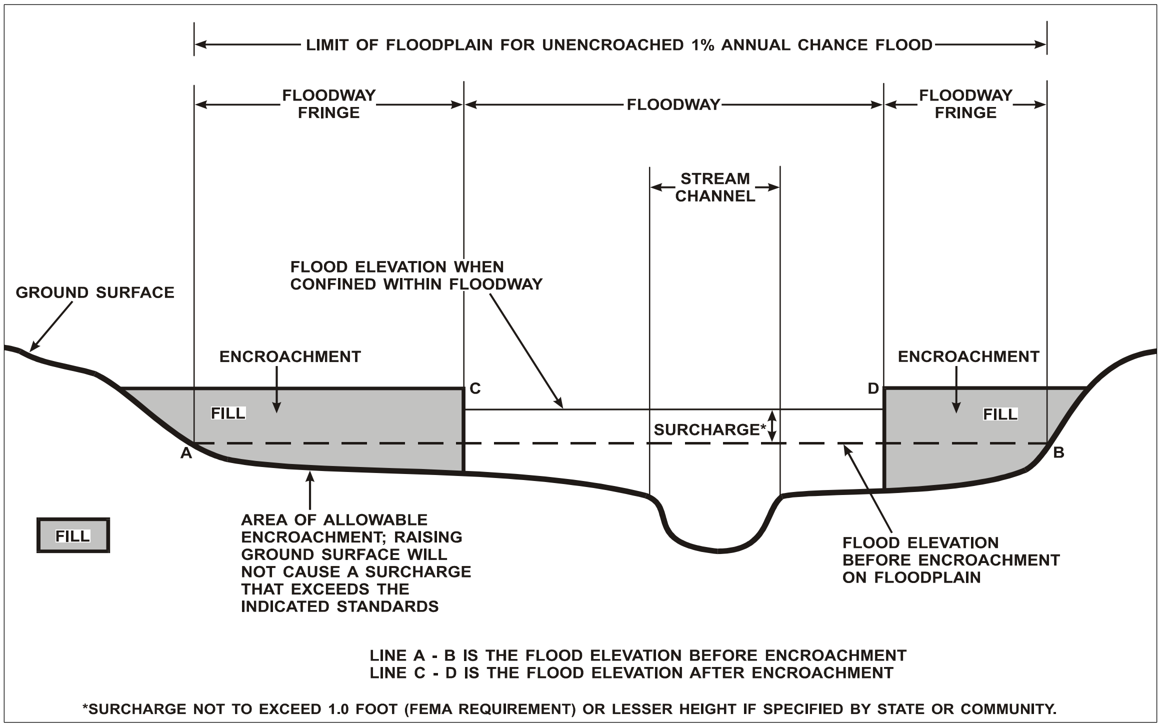


Figure 4 - Floodway Schematic

4.3 Base Flood Elevations

Areas within the community studied by detailed engineering methods have base flood elevations established in AE and VE Zones. These are the elevations of the base (1-percent-annual-chance) flood relative to NAVD. In coastal areas affected by wave action, base flood elevations 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 wave energy. Where possible, changes in base flood elevations have been shown in 1-foot increments on the FIRMs. However, where the scale did not permit, 2- or 3-foot increments were sometimes used. Base flood elevations shown in the wave action areas represent the average elevation within the zone. These elevations vary from 12 to 20 feet NAVD in the unincorporated area of Liberty County and are shown on the FIRM. Current program regulations generally require that all new construction be elevated such that the first floor, including basement, is above the base flood elevation in AE and VE Zones.

4.4 Velocity Zones

The USACE has established the 3-foot wave as the criterion for identifying coastal high hazard zones. 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 much higher than those in AE Zones with similar numerical designations.

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 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 flood depth is insufficient to support a 3-foot breaking 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.

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 Liberty 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 10.

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.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE	FIRM EFFECTIVE DATE	FIRM REVISION DATE
Allenhurst, Town of	February 3, 1978	None	June 17, 1986	September 26, 2008
Flemington, City of	October 18, 1974	October 17, 1975	May 17, 1982	September 30, 1988 September 26, 2008
Gumbranch, City of	September 26, 2008	None	September 26, 2008	None
Hinesville, City of	April 12, 1974	None	September 16, 1982	February 4, 1987 September 26, 2008
Liberty County (Unincorporated Areas)	October 8, 1976	None	December 1, 1983	October 16, 1992 September 26, 2008
Midway, City of	April 4, 1975	None	September 30, 1981	September 26, 2008
Riceboro, City of	May 10, 1974	January 30, 1976	November 4, 1981	September 26, 2008
Walthourville, City of	September 26, 2008	None	September 26, 2008	None

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

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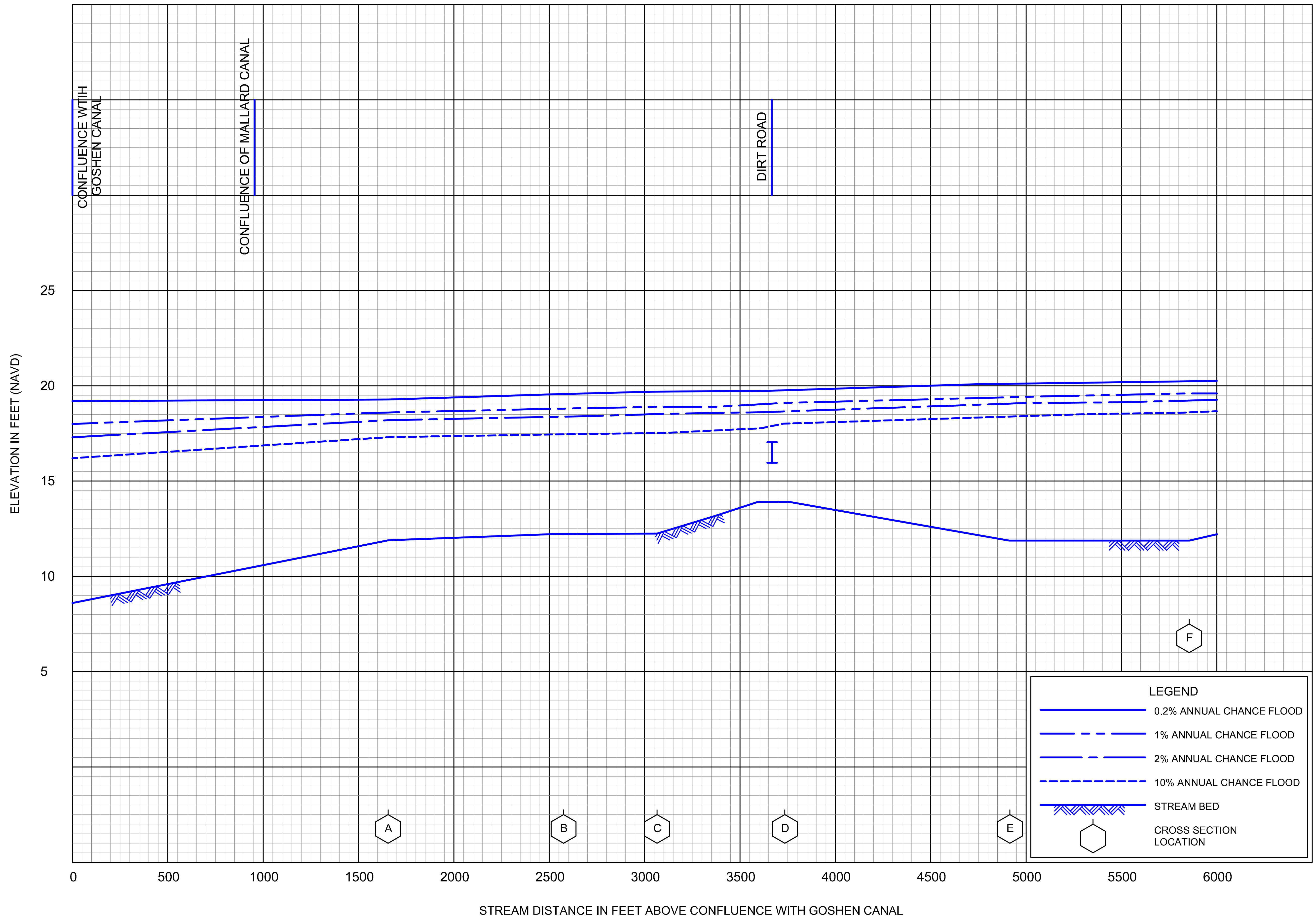

FLOOD PROFILES

ALLIGATOR CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS

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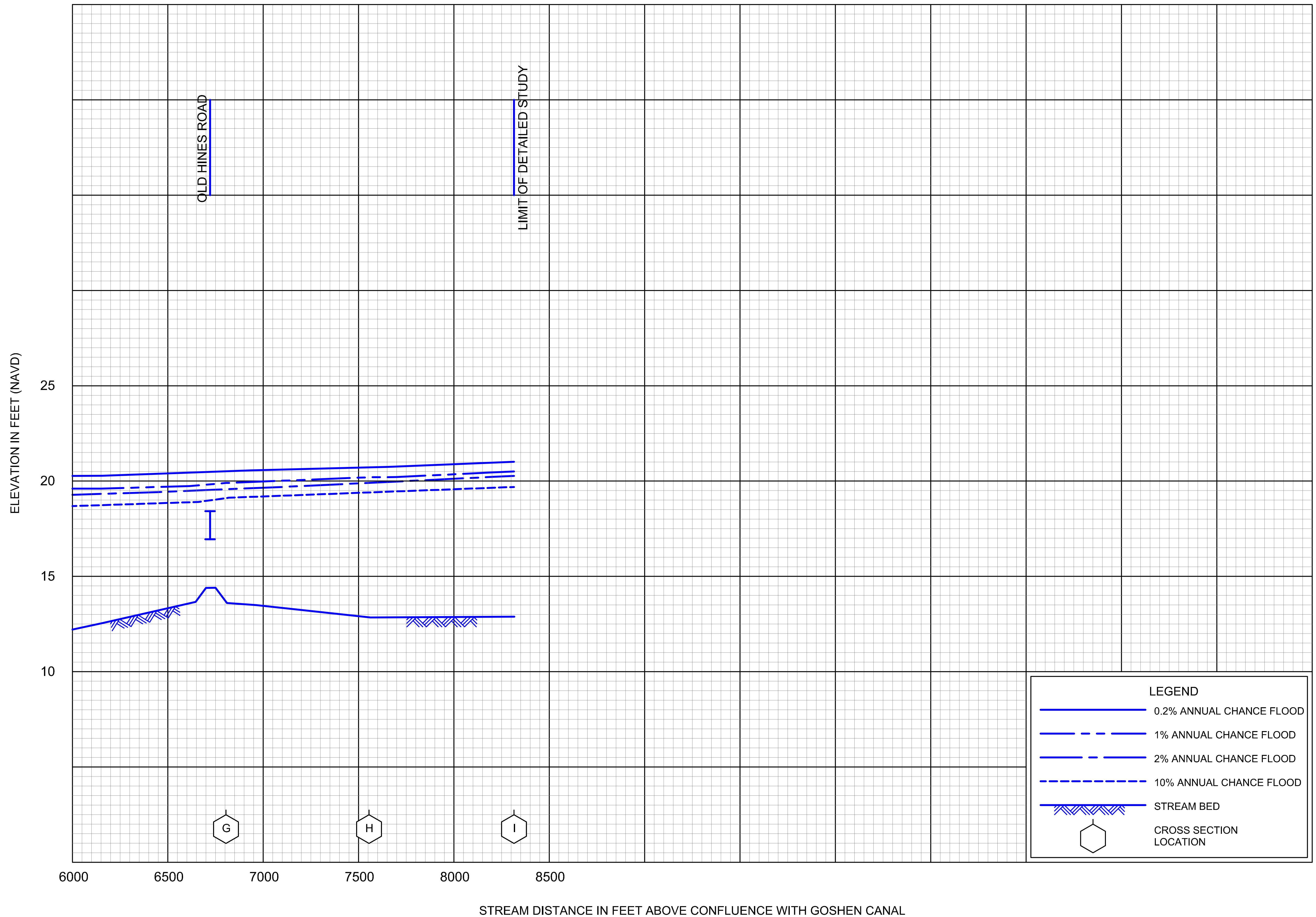


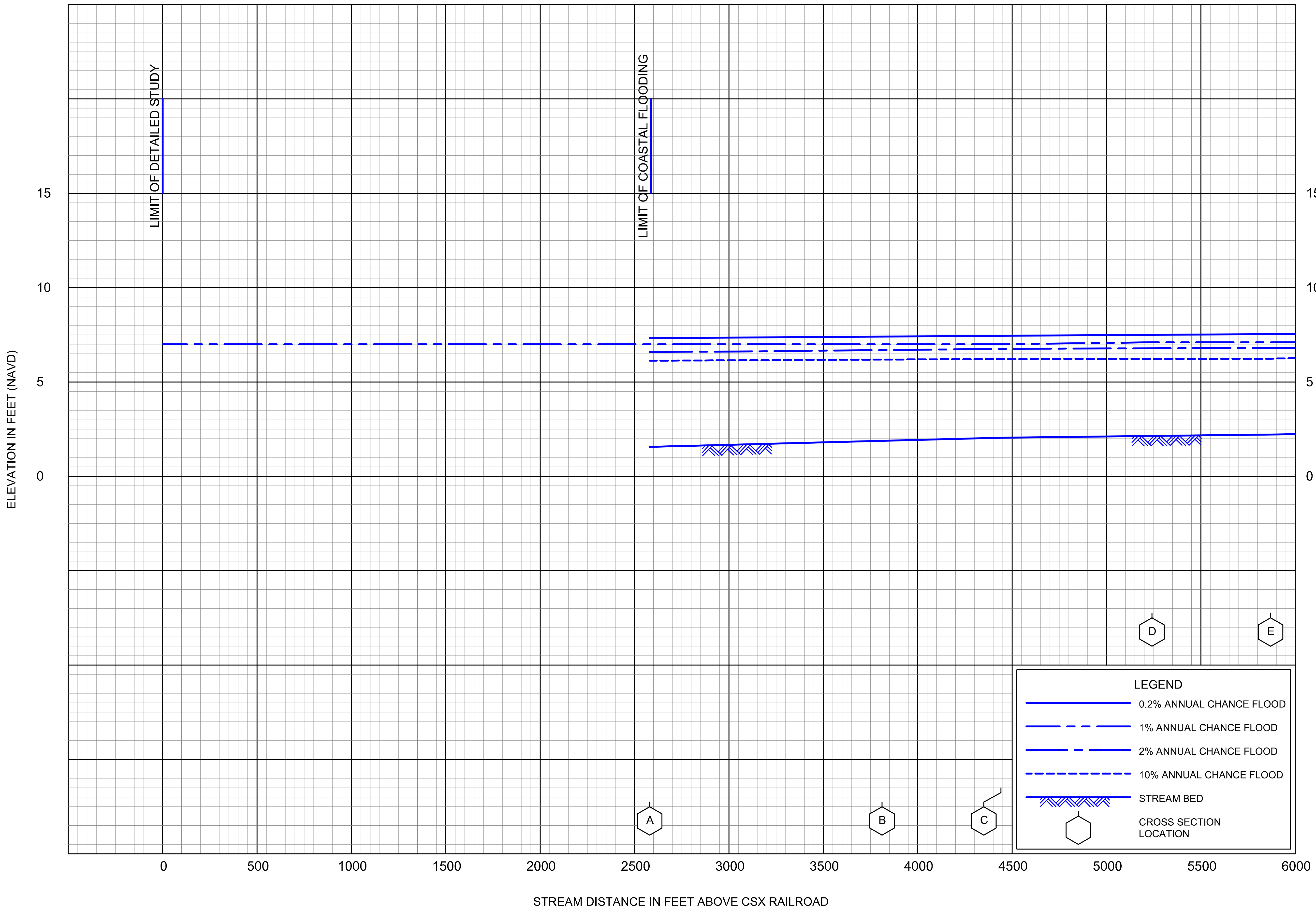
FLOOD PROFILES

ALLIGATOR CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS



FLOOD PROFILES

CAY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS

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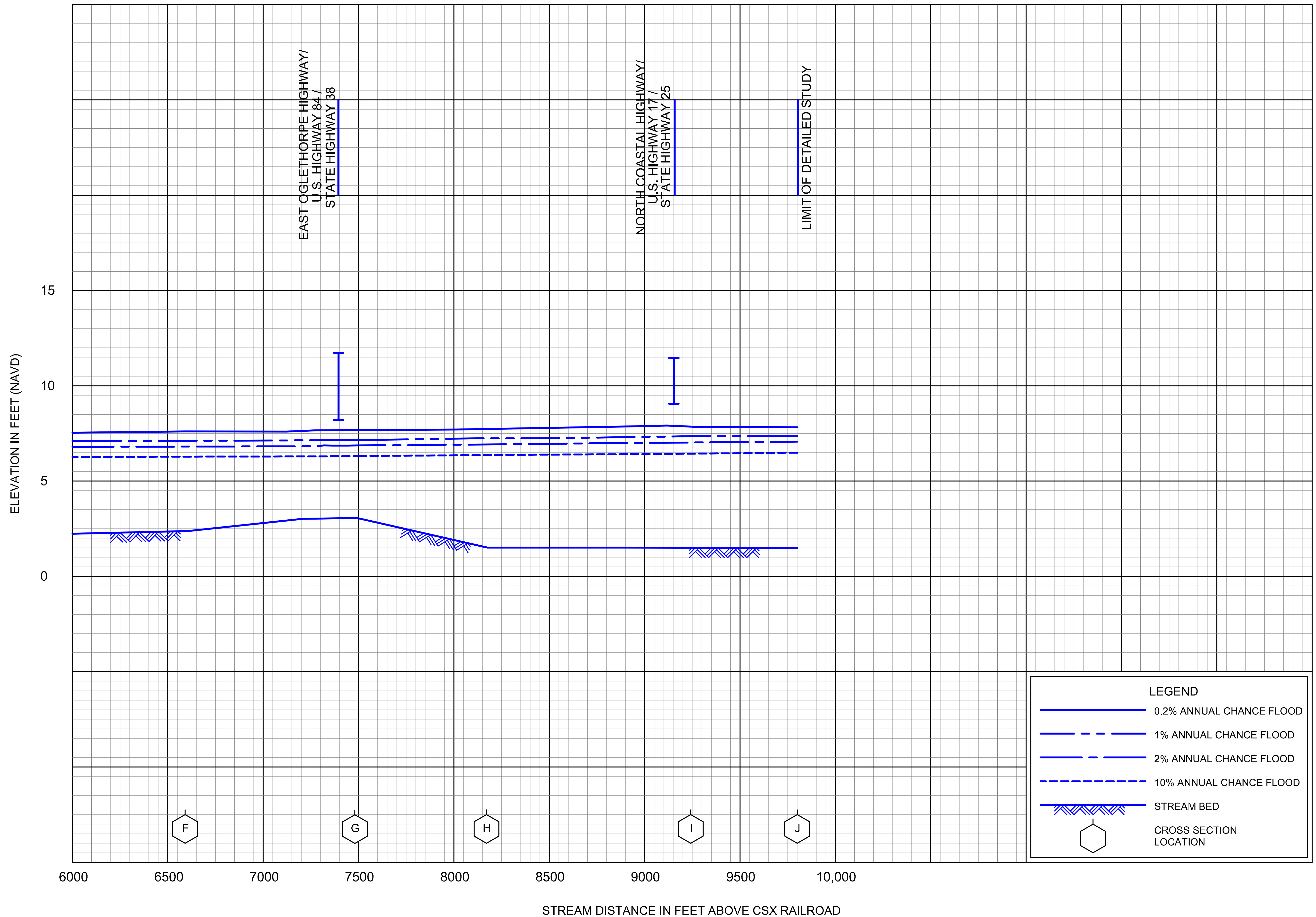


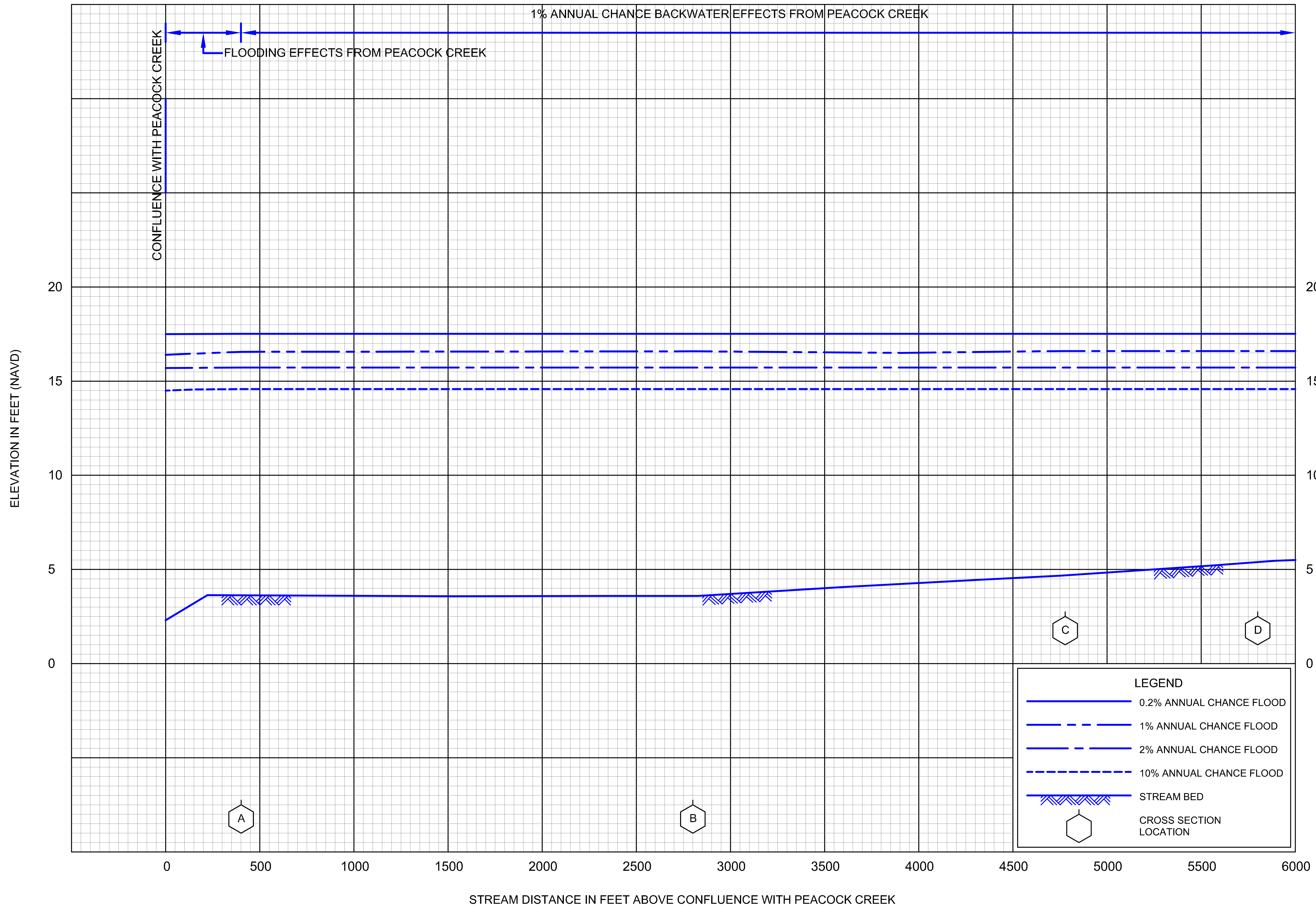
FLOOD PROFILES

CAY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS



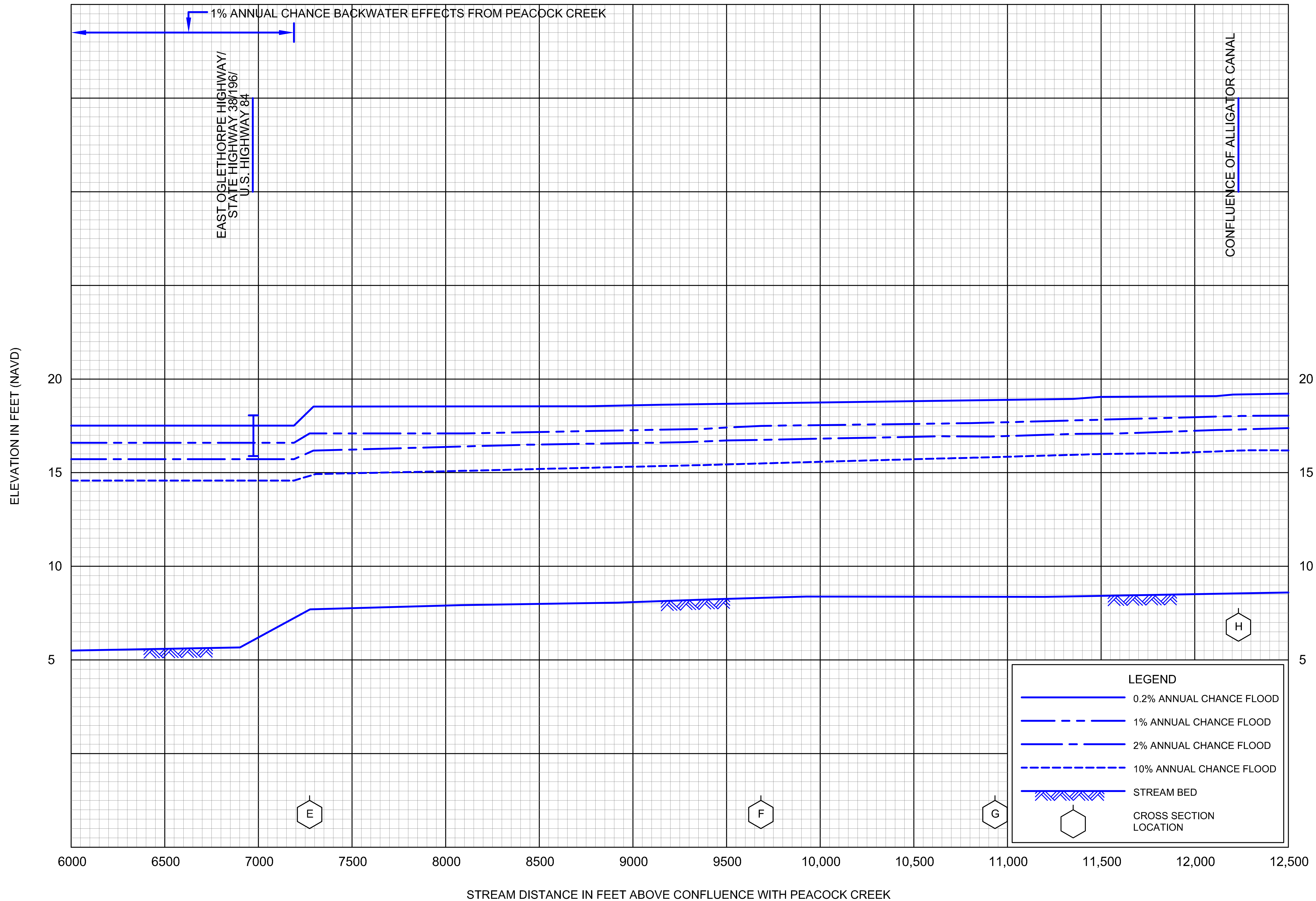
FLOOD PROFILES

GOSHEN CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS



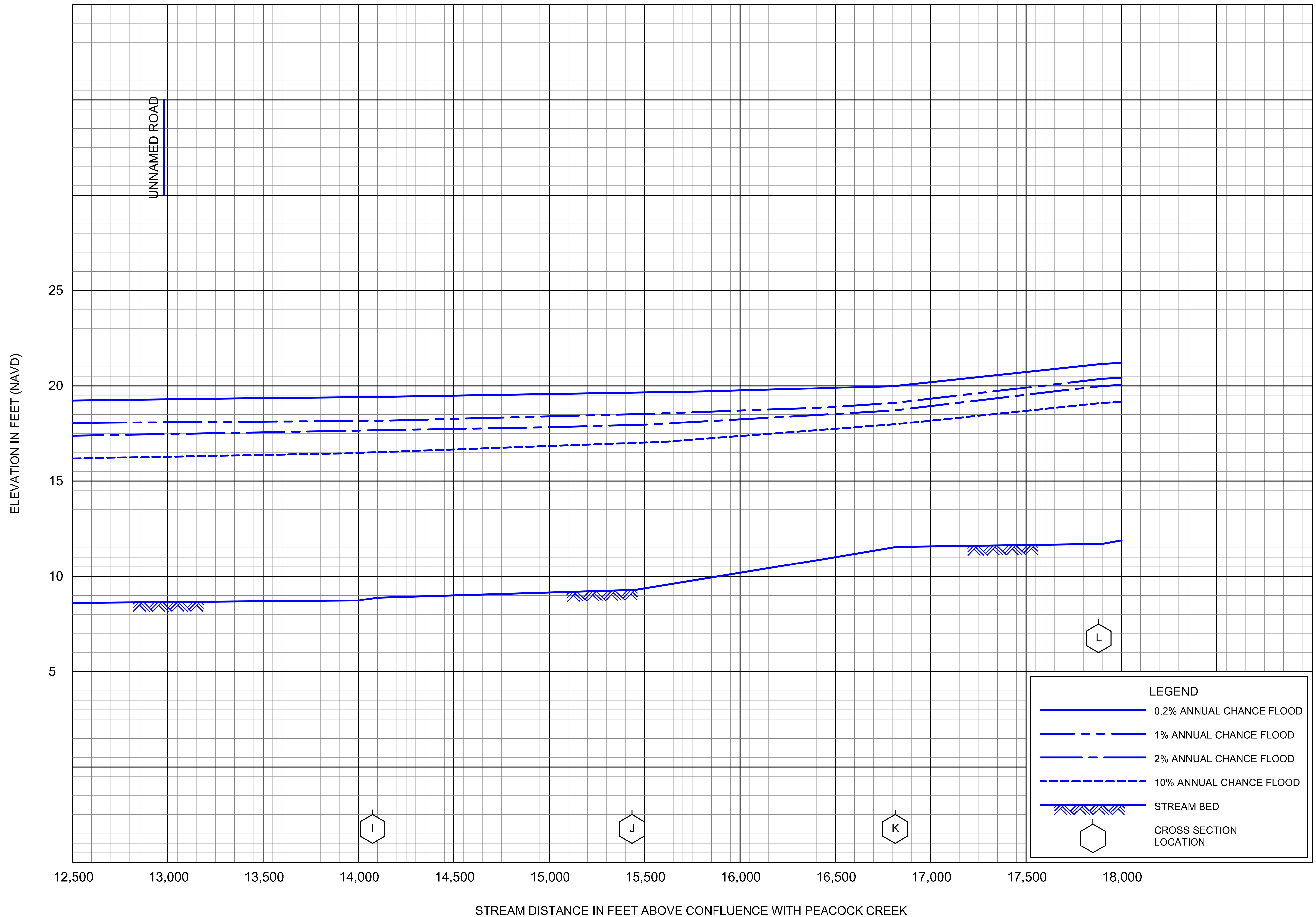
FLOOD PROFILES

GOSHEN CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS



FLOOD PROFILES

GOSHEN CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS

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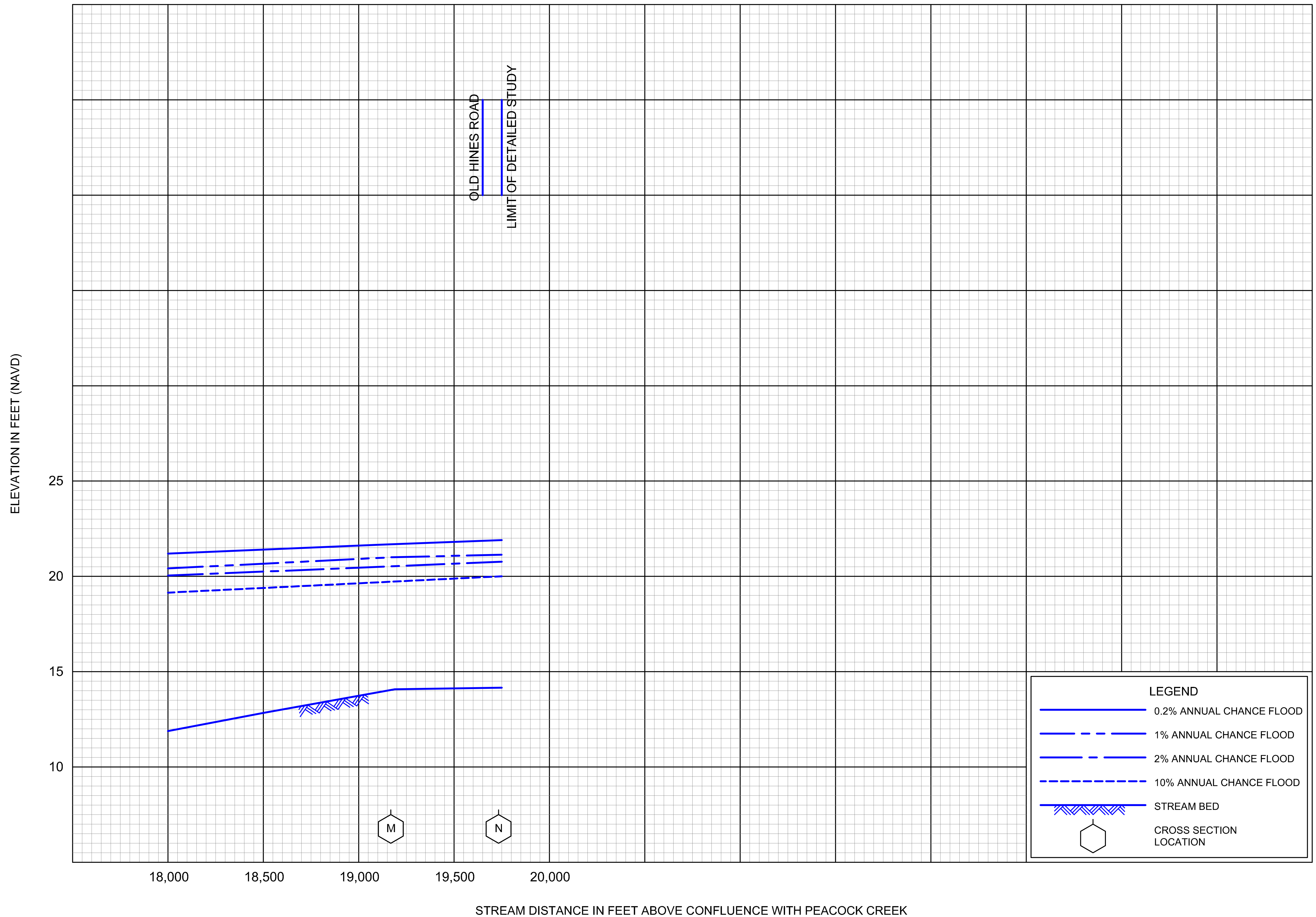


FLOOD PROFILES

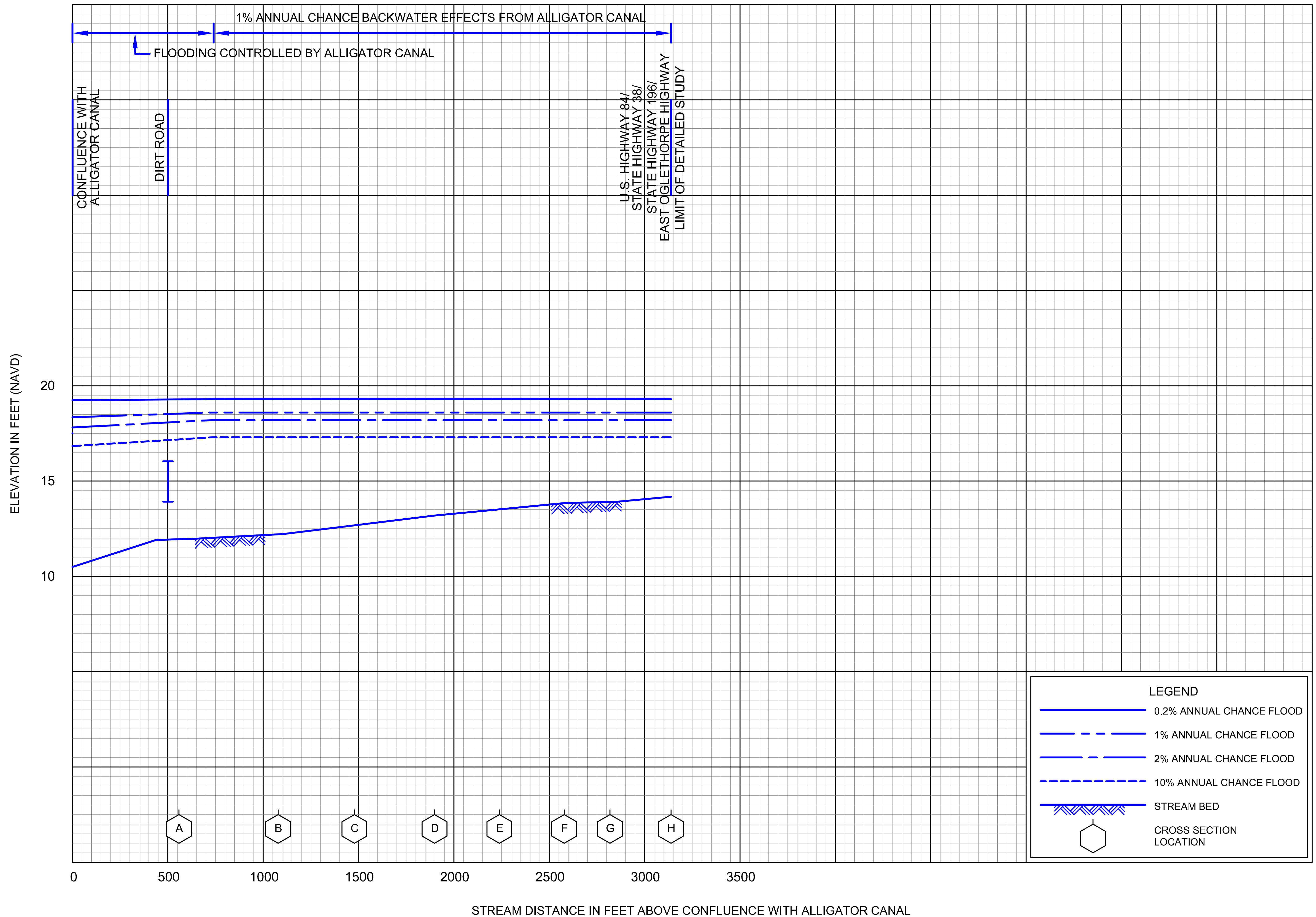
GOSHEN CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS

08P



FLOOD PROFILES

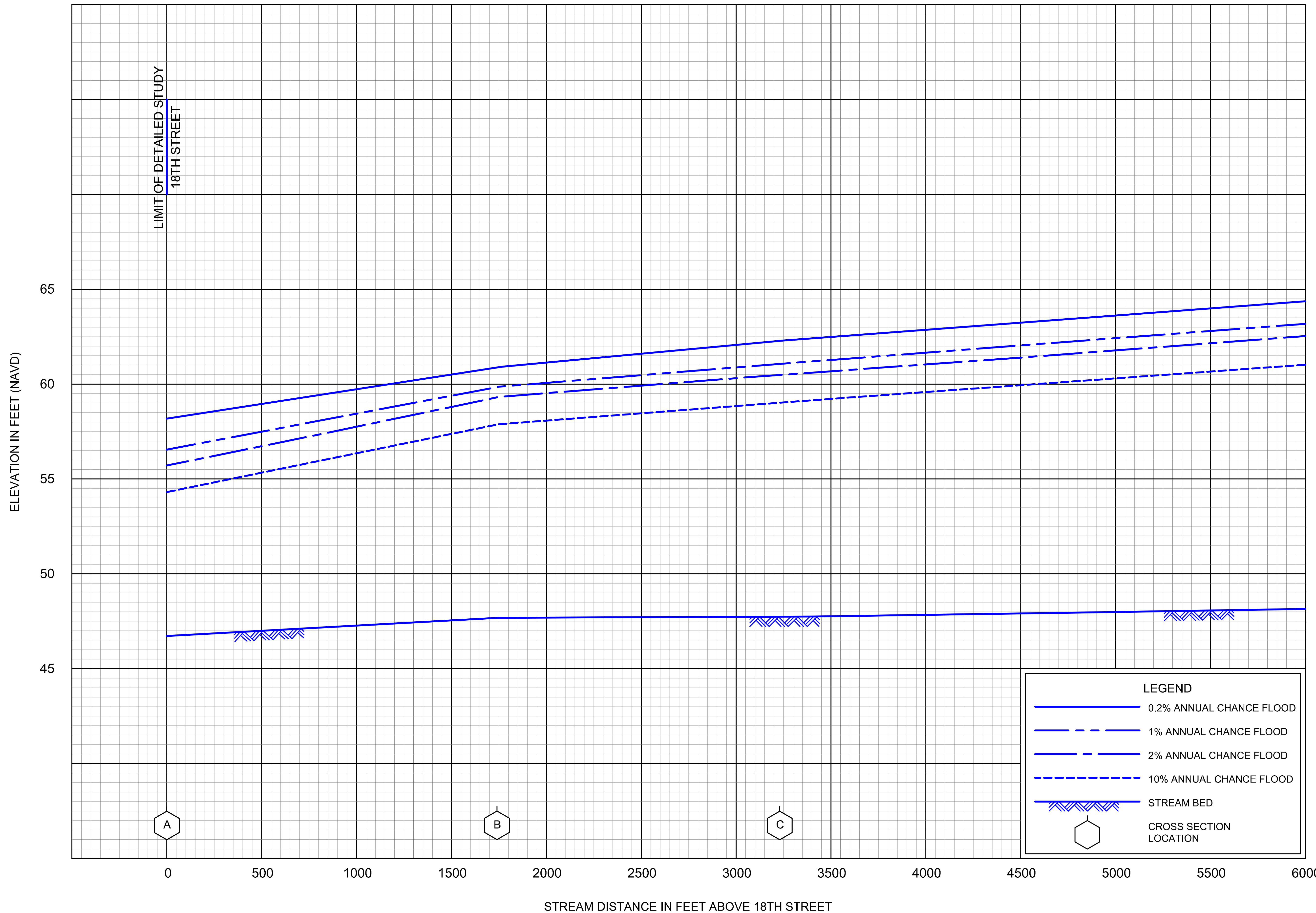
MALLARD CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS

09P



FLOOD PROFILES

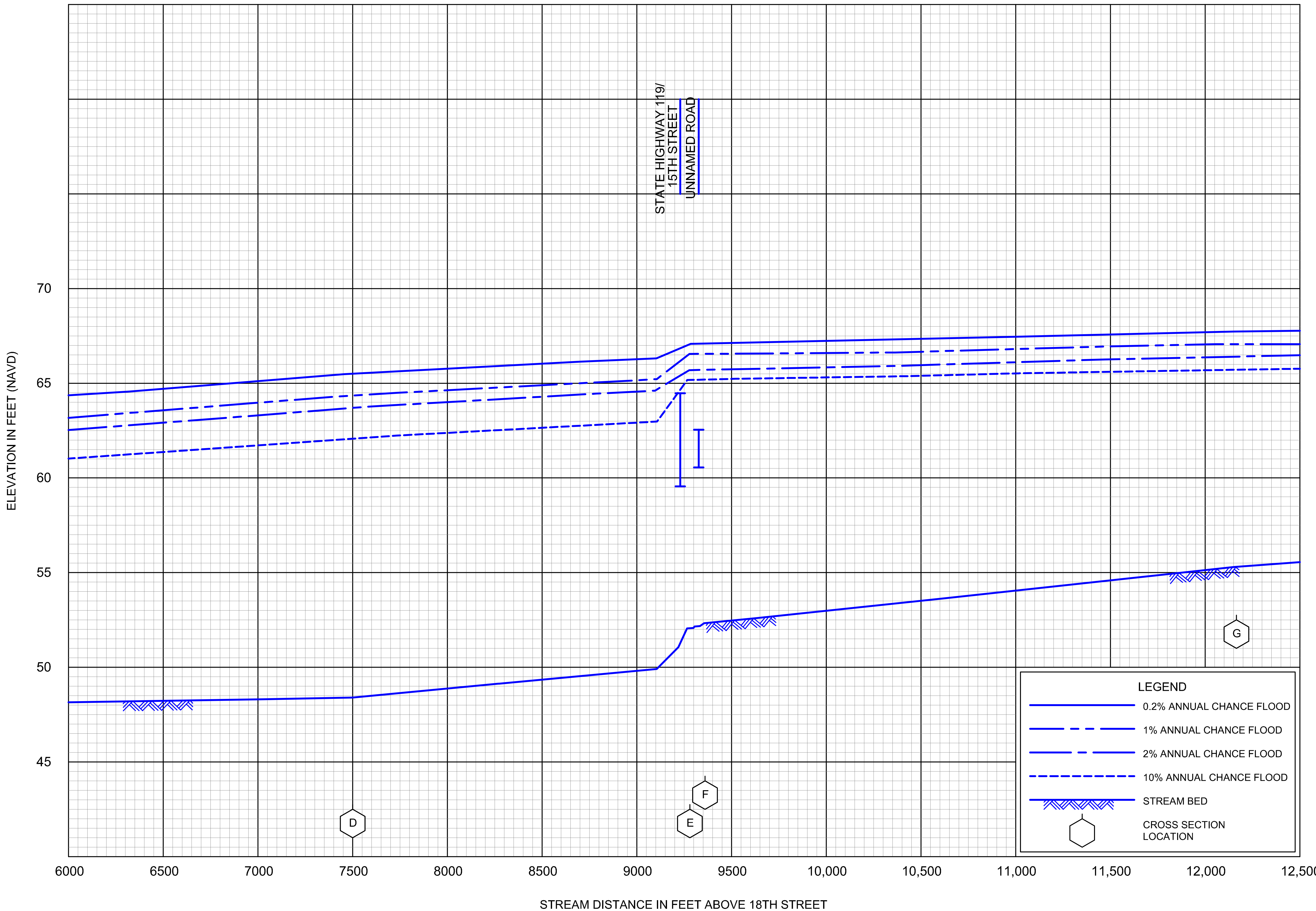
MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS

10P



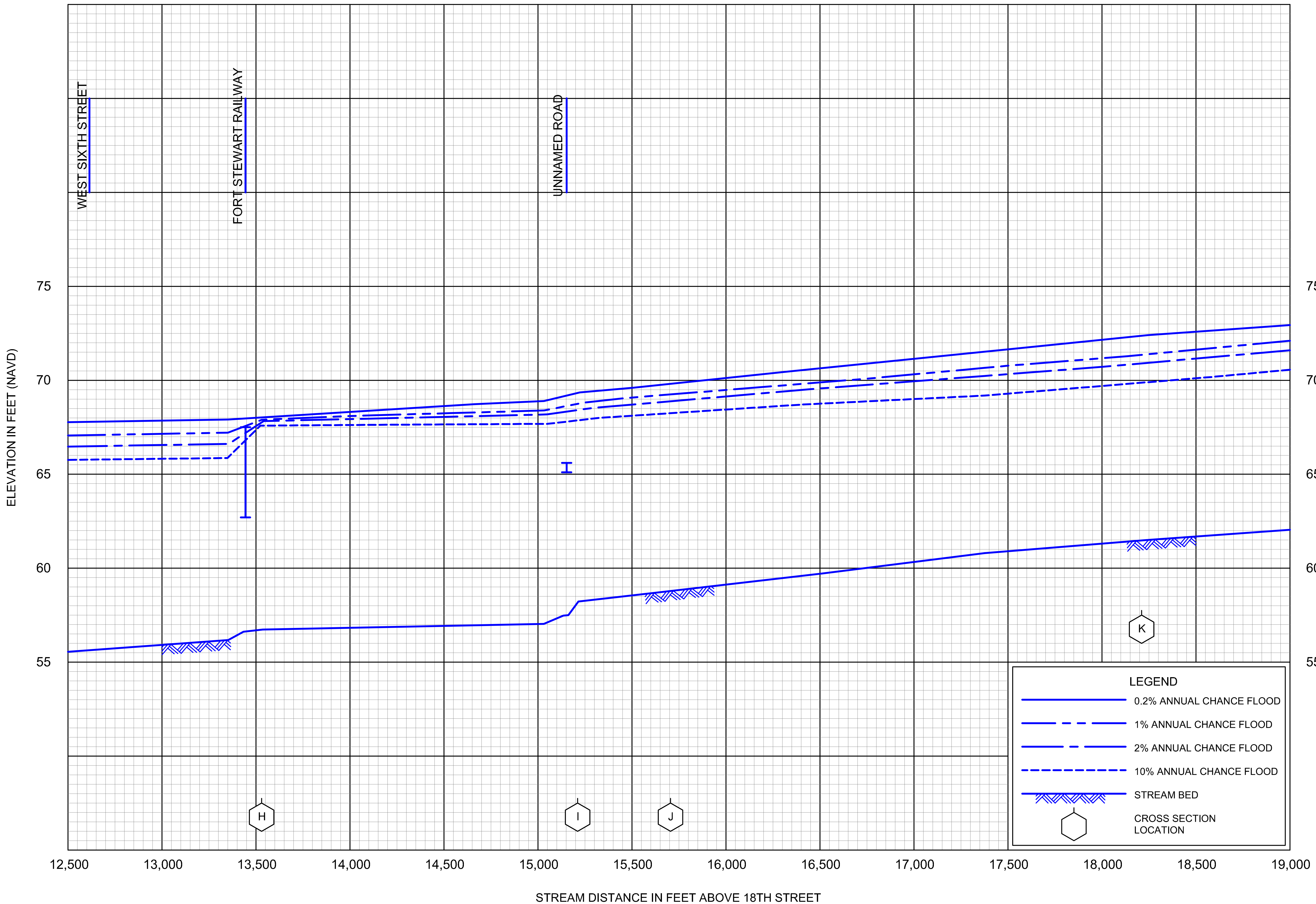
FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS



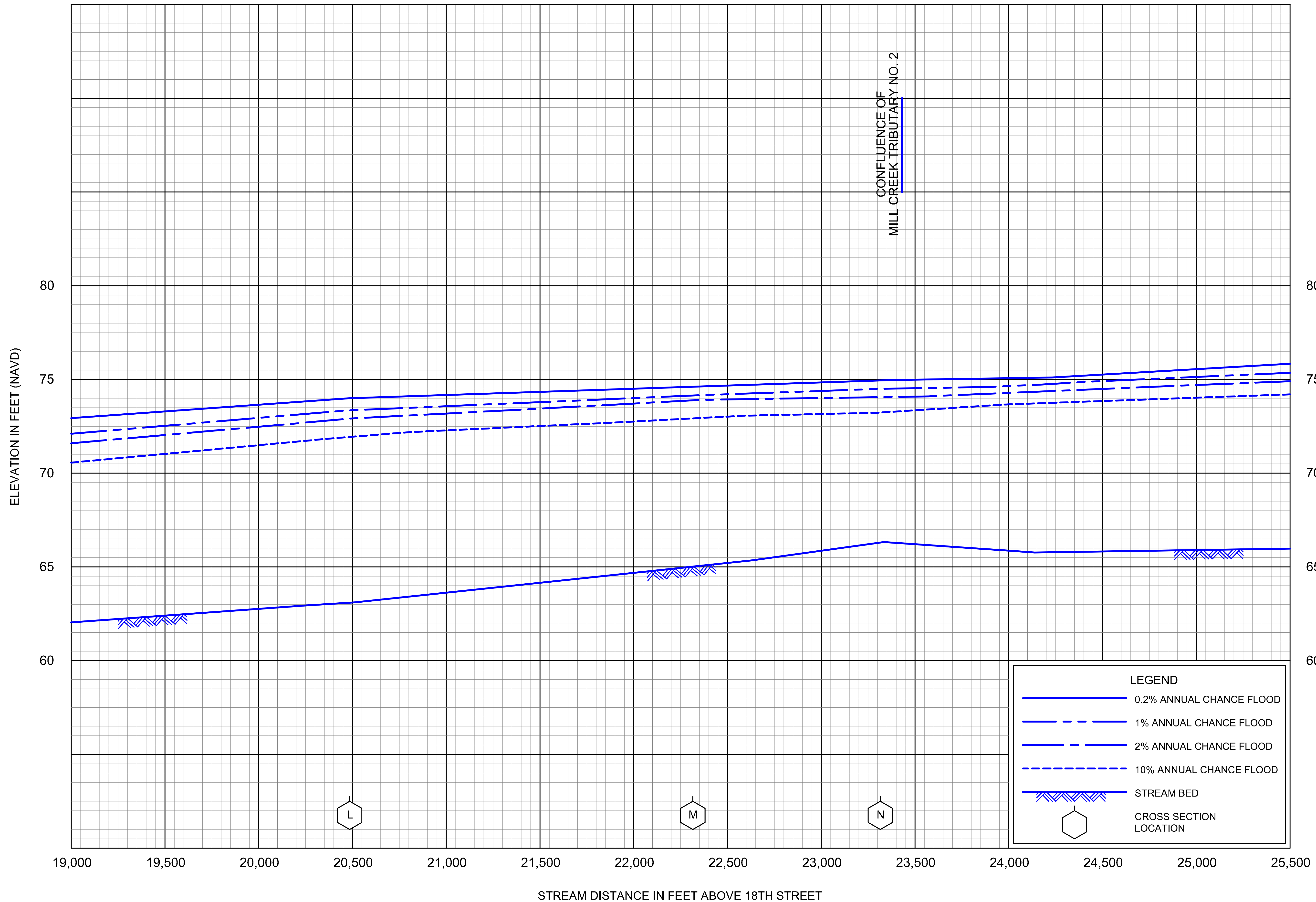
FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS

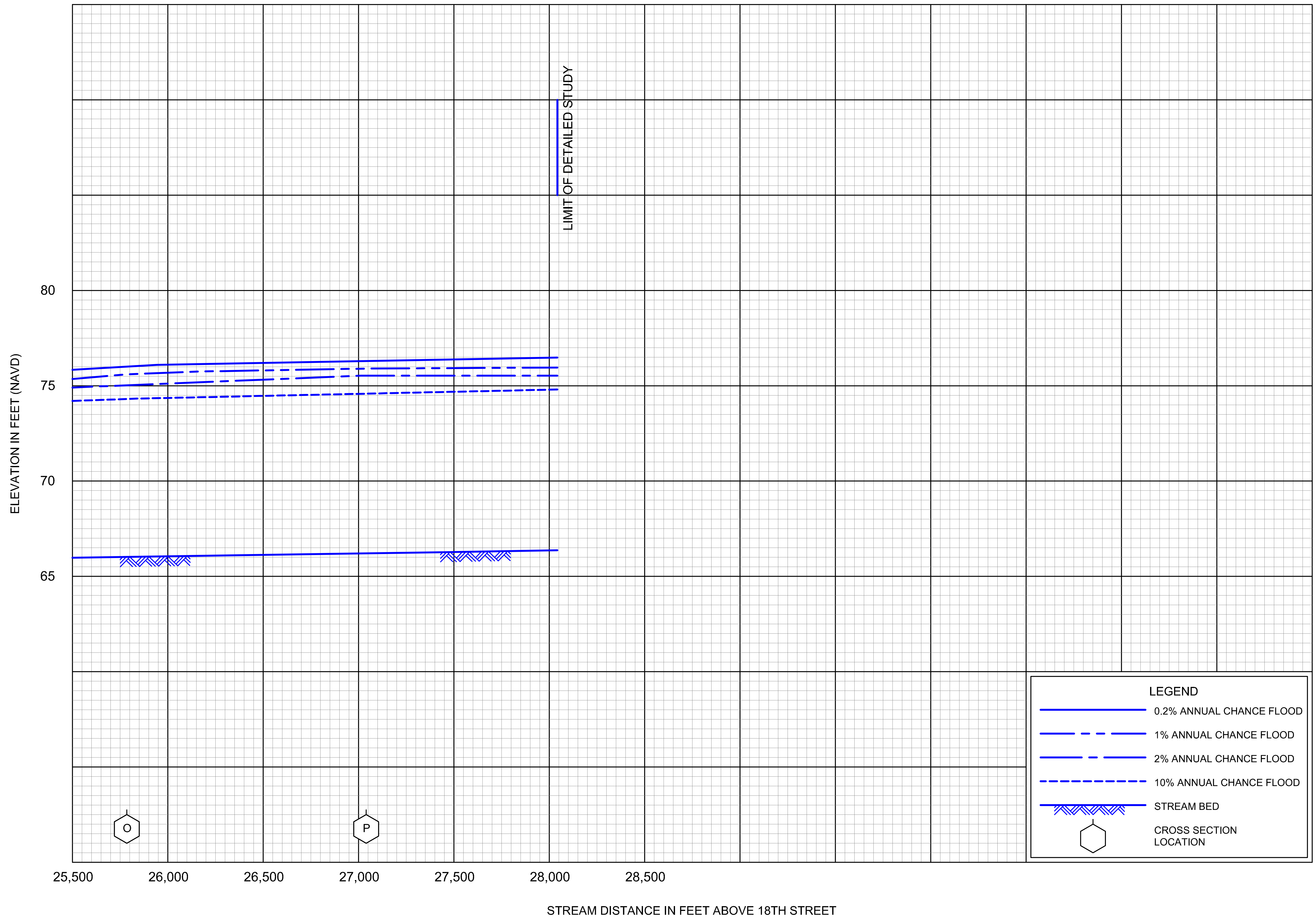


FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA
AND INCORPORATED AREAS



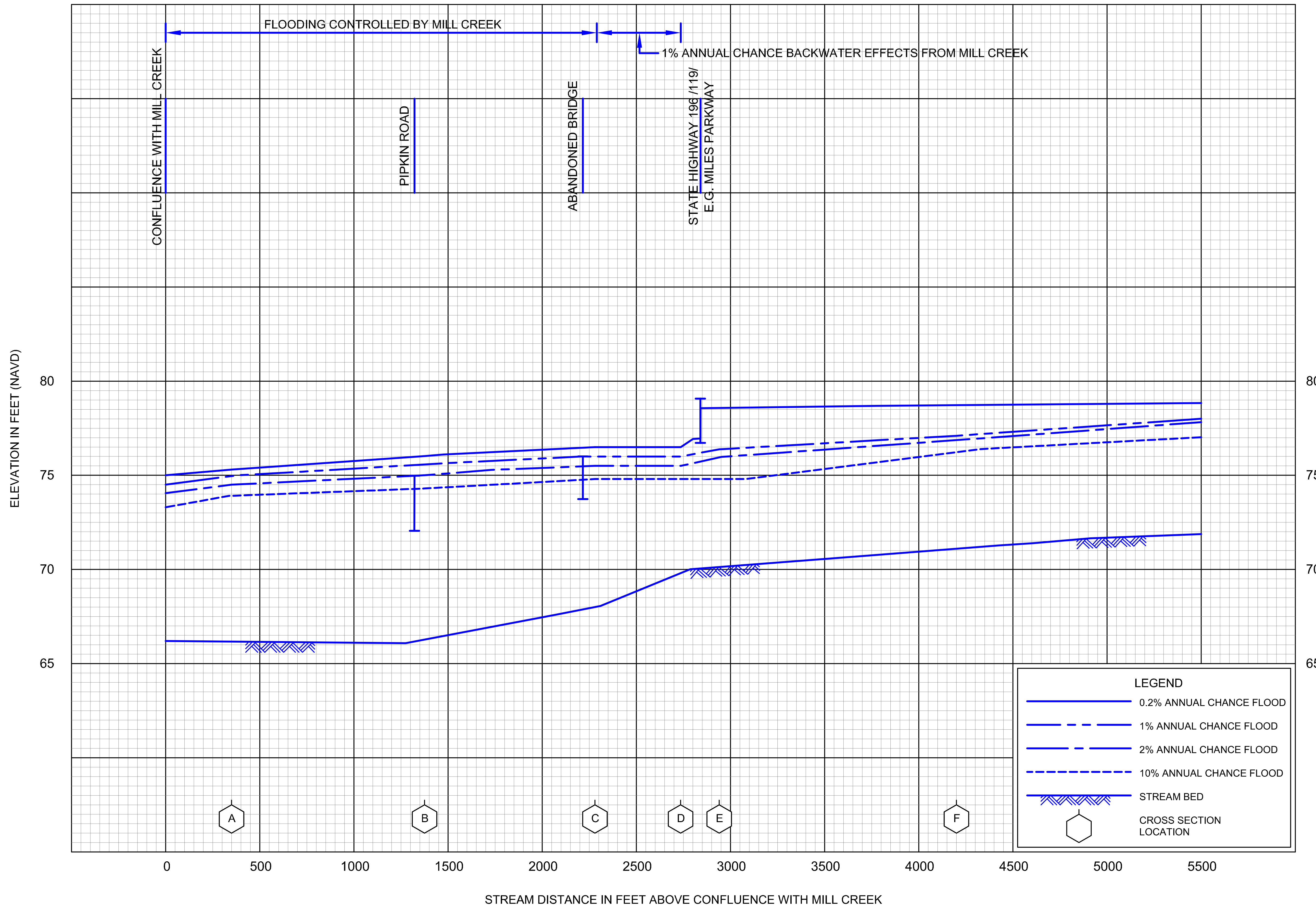
FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS



FLOOD PROFILES

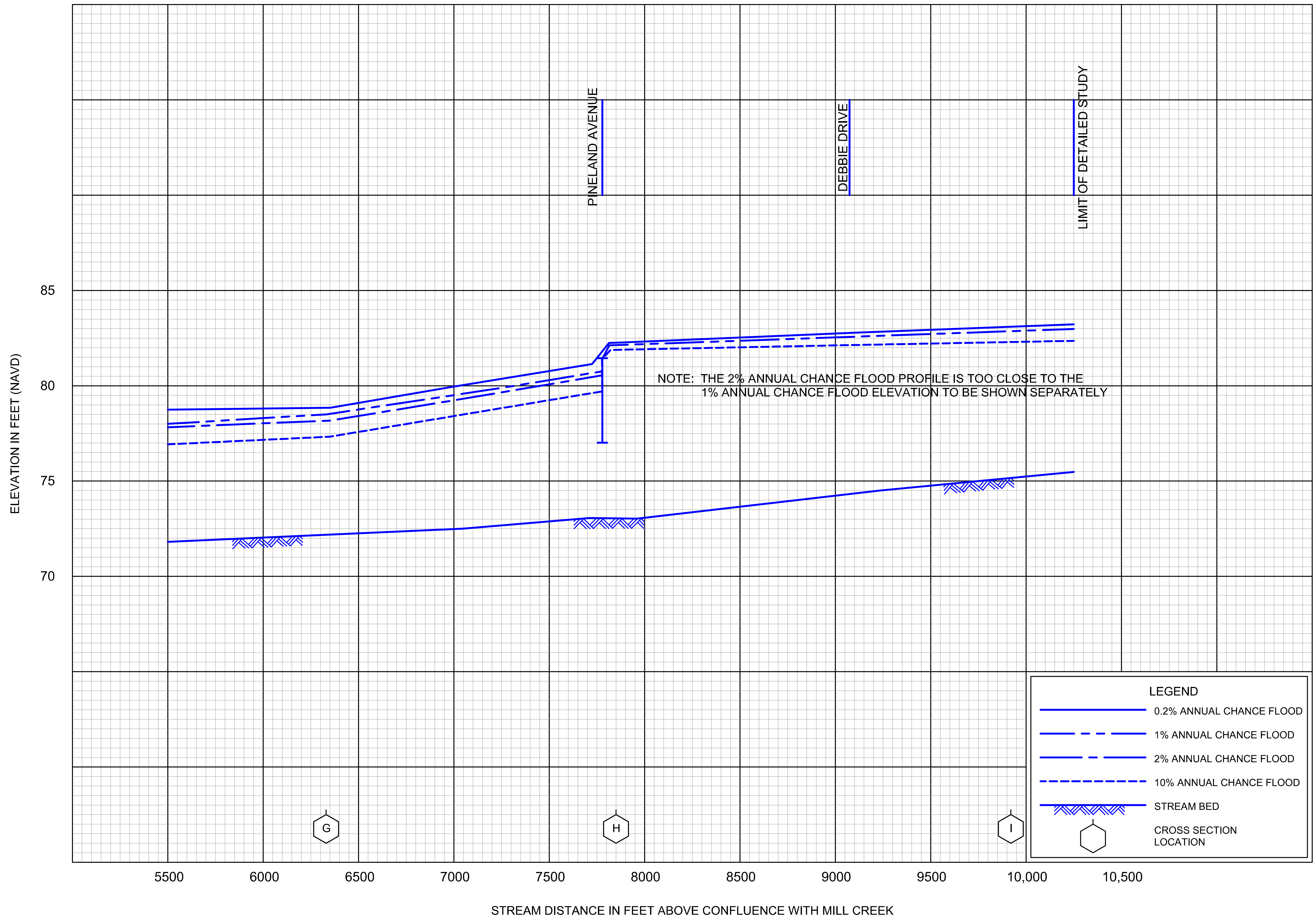
MILL CREEK TRIBUTARY NO. 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS

15P



FLOOD PROFILES

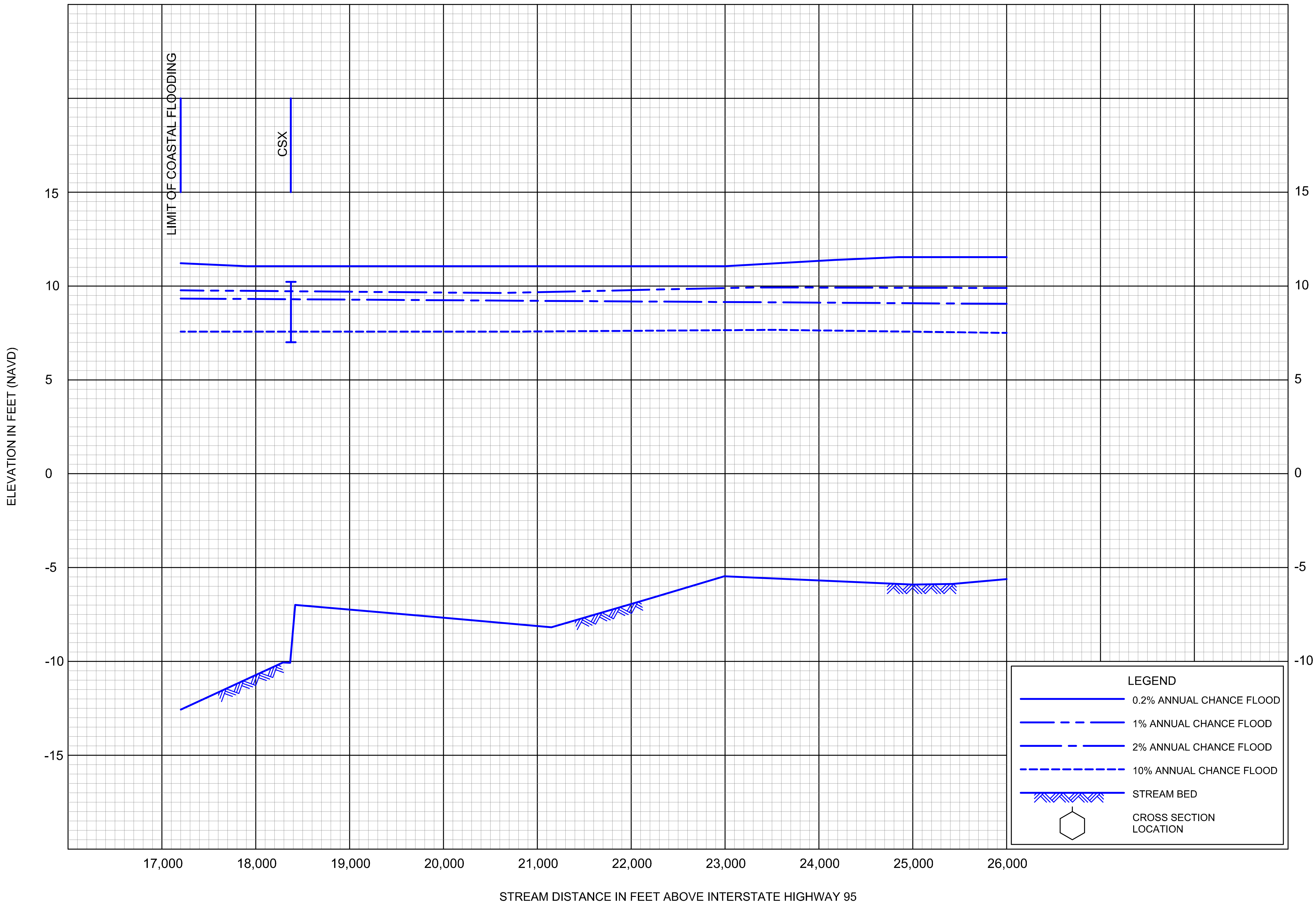
MILL CREEK TRIBUTARY NO. 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS

16P



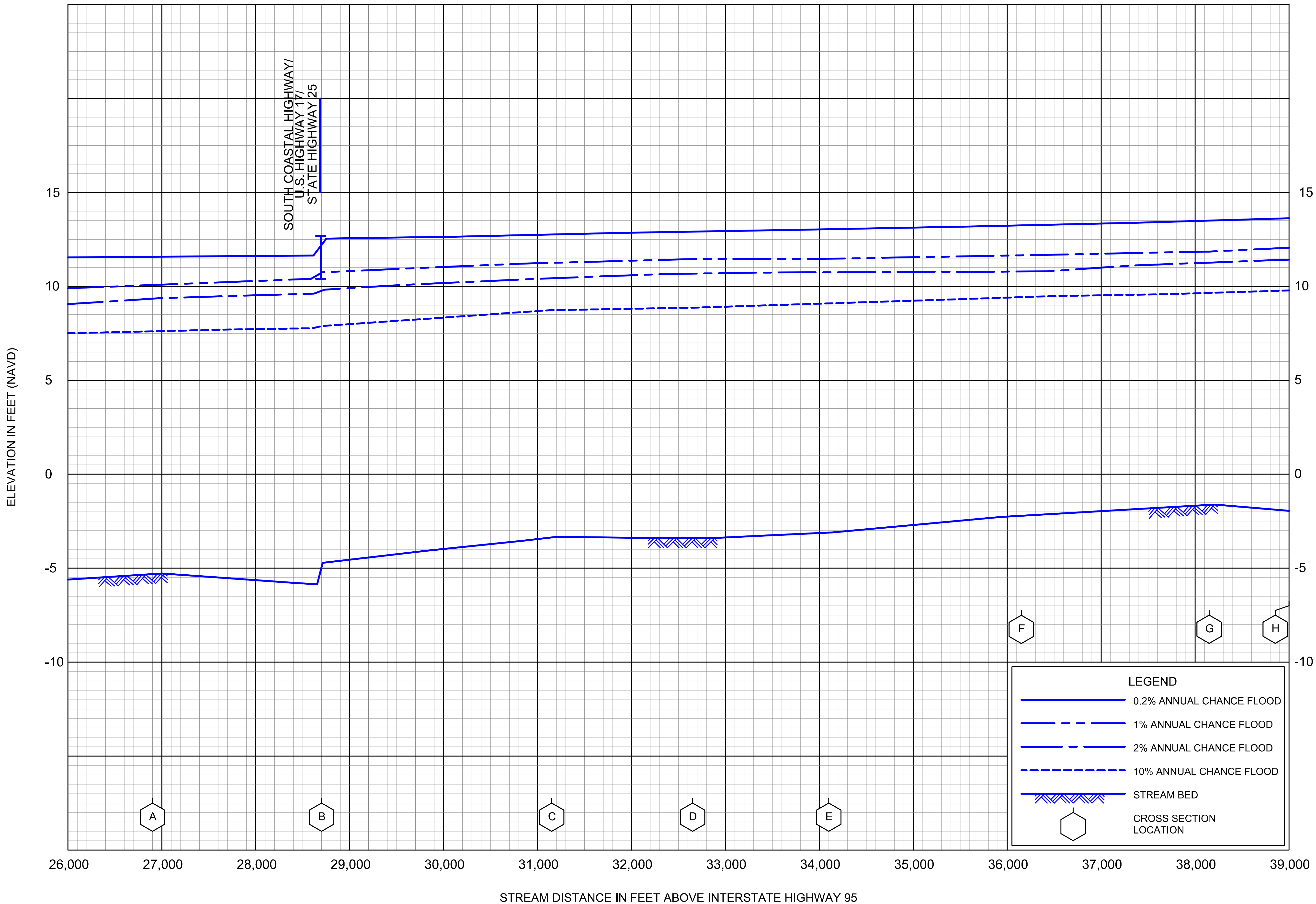
FLOOD PROFILES

PEACOCK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS



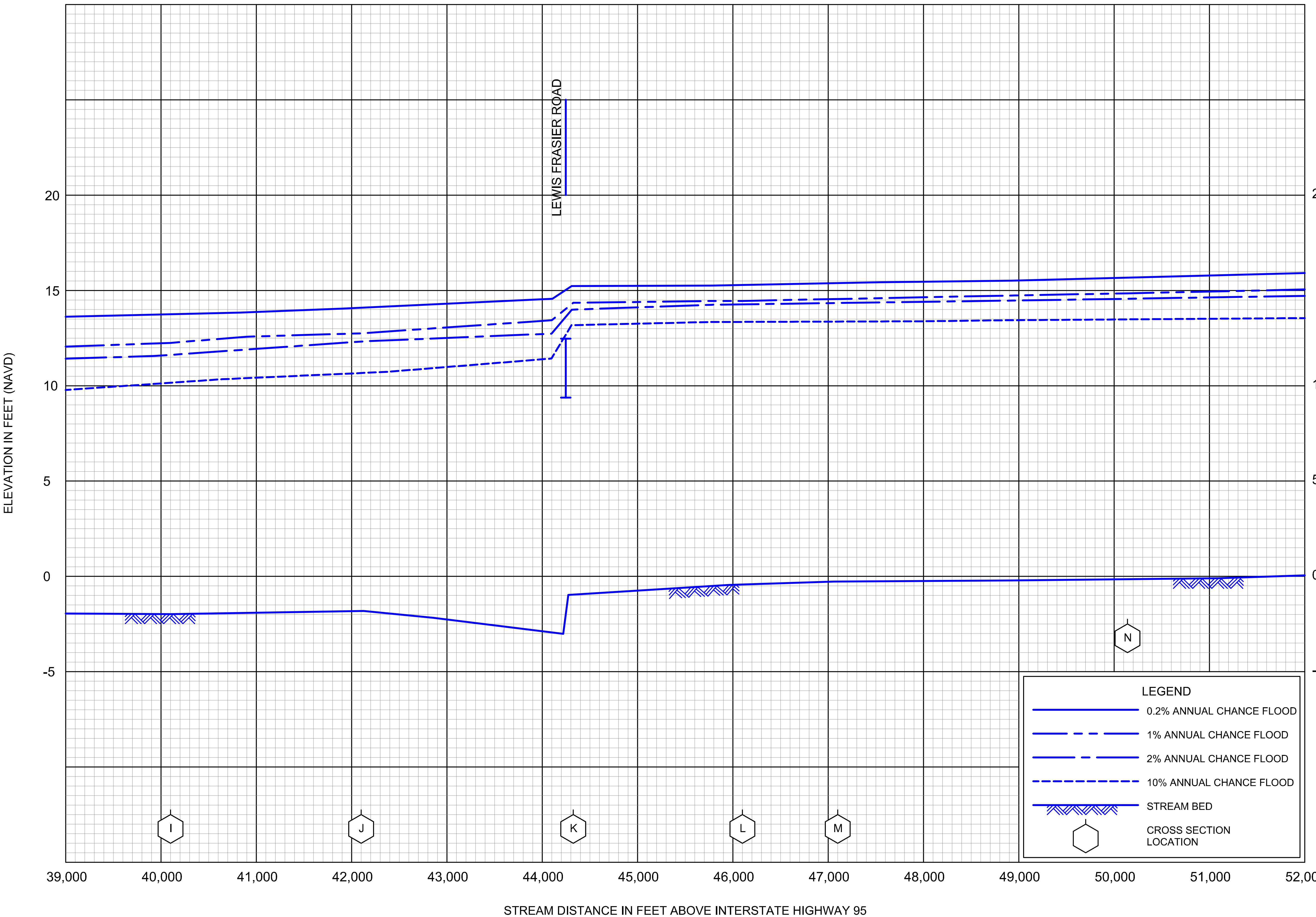
FLOOD PROFILES

PEACOCK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS



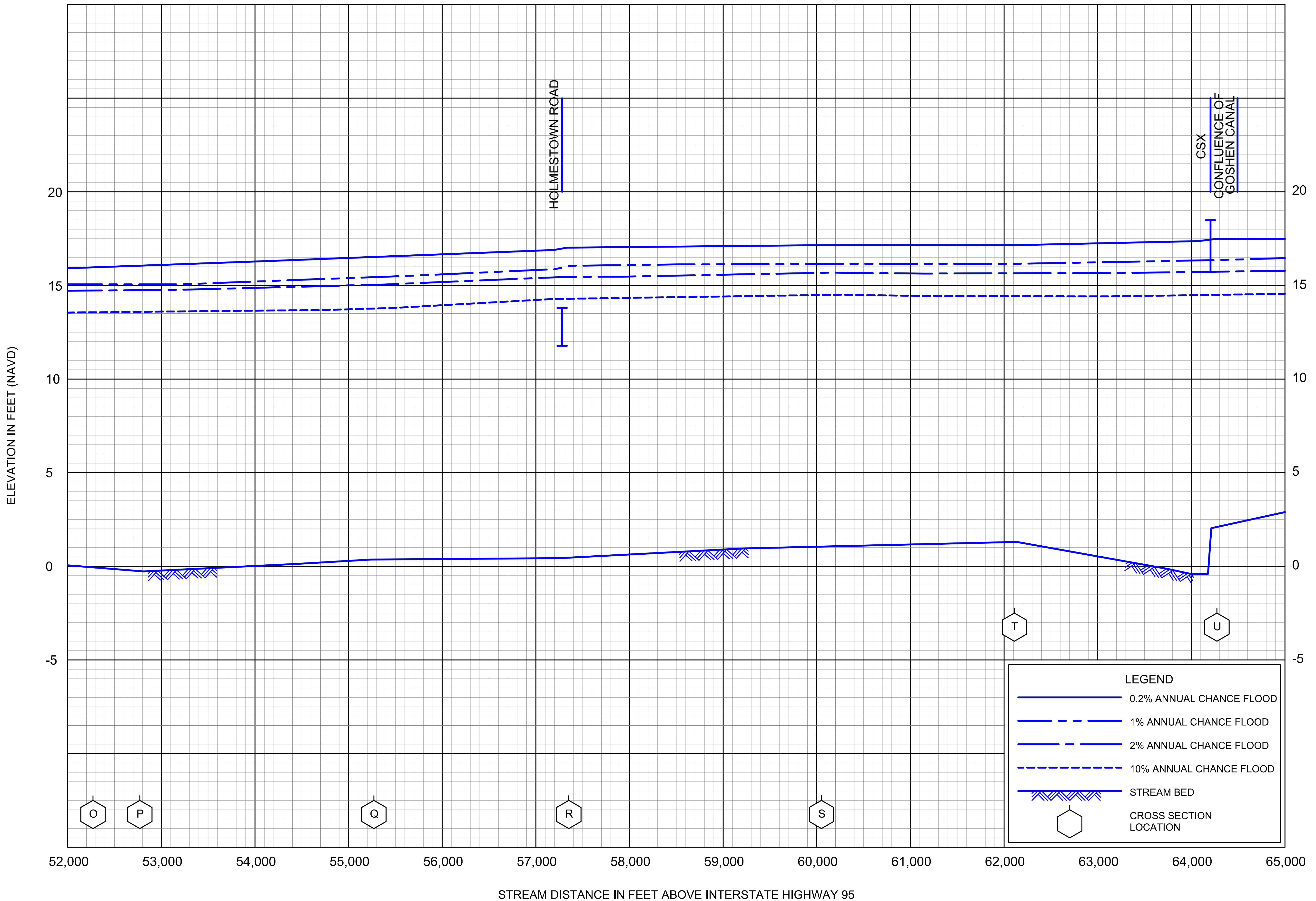
FLOOD PROFILES

PEACOCK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS



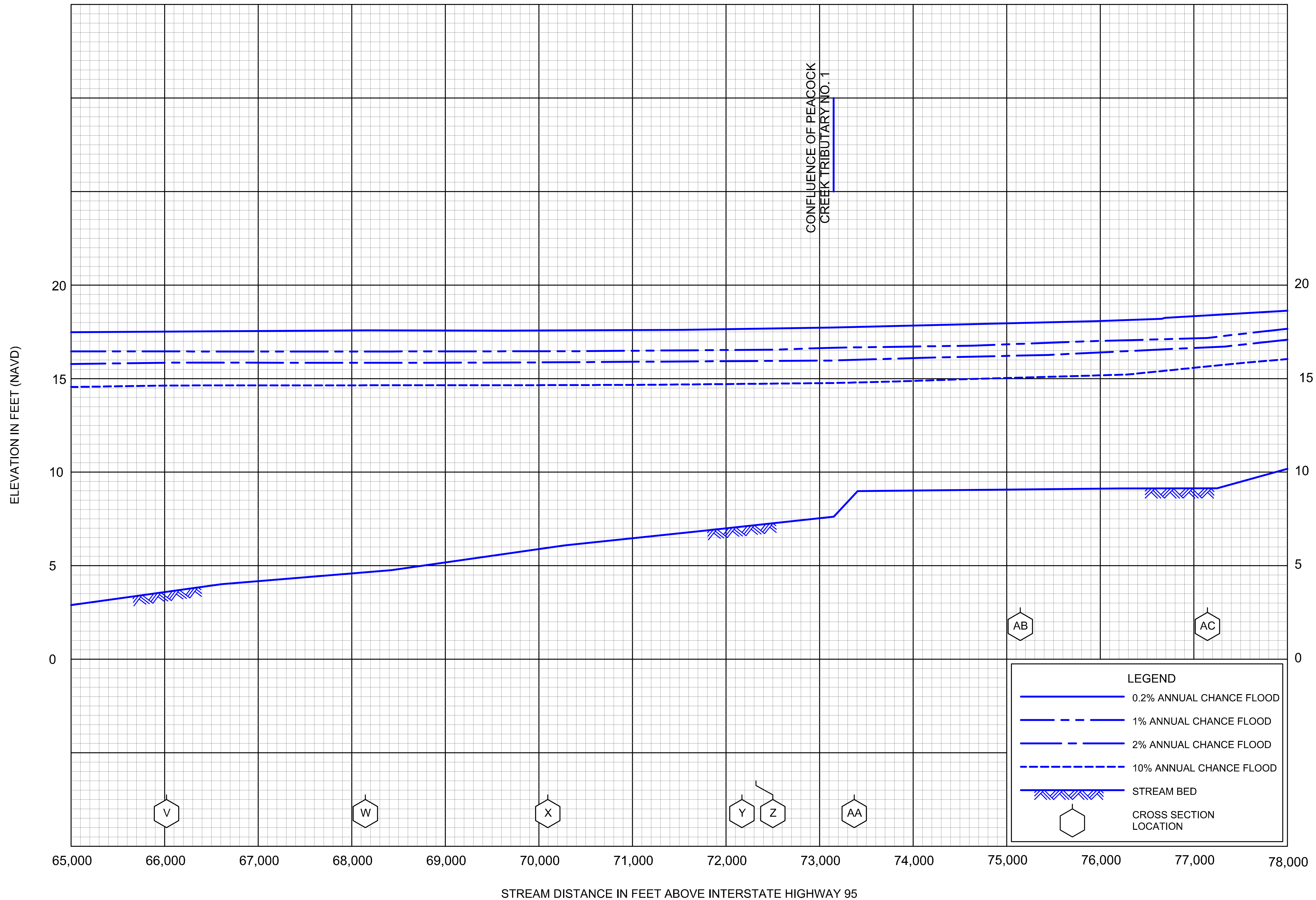
FLOOD PROFILES

PEACOCK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS



FLOOD PROFILES

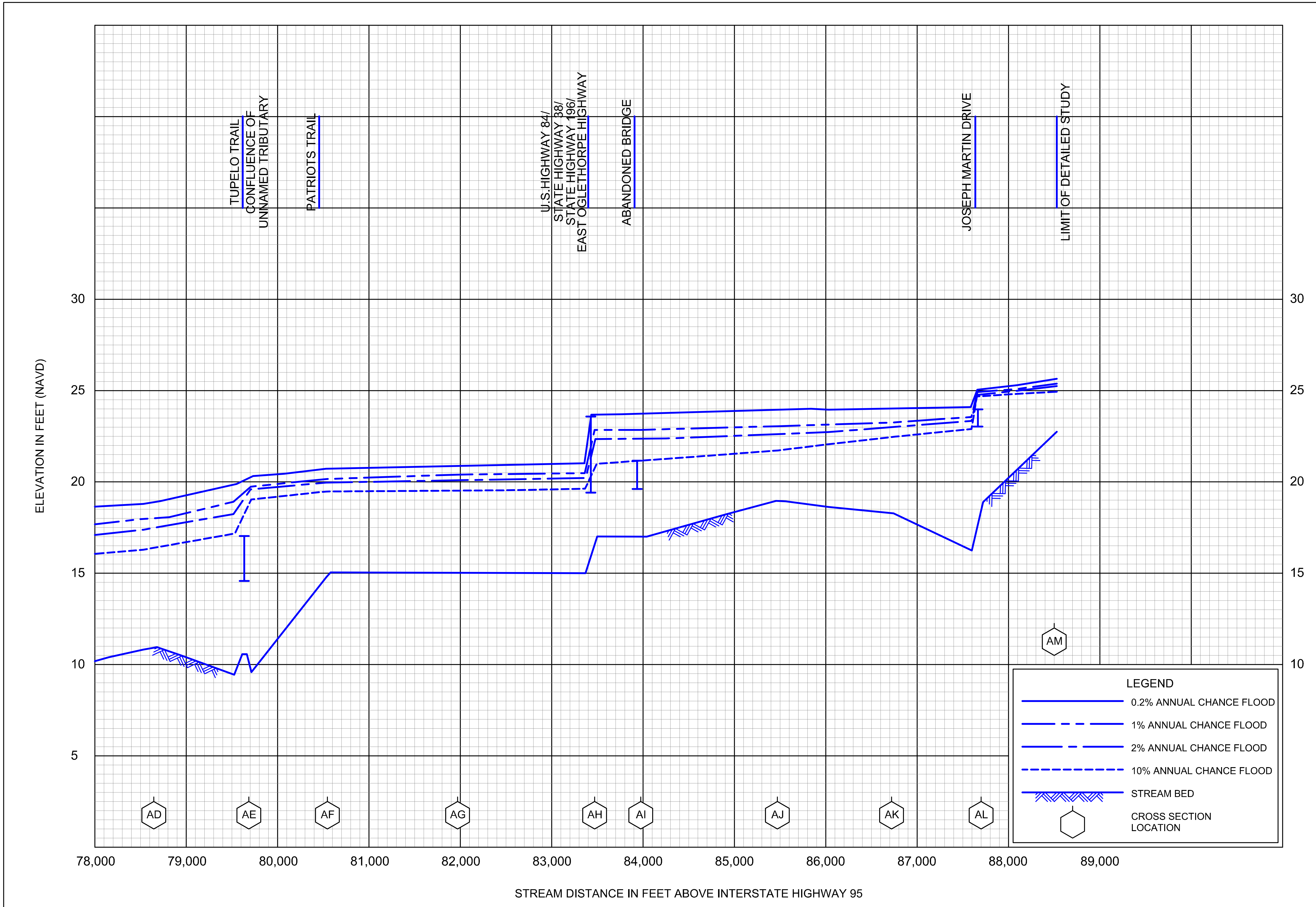
PEACOCK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS

21P



FLOOD PROFILES

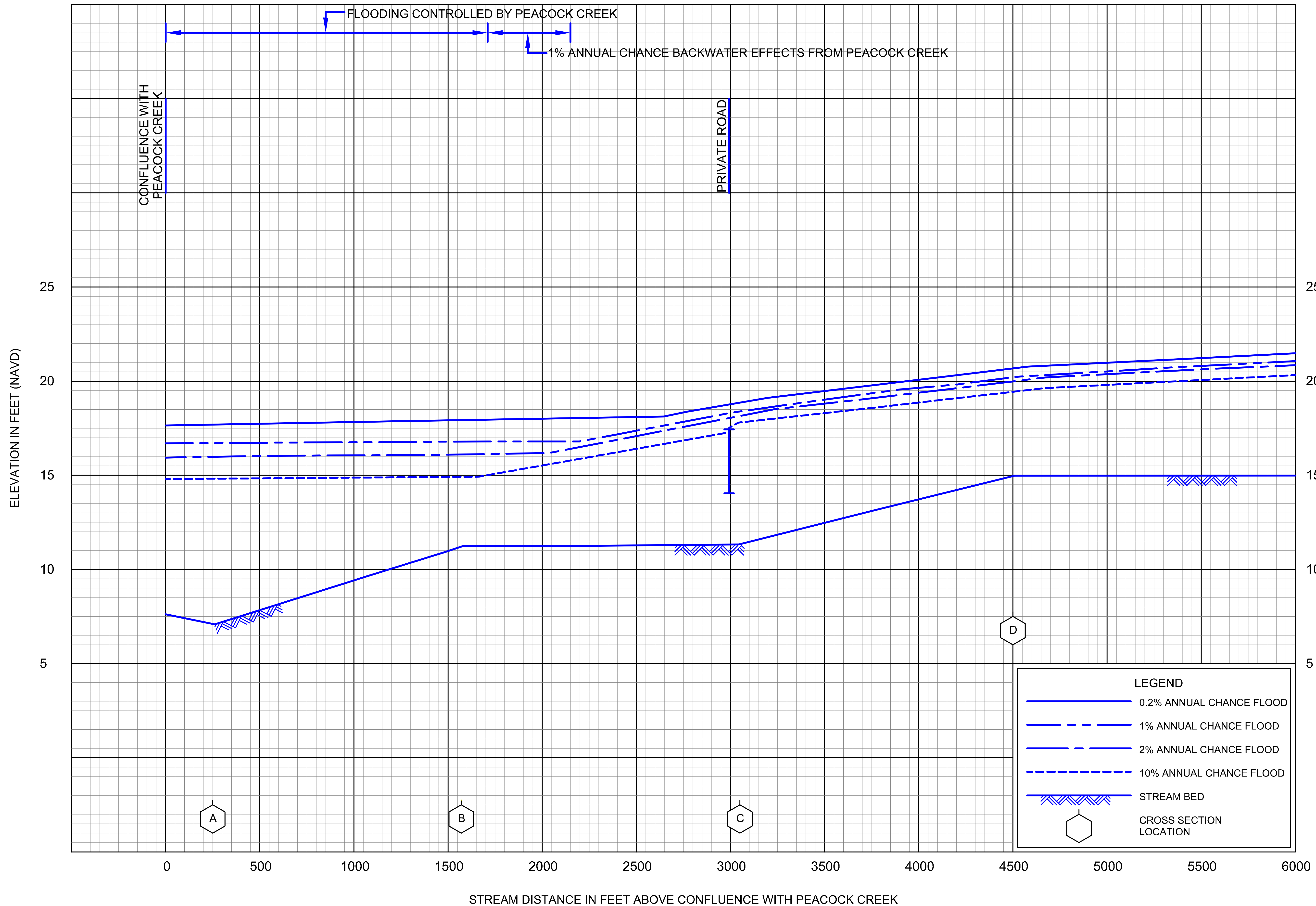
PEACOCK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS

22P



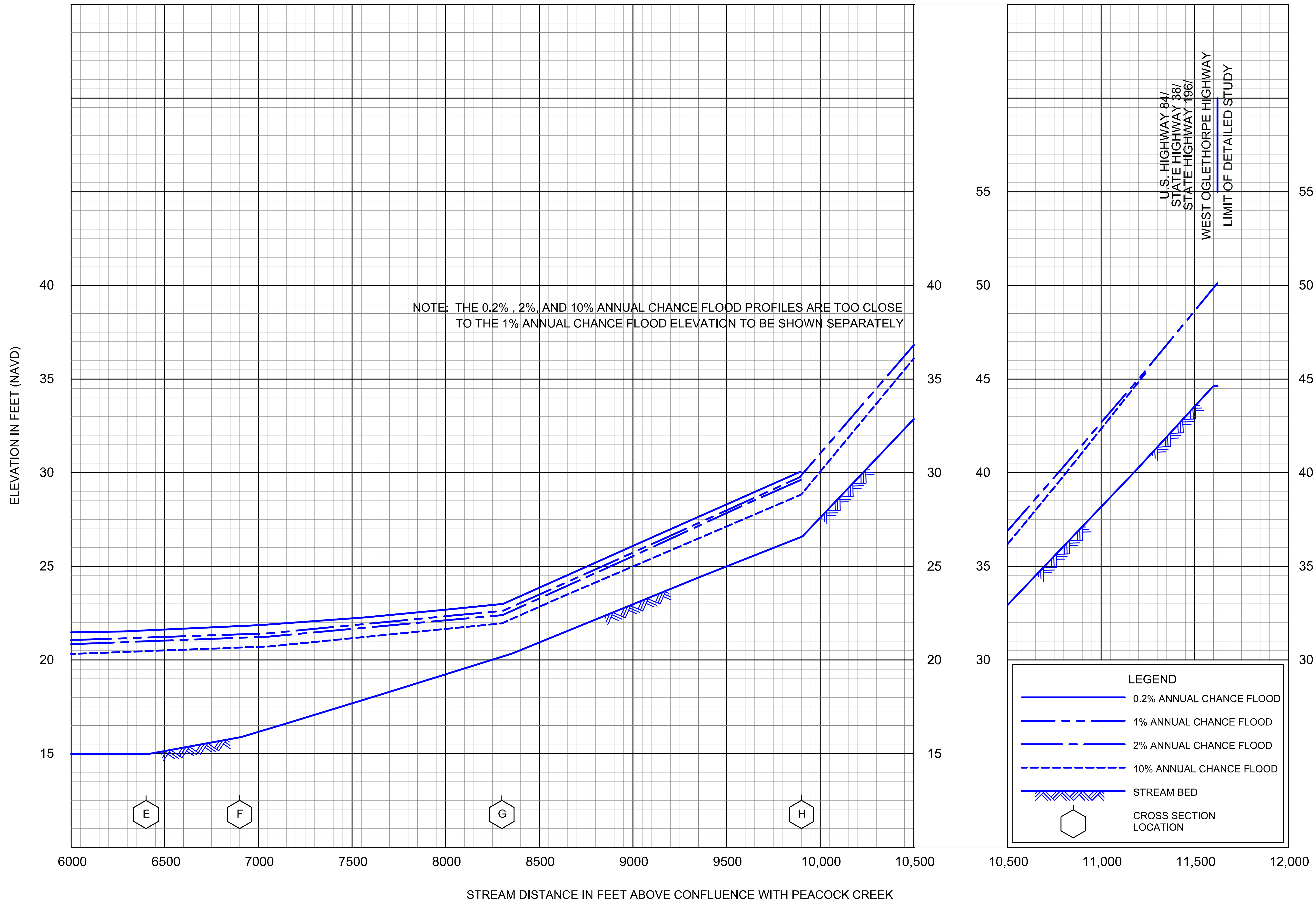
FLOOD PROFILES

PEACOCK CREEK TIBUTARY NO. 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS



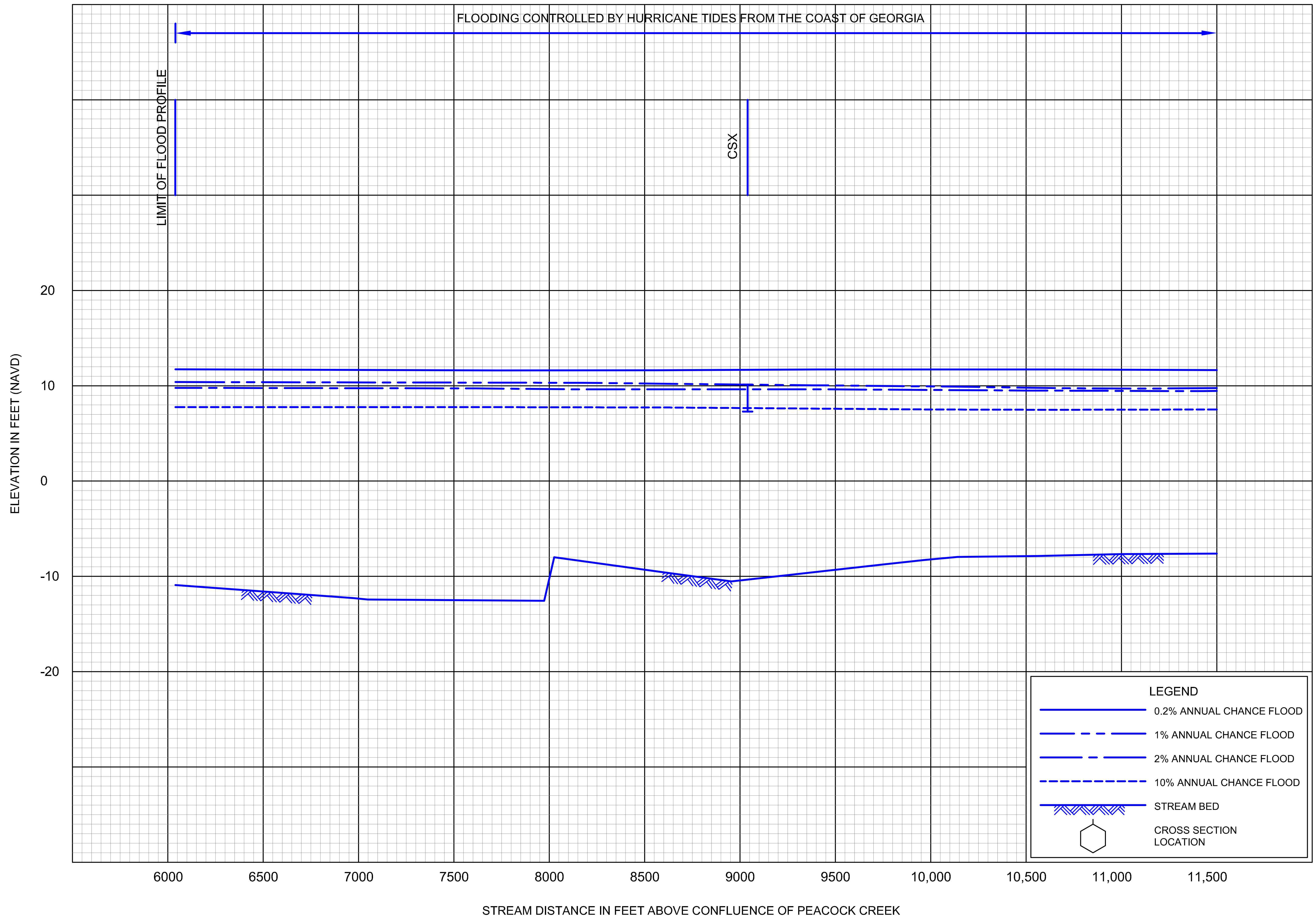
FLOOD PROFILES

PEACOCK CREEK TIBUTARY NO. 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS



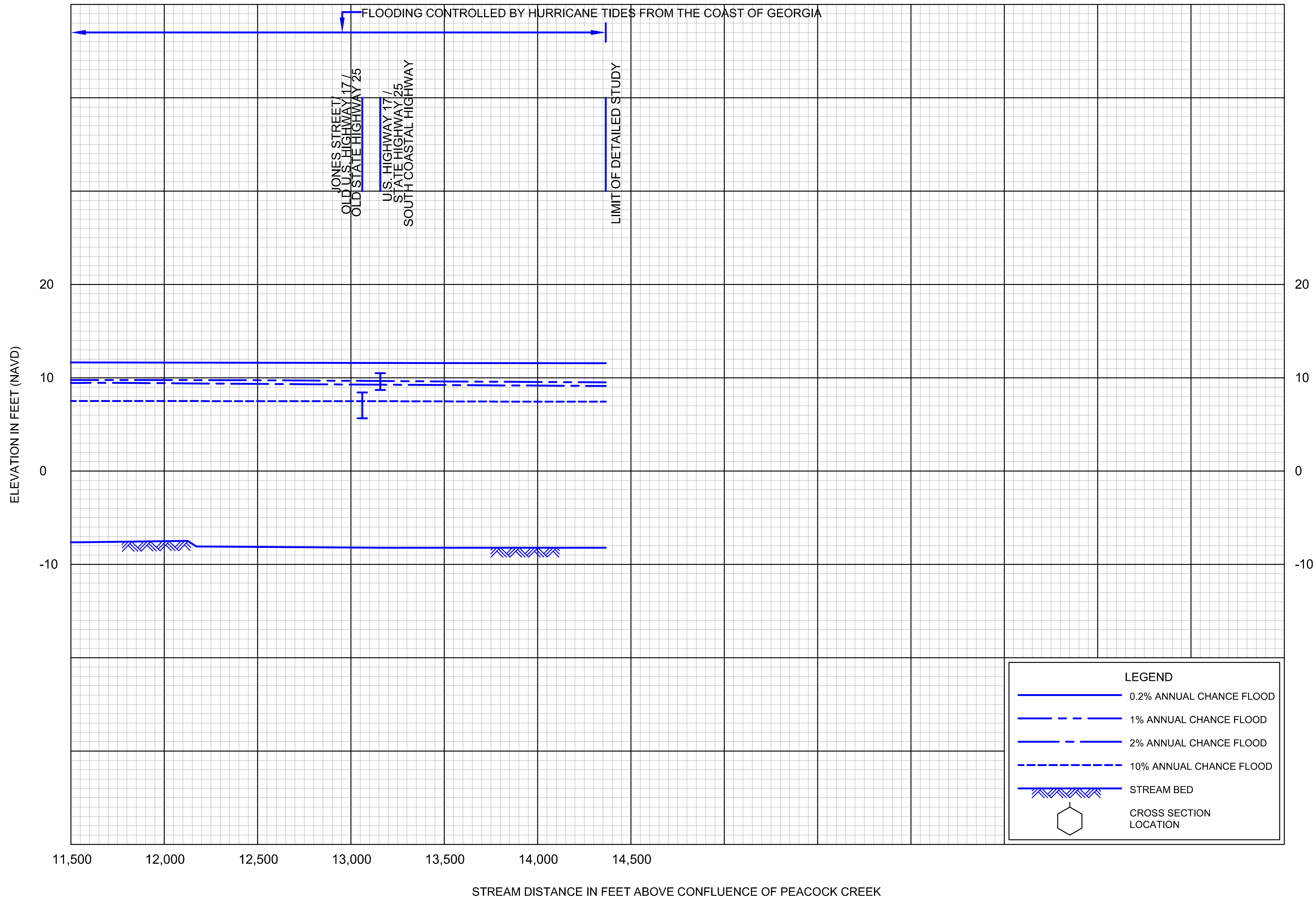
FLOOD PROFILES

RICEBORO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS



FLOOD PROFILES

RICEBORO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, GA

AND INCORPORATED AREAS