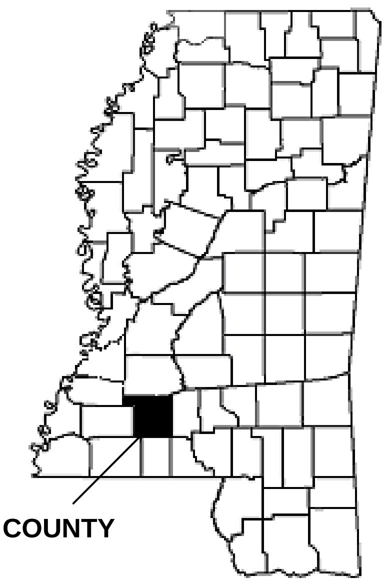
FLOOD INSURANCE STUDY

LINCOLN COUNTY, MISSISSIPPI

AND INCORPORATED AREAS



COMMUNITY NAME	COMMUNITY NUMBER
BROOKHAVEN, CITY OF	280107
LINCOLN COUNTY (UNINCORPORATED AREAS)	280273

EFFECTIVE:

Federal Emergency Management Agency
FLOOD INSURANCE STUDY NUMBER
28085CV000A

NOTICE TO
FLOOD INSURANCE STUDY USERS

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

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

Initial Countywide FIS Effective Date:

Revised Countywide FIS Dates:

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FLOOD INSURANCE STUDY
LINCOLN COUNTY, MISSISSIPPI AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and supersedes the FIS reports and/or Flood Insurance Rate Maps (FIRMs) in the geographic area of Lincoln County, Mississippi, including the City of Brookhaven and unincorporated areas of Lincoln County (hereinafter referred to collectively as Lincoln County).

This FIS aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates. This information will also be used by Lincoln County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the 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.

1.2 Authority and Acknowledgments

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

January 7, 2000, FIS Lincoln County (Unincorporated Areas)

For the original, March 18, 1991, FIS, the hydrologic and hydraulic analyses were prepared by the U.S. Army Corps of Engineers (USACE), Vicksburg District, for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-88-E-2739, Project Order No. 8. That work was completed in July 1989.

For the January 7, 2000, revision, the hydrologic and hydraulic analyses for Halbert Branch were prepared by the Tennessee Valley Authority (TVA) for FEMA, under Inter-Agency Agreement No. EMW-96-IA-0450. The work was completed in August 1997.

January 7, 2000, FIS City of Brookhaven

For the original, July 18, 1977, FIS report, the hydrologic and hydraulic analyses were prepared by Michael Baker, Jr., Inc., for the Federal Insurance Administration (FIA), under Contract No. H-3800. That work was completed in March 1976 and covered all flooding sources affecting the City of Brookhaven.

For the January 7, 2000, revision, the hydrologic and hydraulic analyses for Stream 4 (Halbert Branch) were prepared by the Tennessee Valley Authority for FEMA under Inter-Agency Agreement No. EMW-96-IA-0450. That work was completed in July 1997.

This Countywide FIS

The hydrologic and hydraulic analyses for this countywide FIS were performed by the State of Mississippi for the Federal Emergency Management Agency (FEMA), under Contract No. EMA-2006-CA-5617. This study was completed in January 2009.

The digital base map information files were provided by the U.S. Army Corps of Engineers—Vicksburg District, 4155 East Clay Street, Vicksburg, MS 39183, phone number (601) 631-5053. The digital orthophotography was acquired in March 2006, with the imagery processed to a 2-foot pixel resolution.

The digital FIRM was produced using the Mississippi State Plane Coordinate System, West Zone, FIPSZONE 2302. The horizontal datum was the North American Datum of 1983, GRS 80 spheroid. Distance units were measured in U.S. feet.

1.3 Coordination

An initial Consultation Coordination Officer's (CCO) 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 by detailed methods. A final CCO meeting is held with representatives from FEMA, the community, and the study contractor to review the results of the study.

January 7, 2000, FIS Lincoln County (Unincorporated Areas)

For the original, March 18, 1991, FIS, an initial CCO meeting was held on August 5, 1987, and a final CCO meeting was held on May 1, 1990. Both of these meetings were attended by representatives of Lincoln County, USACE, and FEMA.

For the January 7, 2000, FIS revision, Lincoln County was notified by FEMA in the letter dated September 12, 1997, that its FIS would be revised using the analyses prepared by the TVA.

January 7, 2000, FIS City of Brookhaven

For the July 18, 1977, FIS, an initial CCO meeting was held on February 28, 1975, and was attended by representatives of the city, the State Coordinating Agency, the Lincoln County Planning Commission, Michael Baker Jr., Inc., and the FIA. A final CCO meeting was held on July 22, 1976.

For the January 7, 2000, FIS revision, the City of Brookhaven was notified by FEMA in a letter dated September 12, 1997, that its FIS would be revised using the analyses prepared by the TVA. A final CCO was not required.

This Countywide FIS

For this countywide FIS, the Project Scoping Meeting was held on November 21, 2006. Attendees for these meetings included representatives from the Mississippi Department of Environmental Quality, Mississippi Emergency Management Agency, FEMA National Service Provider, Lincoln County, the City of Brookhaven, the State, and the Study Contractor. Coordination with county officials and Federal, State, and regional agencies produced a variety of information pertaining to floodplain regulations, available community maps, flood history, and other hydrologic data. All problems raised in the meetings have been addressed.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Lincoln County, Mississippi, and its incorporated communities listed in Section 1.1 Several flooding sources within the county were studied by approximate methods. Approximate analyses are used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon, by FEMA and the State of Mississippi.

January 7, 2000, FIS Lincoln County (Unincorporated Areas)

For the March 18, 1991, FIS, Halbert Branch was studied by detailed methods.

For the January 7, 2000, revision, Halbert Branch, from U.S. Route 51 to approximately 1.4 miles upstream of U.S. Highway 84, was restudied by detailed methods.

Numerous flooding sources within the county were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and Lincoln County.

January 7, 2000, FIS City of Brookhaven

For the July 18, 1977, FIS, the following streams were studied by detailed methods: Halbert Branch, Halbert Branch Tributary 1, Halbert Branch Tributary 2, Stream 1, Stream 2, Stream 3, Stream 3 Tributary 1, Stream 5, Stream 5 Tributary 1, Stream 6, Stream 6 Tributary 1, and Stream 7.

For the January 7, 2000, revision, Halbert Branch was restudied by detailed methods.

This Countywide FIS

For this FIS study, certain streams were studied by limited detail methods. This study type entails collecting basic field measurements of hydraulic structures and channel geometry. Vertical control for the measurements is established using Real Time Kinematics Global Positioning System instrumentation. Generalized roughness values are estimated from land-use data, aerial photography, and photographs collected during survey. Channel and overbank reach lengths are computed using GIS methods. Model results are calibrated to known stage values, as they are available and deemed reliable.

Floodplain boundaries of streams that have been previously studied by detailed methods were redelineated based on up-to-date topographic information.

2.2 Community Description

Lincoln County is in the southwest corner of Mississippi. It is border on the north by Copiah County; on the east by Lawrence County; on the south by Walthall, Pike and Amite Counties; and on the west by Franklin and Jefferson Counties. Lincoln County is served by Interstate Route 55; U.S. Routes 51, 84, and 98; and the Canadian National Railroad.

The 2007 population of Lincoln County was reported to be 34,529 (U.S. Census Bureau, 2008).

Lincoln County was established during the post-Civil War Military Reconstruction on April 7, 1870 and was named for President Abraham Lincoln. The City of Brookhaven is the county seat and the largest city in the county. The county's principal's industries are manufacturing, retail trade, and health care.

Lincoln County's terrain is gently rolling hills with sandy loam ridges and well-defined drainage basins with moderately to poorly-drained fertile soil in the valleys. Vegetation consists mostly of loblolly and short-leaf pine.

The climate of the county is generally mild and humid, with abundant rainfall that averages 59 inches annually (National Weather Service, Jackson, MS, 2008). Temperatures range from monthly averages of 46 degrees Fahrenheit (°F) in January to 80°F in July (National Weather Service, Jackson, MS, 2008).

2.3 Principal Flood Problems

The bottom-land areas of Lincoln County are subject to periodic flooding caused by the inability of streams to handle seasonal storms and localized heavy rainfall.

Periodic flooding within the City of Brookhaven is caused by the intense rains and occasional tropical storms and hurricanes. The community suffered major storms every year between 1973 and 1976, causing flooding damage in low-lying, residential areas. Factors retarding the normal runoff of heavy rainfall are bridges and culverts, which may have inadequate capacity and are subject to constriction due to debris collection or siltation.

2.4 Flood Protection Measures

Flood protection measures have consisted of channel improvements by excavation or paving and replacement of inadequate culverts and bridges.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the communities, 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 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.

January 7, 2000, Lincoln County (Unincorporated Areas) FIS

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each stream studied in detail in the county.

Regression equations for three regions of Mississippi developed by the U.S. Geological Survey (USGS) relate peak discharges to basin drainage area, length, and average slope (Dept. of Interior, 1991). The equations for Mississippi Hydrologic Area East that were used to develop peak discharges for Halbert Branch are shown in the following tabulation:

Recurrence Interval	Discharge
10-percent	$Q_{10} = 482 \times A^{0.85} \times S^{0.09} \times L^{-0.34}$
2-percent	$Q_{50} = 648 \times A^{0.85} \times S^{0.11} \times L^{-0.31}$
1-percent	$Q_{100} = 716 \times A^{0.85} \times S^{0.12} \times L^{-0.30}$
0.2-percent	$Q_{500} = 874 \times A^{0.85} \times S^{0.12} \times L^{-0.28}$

Because regional equations do not account for increased discharges resulting from urbanization, the peak discharge values were adjusted using equations by Espy and Winslow (Espy and Winslow, 1974). Ratios of imperviousness were estimated from aerial photographs, USGS 7.5-Minute Series Topographic Maps, and field inspection (U.S. Dept. of Interior, 1972 and 1992).

There are no stream gages on Halbert Branch. The flood model was calibrated by comparing the general shape of the computed profiles with observations of past flood events. At Brookhaven, many inadequately sized and/or silt-laden culverts tend to cause flooding to overflow roadways and parking lots. These conditions cause overflows of control structures at several locations throughout the floodplain. As a result, computed flood profiles are less sensitive than usual to variations in peak discharge, which aided calibration.

January 7, 2000, City of Brookhaven FIS

For original July 18, 1977, FIS, hydrologic analyses were carried out to establish the peak discharge-frequency relationships for the flooding sources studied in detail affecting the community. Peak discharge computations were based on the unit hydrograph method. The rainfall-runoff model was developed for a storm of record, which occurred in Brookhaven on April 13, 1974, using the HEC-1 flood hydrograph computer program (USACE, 1970). Peak-discharges for the 10-, 50-, and 100-year floods were determined using rainfall values given in Technical Paper Number 40 (National Weather Bureau, 1961). The 500-year frequency discharge was determined by straight-line extrapolation of a log probability graph of flood discharges computed for frequencies up to 100 years.

For the January 7, 2000, FIS revision, hydrologic analyses was carried out to establish peak discharge-frequency relationships for floods of the selected recurrence intervals for Halbert Branch. Regression equations for three regions of Mississippi developed by the USGS (U.S. Dept. of Interior, 1991) relate peak discharges to basin drainage area, length, and average slope. Listed below are the equations for Mississippi Hydrologic Area East, which were used to develop peak discharges for Halbert Branch.

Recurrence Interval	Discharge (cfs)
10-percent	$Q_{10} = 482 \times A^{0.85} \times S^{0.09} \times L^{-0.34}$
2-percent	$Q_{50} = 648 \times A^{0.85} \times S^{0.11} \times L^{-0.31}$
1-percent	$Q_{100} = 716 \times A^{0.85} \times S^{0.12} \times L^{-0.30}$
0.2-percent	$Q_{500} = 874 \times A^{0.85} \times S^{0.12} \times L^{-0.28}$

Because regional relationships do not account for increased discharges resulting from urbanization, the peak discharge values were adjusted using equations by Espy and Winslow (Espy and Winslow, 1974). Espy and Winslow equations, which relate discharge to imperviousness, are in the form $Q_{pu} = I^x * Q_{pn}$, where I is the percent of imperviousness and x is a factor which varies with flood probability. Subscript pu denotes urbanized conditions for a selected probability, p, and subscript pn denotes natural, or unurbanized conditions. Ratios of imperviousness were estimated from aerial photographs (U.S. Dept. of Interior, 1992), 7.5 minute topographic maps (U.S. Dept. of Interior, 1972), and by field inspection.

This Countywide FIS Analysis

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by limited detail methods affecting the communities. Peak discharges were calculated based on USGS regional regression equations (U.S. Department of the Interior, 1991). For the discharges calculated based on regional regression equations, the rural regression values were modified to reflect stream gage weighting and/or urbanization as necessary.

A summary of the drainage area-peak discharge relationships for Halbert Branch is shown in Table 1, "Summary of Discharges."

TABLE 1. SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. mi.)	PEAK DISCHARGES (cfs)			
		10-percent	2-percent	1-percent	0.2-percent
HALBERT BRANCH					
At confluence with East Bogue Chitto River	4.33	2,733	3,608	3,816	4,385
Approximately 750 feet downstream of Natchez Avenue	3.13	2,647	3,416	3,576	4,032
At Halbert Heights Road	1.46	1,598	2,043	2,129	2,381
At East Meadowbrook Drive	0.30	594	749	776	862

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.

January 7, 2000, Lincoln County (Unincorporated Areas) FIS Analyses

Analyses of the hydraulic characteristics of flooding from the source studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

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

Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-2 step-backwater computer program (USACE, 1991). Starting water-surface elevations were calculated using the slope/area method, using the slope for the streambed in the first downstream sub-basin that was defined for the development of peak discharge values. Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

Roughness factors (Manning's "n") used in the hydraulic computations were chosen by field inspection. The channel "n" value ranged from 0.045 to 0.065, and the overbank "n" value ranged form 0.055 to 0.15.

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

January 7, 2000, City of Brookhaven FIS Analyses

Analyses of the hydraulic characteristics of flooding from the source studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

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

For the July 18, 1977, FIS and the January 7, 2000, revision, water-surface elevations of the selected recurrence intervals were computed using the USACE-HEC-2 step-backwater computer program (USACE, 1973, 1991). Starting water-surface elevations were calculated using the slope-area method. Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

Roughness factors (Manning's "n") used in the hydraulic computations were chosen by field inspection and engineering judgment. For the stream restudied by detailed methods, the channel "n" values ranged form 0.030-0.065, and the overbank "n" values ranged from 0.035-0.15.

This Countywide FIS Analysis

Cross section geometries were obtained from a combination of terrain data and field surveys. Bridges and culverts located within the limited detailed study limits were field surveyed to obtain elevation data and structural geometry.

Downstream boundary conditions for the hydraulic models were set to normal depth using a starting slope calculated from values taken from topographic data, or where applicable, derived from the water-surface elevations. Water-surface profiles were computed through the use of the USACE HEC-RAS version 3.1.3 computer program (USACE, 2003). The model was run for the 1-percent annual chance storm for the limited detail and approximate studies.

The hydraulic analyses for this countywide FIS 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.

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

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

> Stability A: Monuments of the most reliable nature, expected to hold position/elevation well (e.g., mounted in bedrock)
>
> Stability B: Monuments which generally hold their position/elevation well (e.g., concrete bridge abutment)

Stability C: Monuments which may be affected by surface ground movements (e.g., concrete monuments below frost line)

Stability D: Mark of questionable or unknown vertical stability (e.g., concrete monument above frost line, or steel witness post)

In addition to NSRS benchmarks, the FIRM may also show vertical control monument established by a local jurisdiction; these monuments will be shown on the FIRM with the appropriate designations. Local monuments will only be placed on the FIRM if the community has requested that they be included, and if the monuments meet the aforementioned NSRS inclusion criteria.

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

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. Interested individuals may contact FEMA to access this data.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the finalization of the North American Vertical Datum of 1988 (NAVD88), many FIS reports and FIRMs are being prepared using NAVD88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. Structure and ground elevations in the community must, therefore, be referenced to NAVD88. It is important to note that adjacent communities may be referenced to NGVD29. This may result in differences in Base Flood Elevations (BFEs) across the corporate limits between the communities. The elevations shown in the FIS report and on the FIRM for Lincoln County are referenced to NAVD88.

Ground, structure, and flood elevations may be compared and/or referenced to NGVD29 by applying a conversion factor. To convert elevations from NAVD88 to NGVD29, add 0.03 feet to the NAVD88 elevation. The 0.03 feet value is an average for the entire county. The adjustment value was determined using the USACE Corpscon 6.0.1 computer program (USACE, 2004) and topographic maps (U.S. Department of the Interior, 1972). The BFE’s shown on the FIRM represent whole-foot rounded values. For example, a BFE of 12.4 feet will appear as 12 feet on the FIRM, and 12.6 feet as 13 feet. Users who wish to convert the elevations in this FIS report to NGVD29 should apply the stated conversion factor to elevations shown on the Flood Profiles and supporting data tables in the FIS report, which are shown at a minimum to the nearest 0.1-foot.

For more information regarding conversion between the NGVD and the NAVD, see the FEMA publication entitled *Converting the National Flood Insurance Program to the North American Vertical Datum of 1988* or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Rockville, Maryland 20910 (Internet address http://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 flood elevations and delineations of the 1- and 0.2-percent-annual-chance 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-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section.

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM (Exhibit 2), On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-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 limited detailed and approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM (Exhibit 2). Floodplain boundaries for these streams, as well as those streams that have been previously studied by detailed methods, were generated using USGS 10-meter Digital Elevation Models (USGS), then refined using detailed hydrographic data.

4.2 Floodways

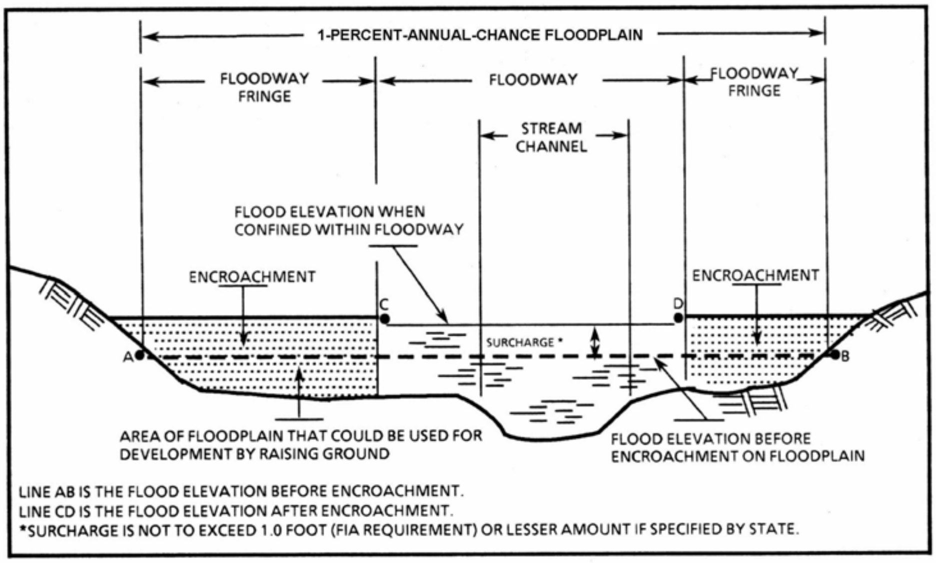
Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development 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 1.0 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 floodway presented in this FIS report and on the FIRM was computed for certain stream segments on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations have been tabulated for selected cross sections of detailed study streams (Table 2). For detailed study streams, in cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

Near the mouths of streams studied in detail, floodway computations are made without regard to flood elevations on the receiving water body. Therefore, “Without Floodway” elevations presented in Table 2, “Floodway Data,” for certain downstream cross sections are lower than the regulatory flood elevations in that area, which must take into account the 1-percent-annual-chance flooding due to backwater from other sources.

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage, and heightens potential flood hazards by further increasing velocities. For detailed study streams, a listing of stream velocities at selected cross sections is provided in Table 2. In order to reduce the risk of property damage in areas where the stream velocities are high, the county may wish to restrict development in areas outside the floodway.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 1-percent-annual-chance flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.



FLOODWAY SCHEMATIC Figure 1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
HALBERT BRANCH								
A	1,932	970	2,154	1.8	412.7	412.7	412.7	0.0
B	2,442	320	1,512	2.5	412.9	412.9	412.9	0.0
C	3,264	320	3,283	1.2	418.8	418.8	419.1	0.3
D	4,194	400	3,534	1.1	418.9	418.9	419.3	0.4
E	6,634	400	1,911	1.9	419.9	419.9	420.9	1.0
F	7,894	260	1,073	3.4	422.5	422.5	423.4	0.9
G	9,834	240	1,017	3.5	427.9	427.9	428.9	1.0
H	11,120	53	619	5.6	432.6	432.6	433.6	1.0
I	11,990	116	808	4.2	433.9	433.9	434.6	0.7
J	12,600	79	586	5.7	434.6	434.6	435.2	0.6
K	13,784	81	517	3.7	438.4	438.4	439.0	0.6
L	14,694	75	353	4.7	440.8	440.8	441.5	0.7
M	15,607	75	635	2.2	448.2	448.2	449.2	1.0
N	15,985	90	470	2.8	451.3	451.3	451.8	0.5
O	16,295	90	555	2.3	451.5	451.5	452.2	0.7
P	16,685	68	272	4.6	451.7	451.7	452.7	1.0
Q	17,318	245	664	1.8	454.5	454.5	455.1	0.6
R	17,506	307	2,325	0.5	461.0	461.0	461.0	0.0
S	17,745	90	807	1.4	461.0	461.0	461.1	0.1
T	18,440	90	764	1.4	464.5	464.5	465.2	0.7
U	19,210	110	774	1.3	464.5	464.5	465.3	0.8

[1] FEET ABOVE CONFLUENCE WITH EAST BOGUE CHITTO RIVER

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS AND INCORPORATED AREAS

FLOODWAY DATA

HALBERT BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
HALBERT BRANCH (CONTINUED)								
V	19,938[1]	110	392	2.4	464.7	464.7	465.6	0.9
W	20,368[1]	110	256	3.4	465.4	465.4	466.3	0.9
X	20,596[1]	95	289	3.0	467.6	467.6	468.5	0.9
Y	21,406[1]	55	202	3.8	470.3	470.3	471.3	1.0
HALBERT BRANCH TRIBUTARY 1								
A	270[2]	72	466	3.0	438.2	438.2	439.2	1.0
B	1,107[2]	76	432	2.8	441.6	441.6	442.2	0.6
C	1,817[2]	29	161	7.4	444.0	444.0	444.0	0.0
D	2,317[2]	36	163	7.4	445.4	445.4	445.5	0.1
E	3,000[2]	39	242	2.9	454.3	454.3	454.3	0.0
F	3,157[2]	52	330	2.1	454.3	454.3	454.3	0.0

[1] FEET ABOVE CONFLUENCE WITH EAST BOGUE CHITTO RIVER
[2] FEET ABOVE CONFLUENCE WITH HALBERT BRANCH

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS AND INCORPORATED AREAS

FLOODWAY DATA

HALBERT BRANCH – HALBERT BRANCH TRIBUTARY 1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
HALBERT BRANCH TRIBUTARY 2								
A	600[1]	27	73	9.3	450.9	450.9	450.9	0.0
B	1,109[1]	25	143	4.8	455.4	455.4	456.0	0.6
C	1,601[1]	174	318	1.6	458.7	458.7	459.1	0.4
STREAM 2								
A	1,588[2]	76	128	5.8	446.6	446.6	446.8	0.2
B	2,588[2]	49	147	4.8	453.3	453.3	454.1	0.8
C	3,235[2]	126	291	2.4	455.0	455.0	456.0	1.0
D	4,168[2]	15	87	5.4	460.9	460.9	461.3	0.4
E	4,373[2]	29	138	3.4	462.9	462.9	463.6	0.7
F	5,073[2]	22	74	3.1	465.1	465.1	465.8	0.7

[1] FEET ABOVE CONFLUENCE WITH HALBERT BRANCH TRIBUTARY 1
[2] FEET ABOVE CONFLUENCE WITH STREAM 5

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS AND INCORPORATED AREAS

FLOODWAY DATA

HALBERT BRANCH TRIBUTARY 2 – STREAM 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
STREAM 3								
A	4,220[1]	192	308	3.0	431.9	431.9	432.9	1.0
B	5,440[1]	64	141	3.9	440.7	440.7	441.6	0.9
C	5,814[1]	160	224	2.1	443.9	443.9	444.5	0.6
D	6,949[1]	22	71	4.8	453.0	453.0	453.6	0.6
E	7,175[1]	18	54	6.3	456.4	456.4	456.8	0.4
F	7,651[1]	17	75	4.0	463.5	463.5	464.4	0.9
STREAM 3 TRIBUTARY 1								
A	778[2]	45	106	3.6	441.7	441.7	442.1	0.4
B	1,279[2]	78	424	0.8	447.9	447.9	448.9	1.0
C	1,757[2]	19	86	3.8	448.6	448.6	449.6	1.0
D	2,569[2]	17	65	3.8	453.9	453.9	454.3	0.4

[1] FEET ABOVE CONFLUENCE WITH EAST BOGUE CHITTO RIVER
[2] FEET ABOVE CONFLUENCE WITH STREAM 3

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS AND INCORPORATED AREAS

FLOODWAY DATA

STREAM 3 – STREAM 3 TRIBUTARY 1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
STREAM 5								
A	13,128[1]	235	1493	0.5	470.7	470.7	471.7	1.0
B	14,269[1]	45	140	2.8	472.1	472.1	472.6	0.5
C	14,369[1]	77	183	2.1	472.7	472.7	473.1	0.4
D	14,707[1]	134	489	1.4	474.1	474.1	475.1	1.0
E	15,582[1]	22	134	1.8	474.5	474.5	475.5	1.0
STREAM 6								
A	2,100[2]	172	379	4.8	467.2	467.2	467.2	0.0
B	2,776[2]	116	306	4.9	471.4	471.4	471.5	0.1
C	3,726[2]	98	264	4.5	472.4	472.4	473.3	0.9

[1] FEET ABOVE CONFLUENCE WITH EAST BOGUE CHITTO RIVER
[2] FEET ABOVE CONFLUENCE WITH STREAM 7

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS AND INCORPORATED AREAS

FLOODWAY DATA

STREAM 5 – STREAM 6

5.0 INSURANCE APPLICATION

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

Zone A

Zone A is the flood insurance 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 base (1-percent annual chance) flood elevations (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 AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 1-percent annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within the zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 1-percent annual chance shallow flooding (usually sheet flow on sloping terrain) where the average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within the zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 1-percent floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 1-percent coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 1-percent coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

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 base flood by levees. No BFEs or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

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 Lincoln 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 (FBFMs), where applicable. Historical data relating to the maps prepared for each community, up to and including this countywide FIS are presented in Table 3, "Community Map History."

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
City of Brookhaven	January 24, 1975	--	July 18, 1977	January 7, 2000
Lincoln County (Unincorporated Areas)	February 17, 1978	--	March 18, 1991	January 7, 2000

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS

AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

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

8.0 LOCATION OF DATA

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

9.0 BIBLIOGRAPHY AND REFERENCES

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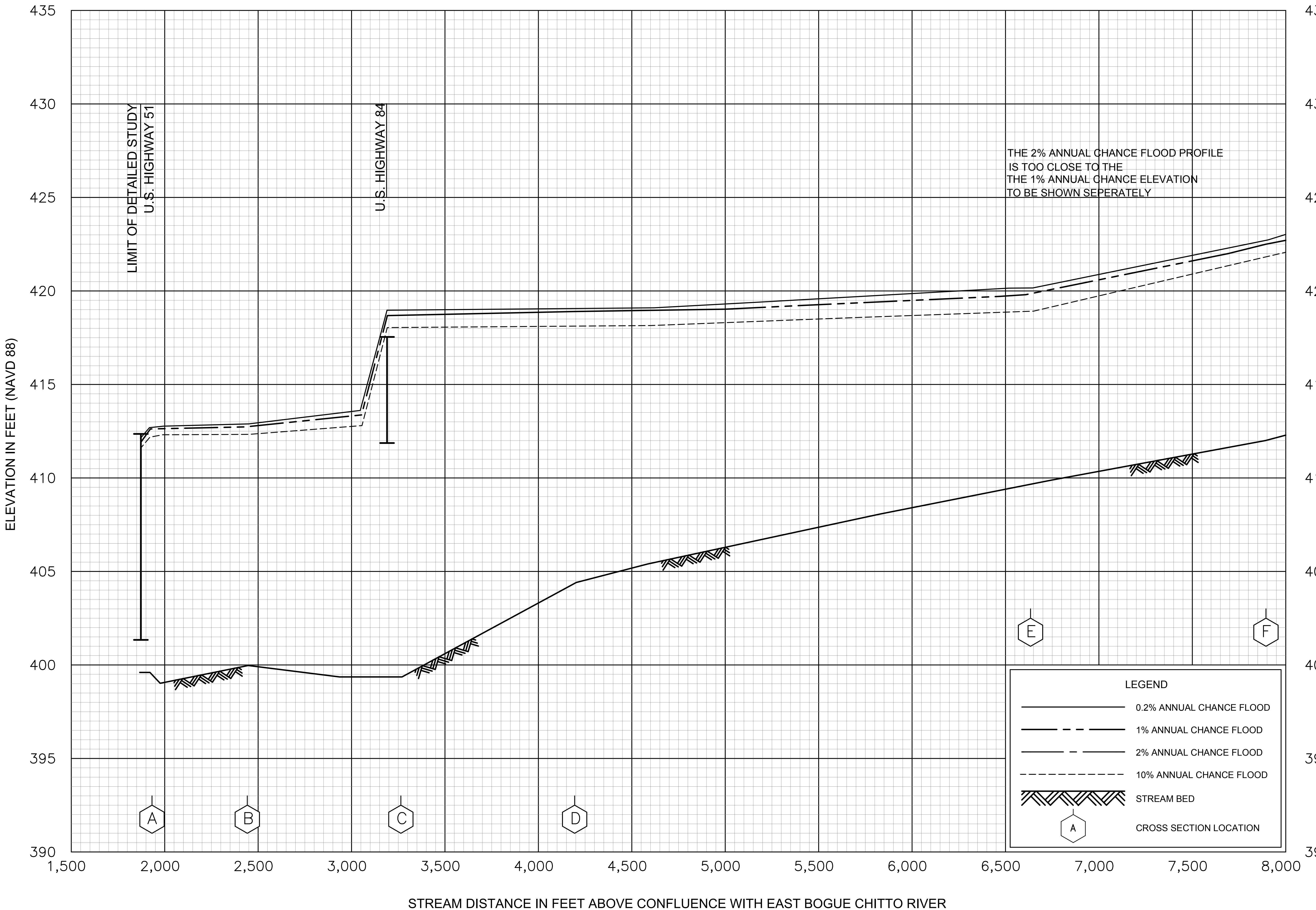
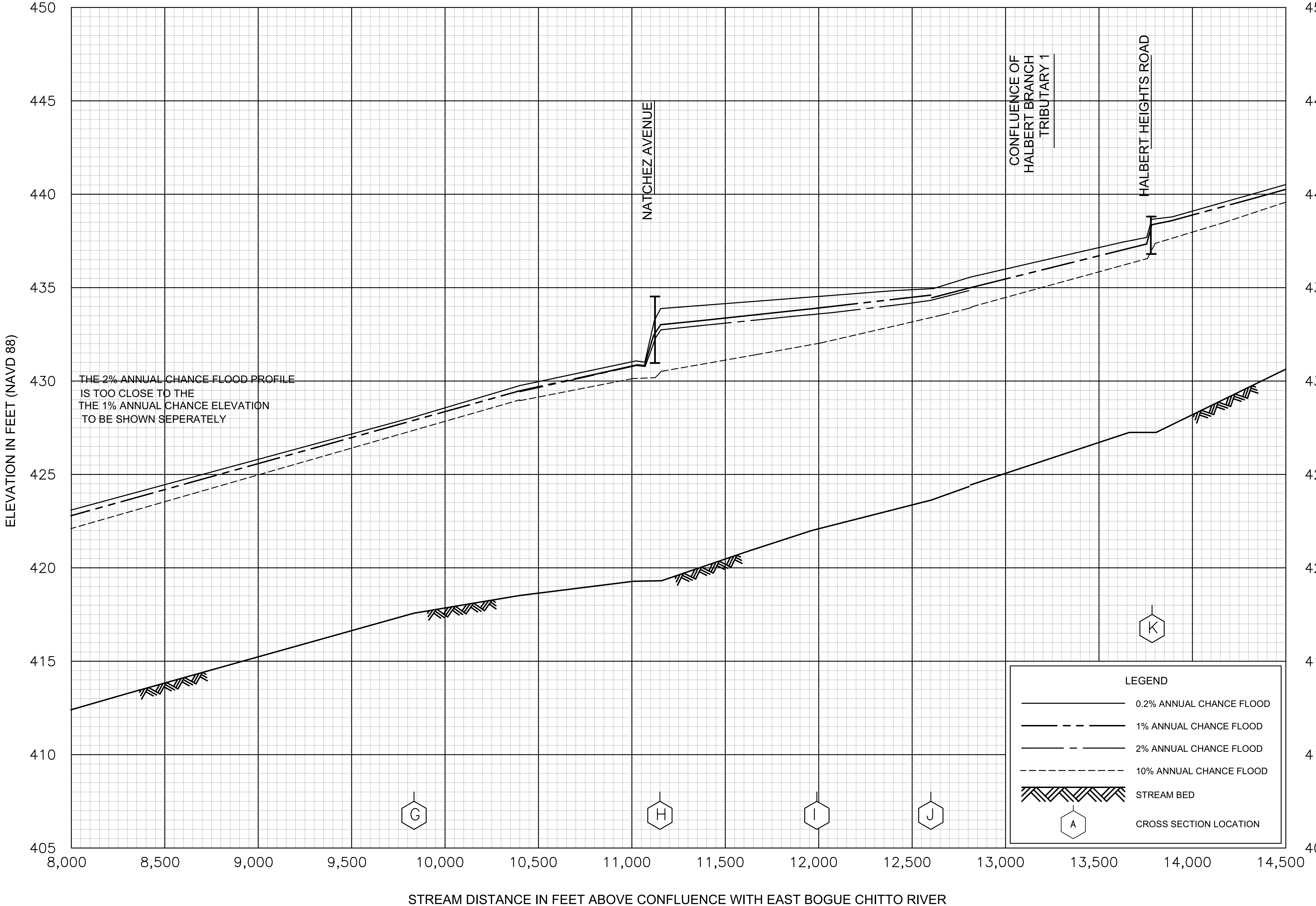

ELEVATION IN FEET (NAVD 88)
435
430
425
420
415
410
405
400
395
390
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
5,500
6,000
6,500
7,000
7,500
8,000
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH EAST BOGUE CHITTO RIVER
LIMIT OF DETAILED STUDY
U.S. HIGHWAY 51
U.S. HIGHWAY 84
THE 2% ANNUAL CHANCE FLOOD PROFILE
IS TOO CLOSE TO THE
THE 1% ANNUAL CHANCE ELEVATION
TO BE SHOWN SEPERATELY
A
B
C
D
E
F
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION



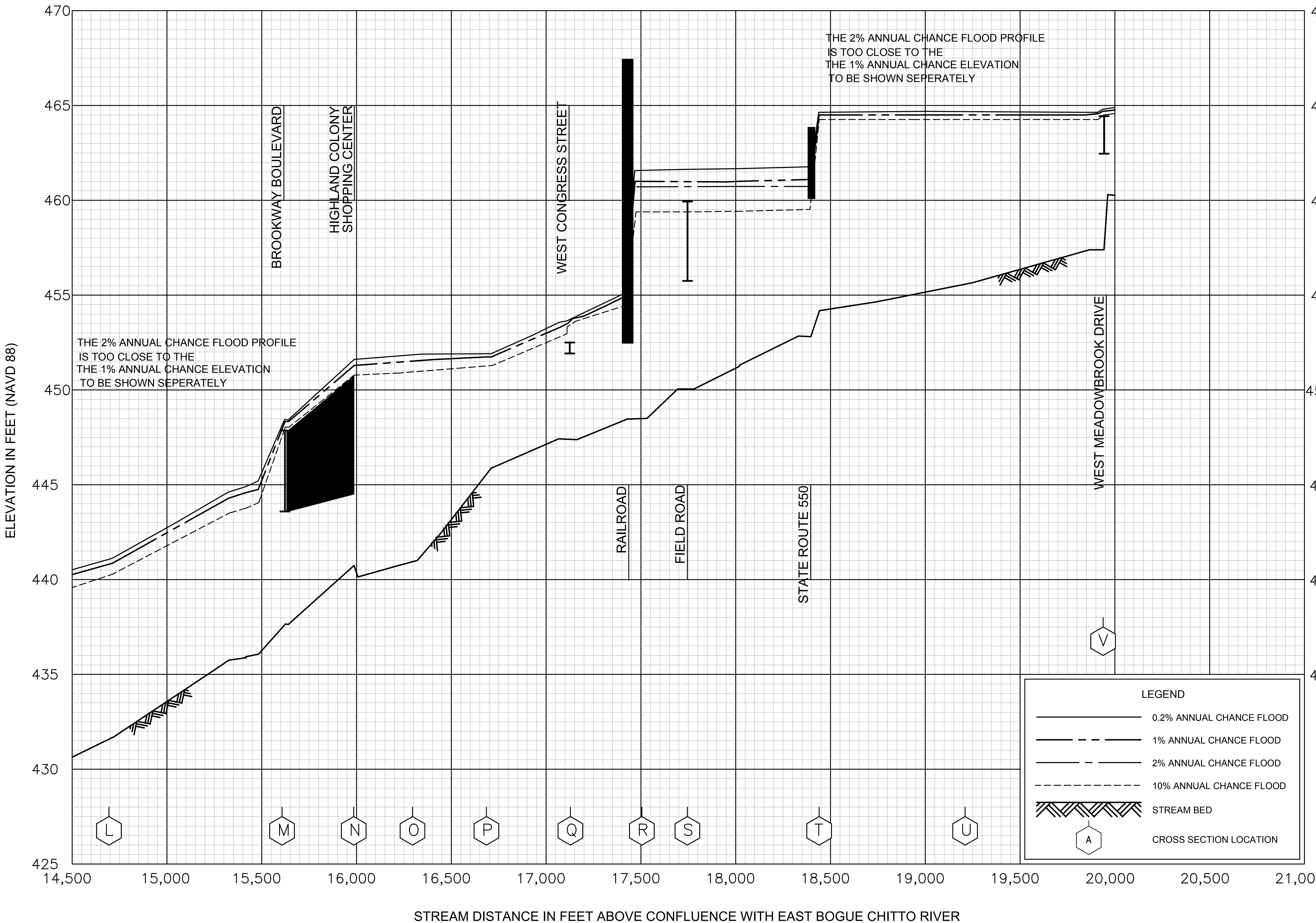
FLOOD PROFILES

HALBERT BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS
AND INCORPORATED AREAS

02P



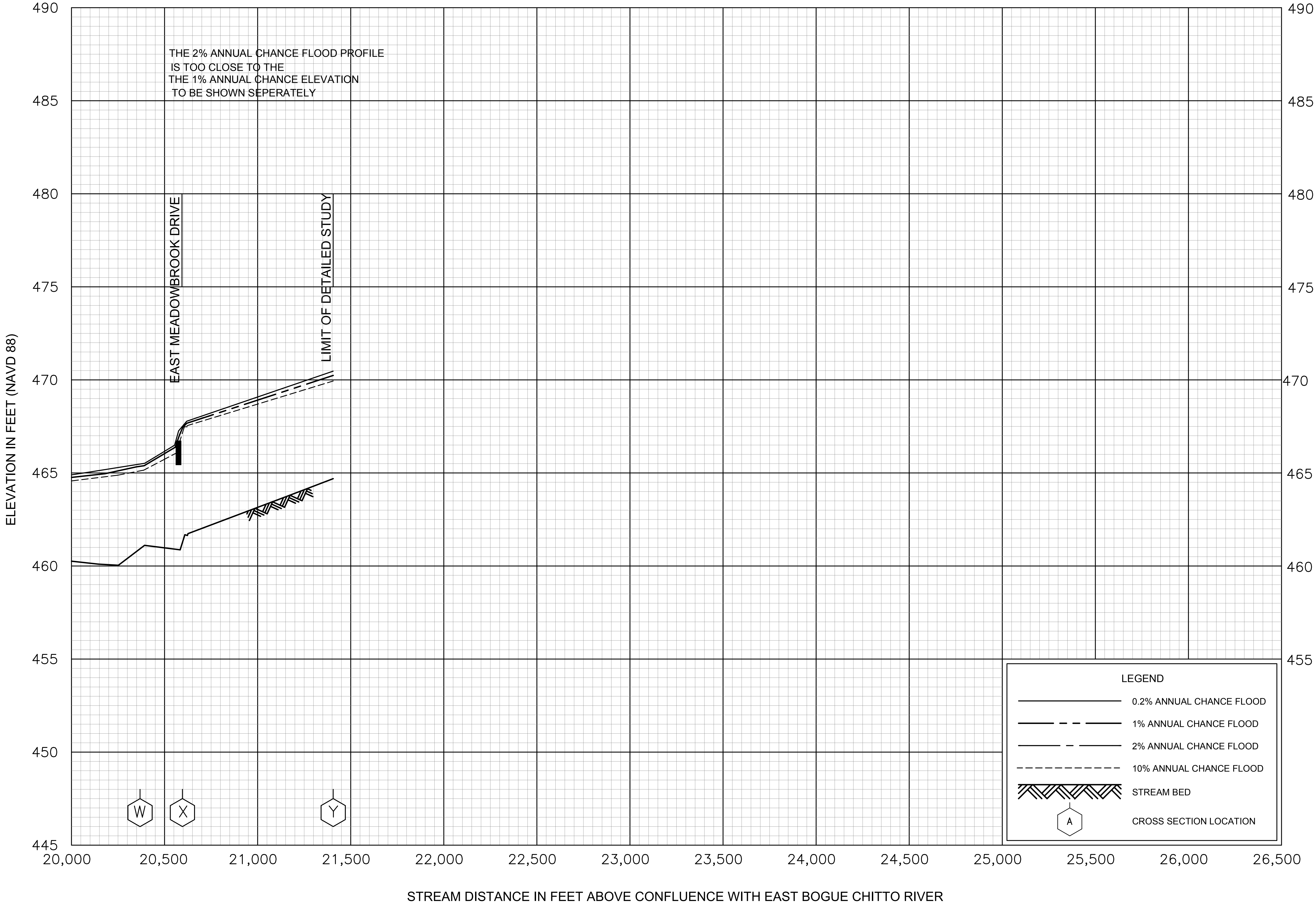
FLOOD PROFILES

HALBERT BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS
AND INCORPORATED AREAS

03P



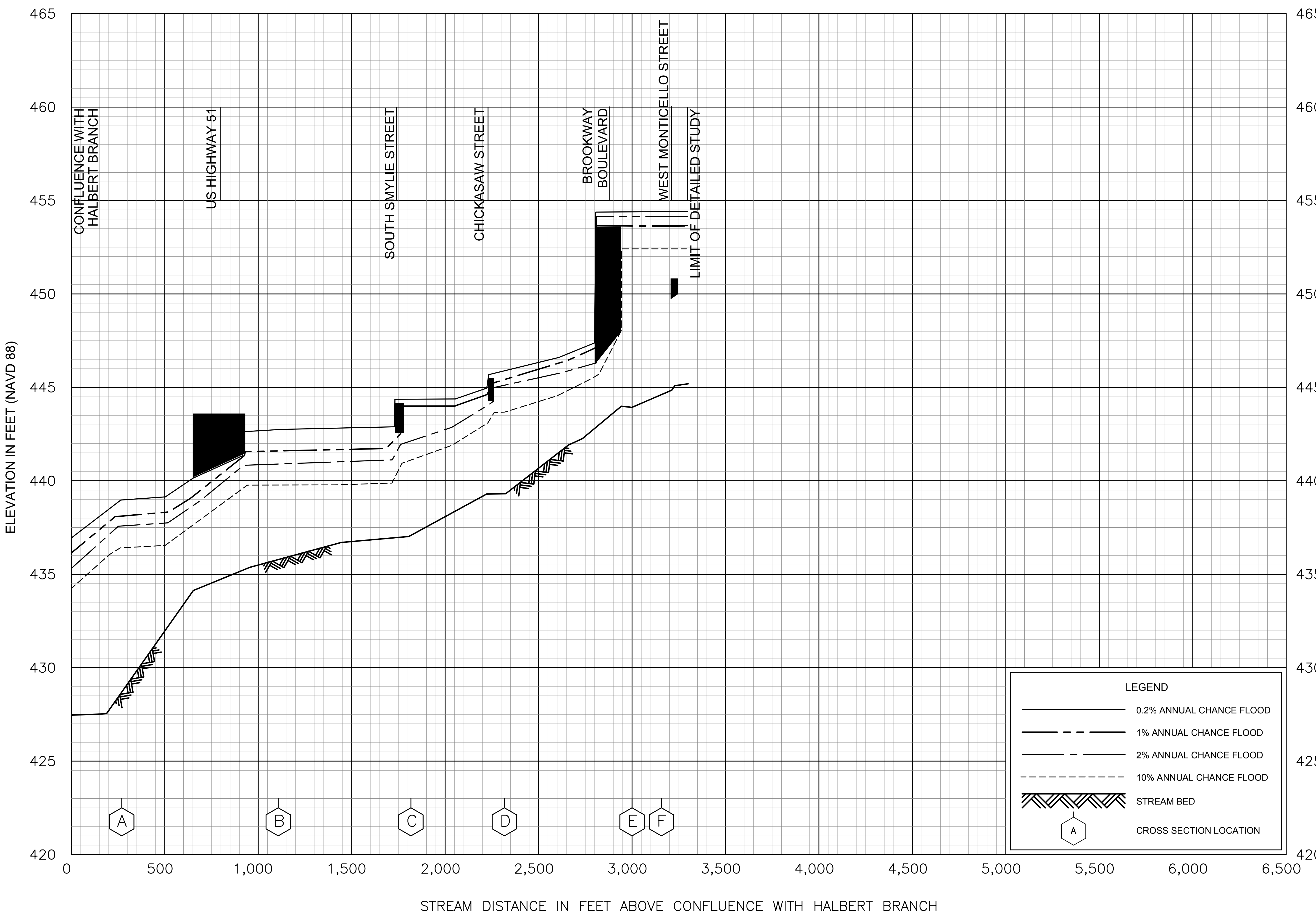
FLOOD PROFILES

HALBERT BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS
AND INCORPORATED AREAS

04P



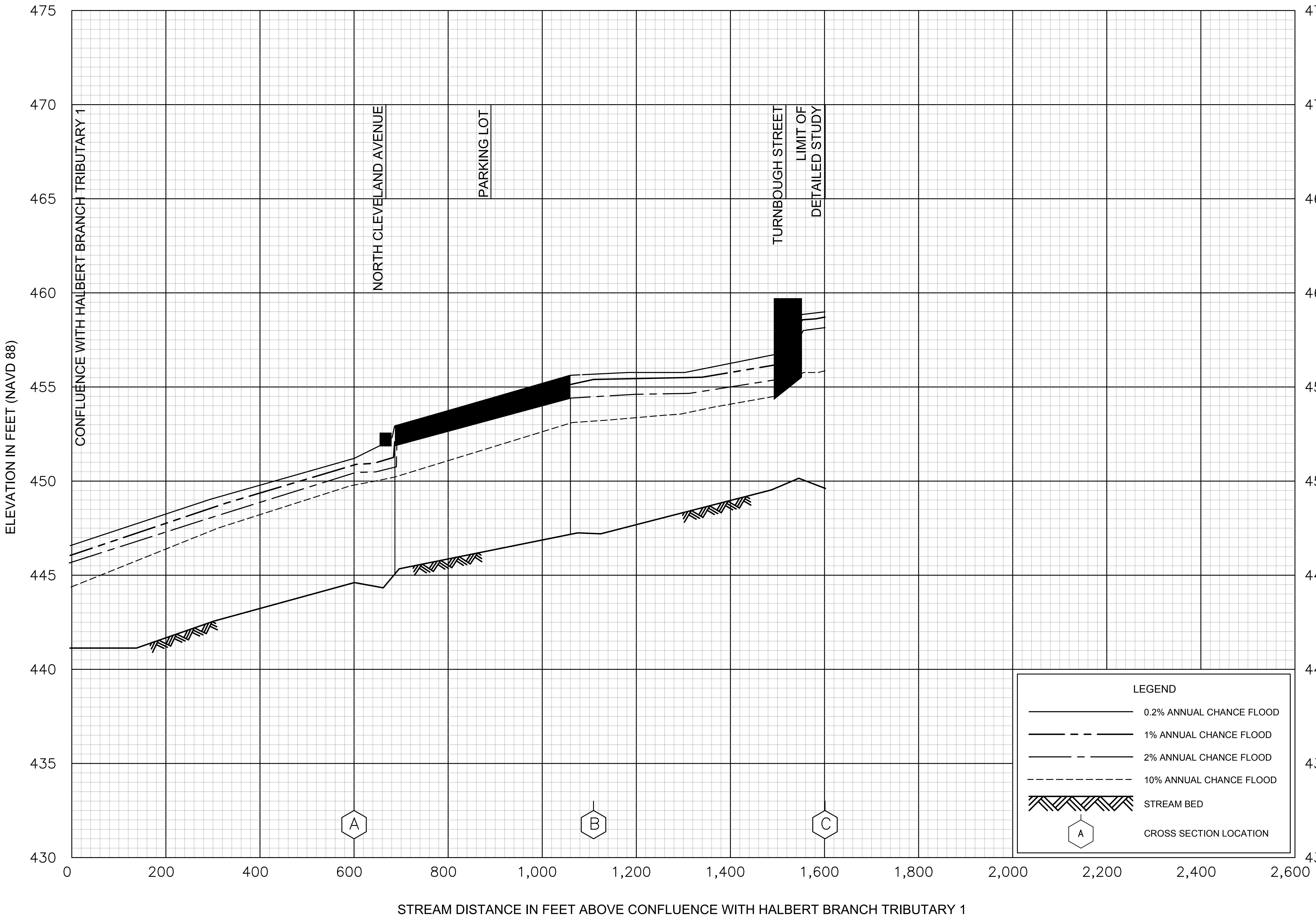
FLOOD PROFILES

HALBERT BRANCH TRIBUTARY 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS
AND INCORPORATED AREAS

05P



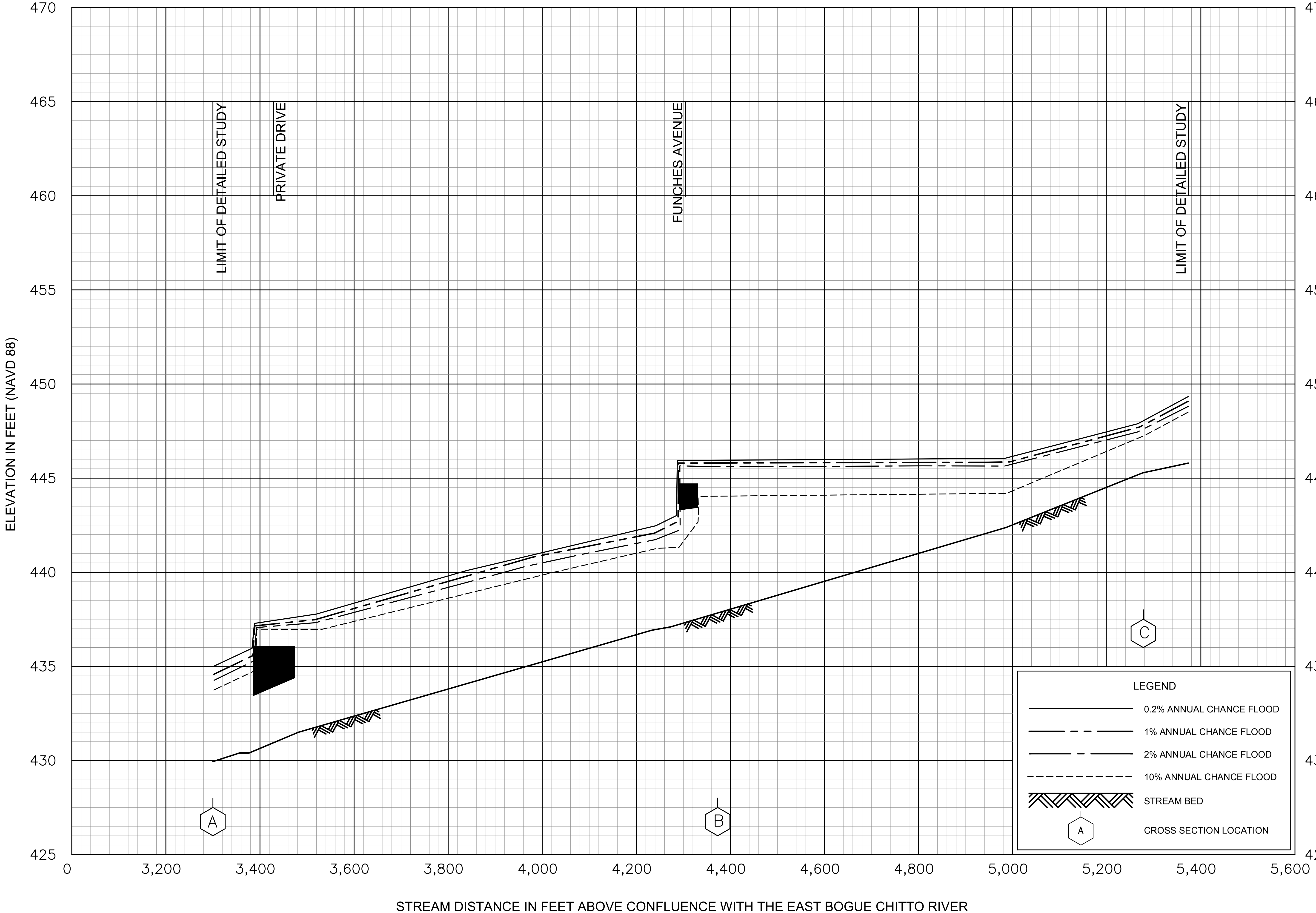
FLOOD PROFILES

HALBERT BRANCH TRIBUTARY 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS
AND INCORPORATED AREAS

06P



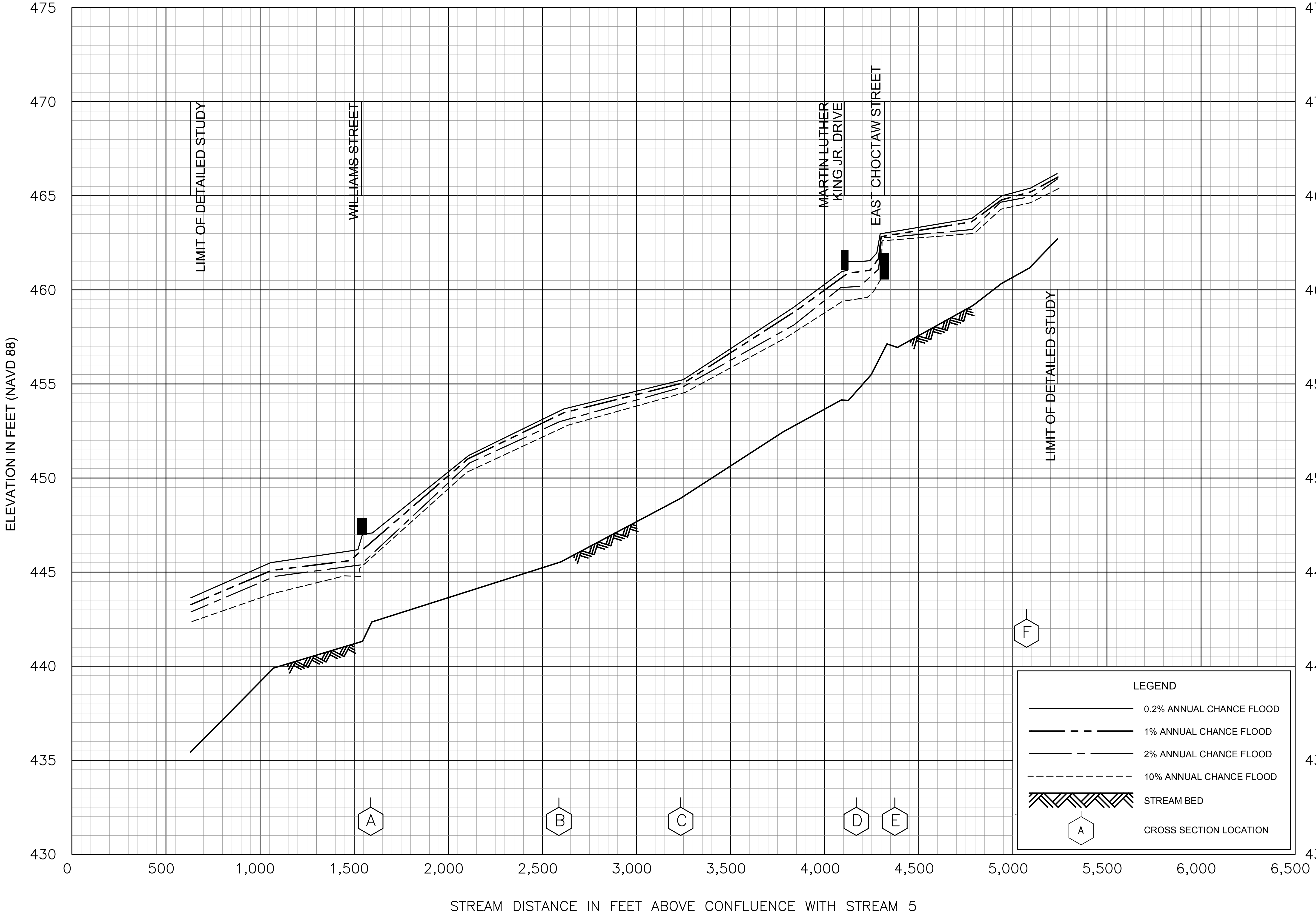
FLOOD PROFILES

STREAM 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS
AND INCORPORATED AREAS

07P

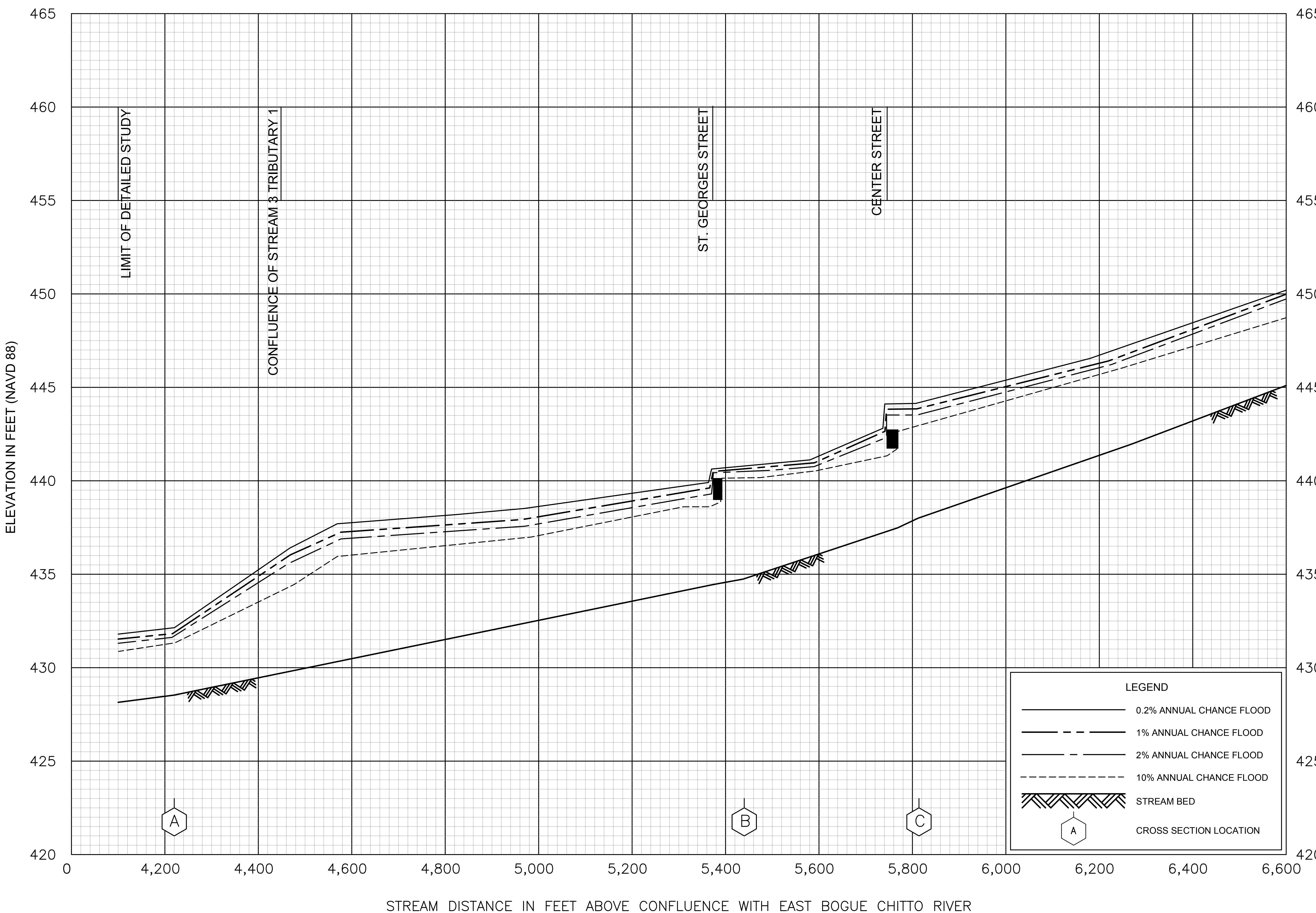


FLOOD PROFILES

STREAM 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS
AND INCORPORATED AREAS



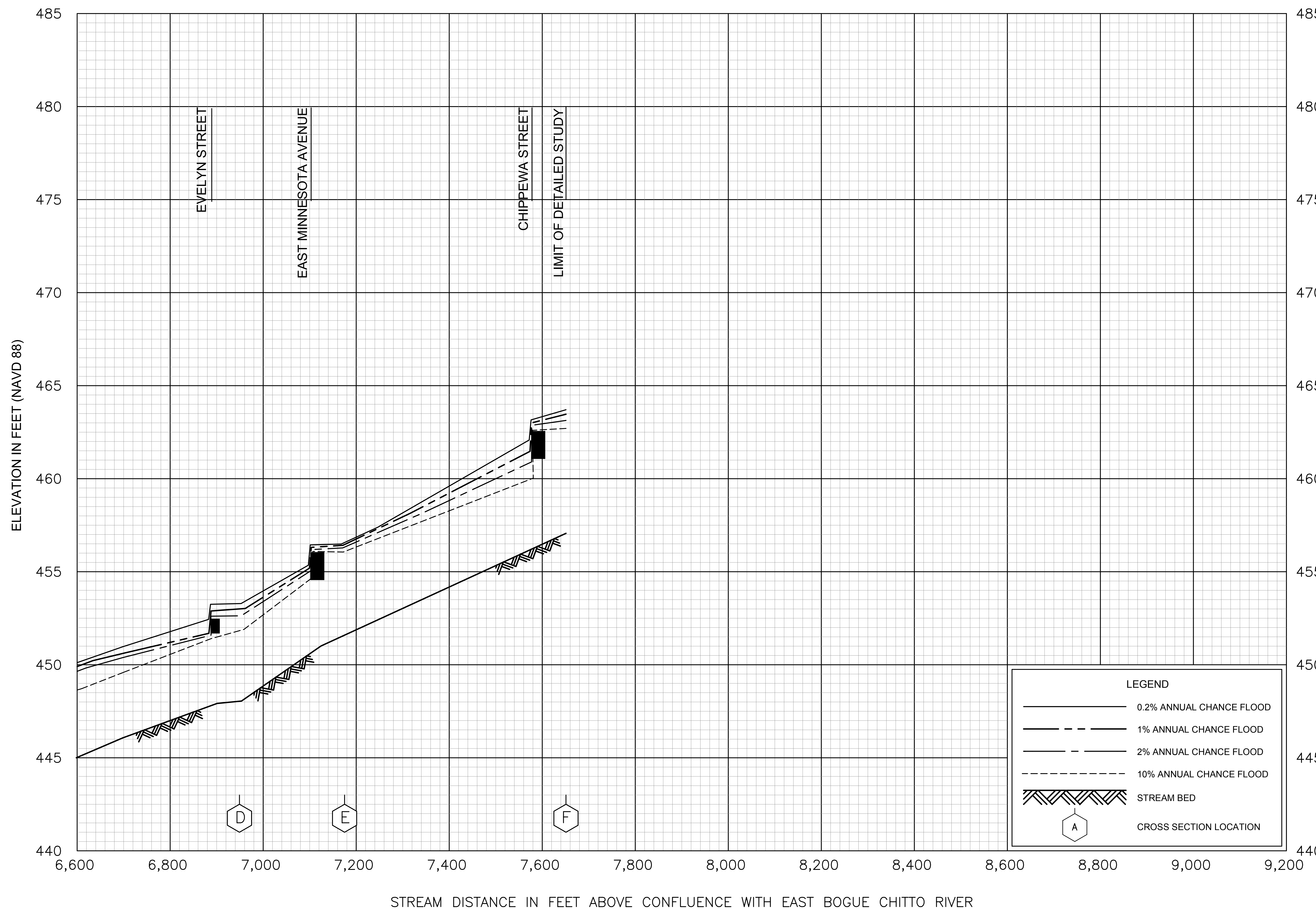
FLOOD PROFILES

STREAM 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS
AND INCORPORATED AREAS

09P



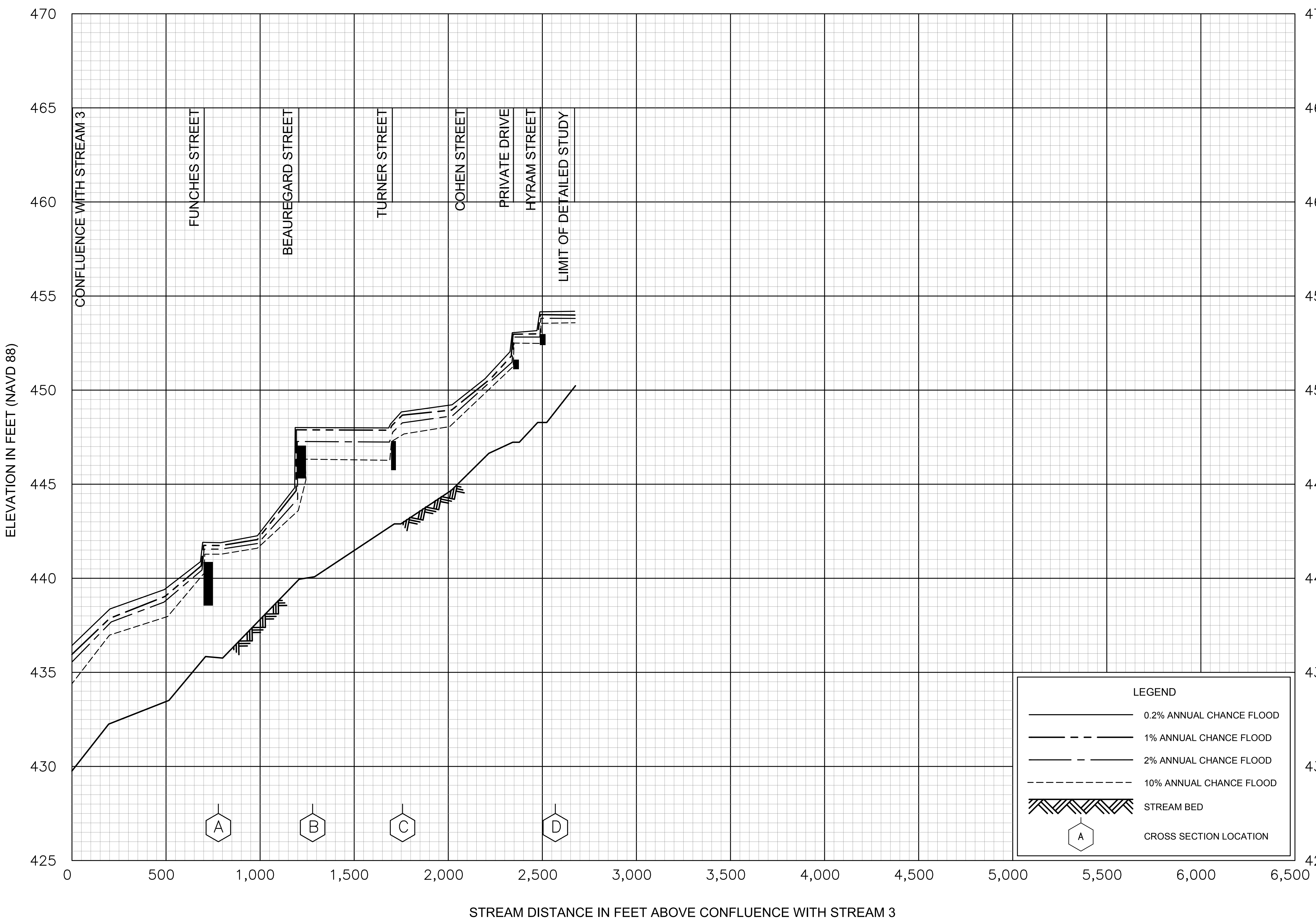
FLOOD PROFILES

STREAM 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS
AND INCORPORATED AREAS

10P



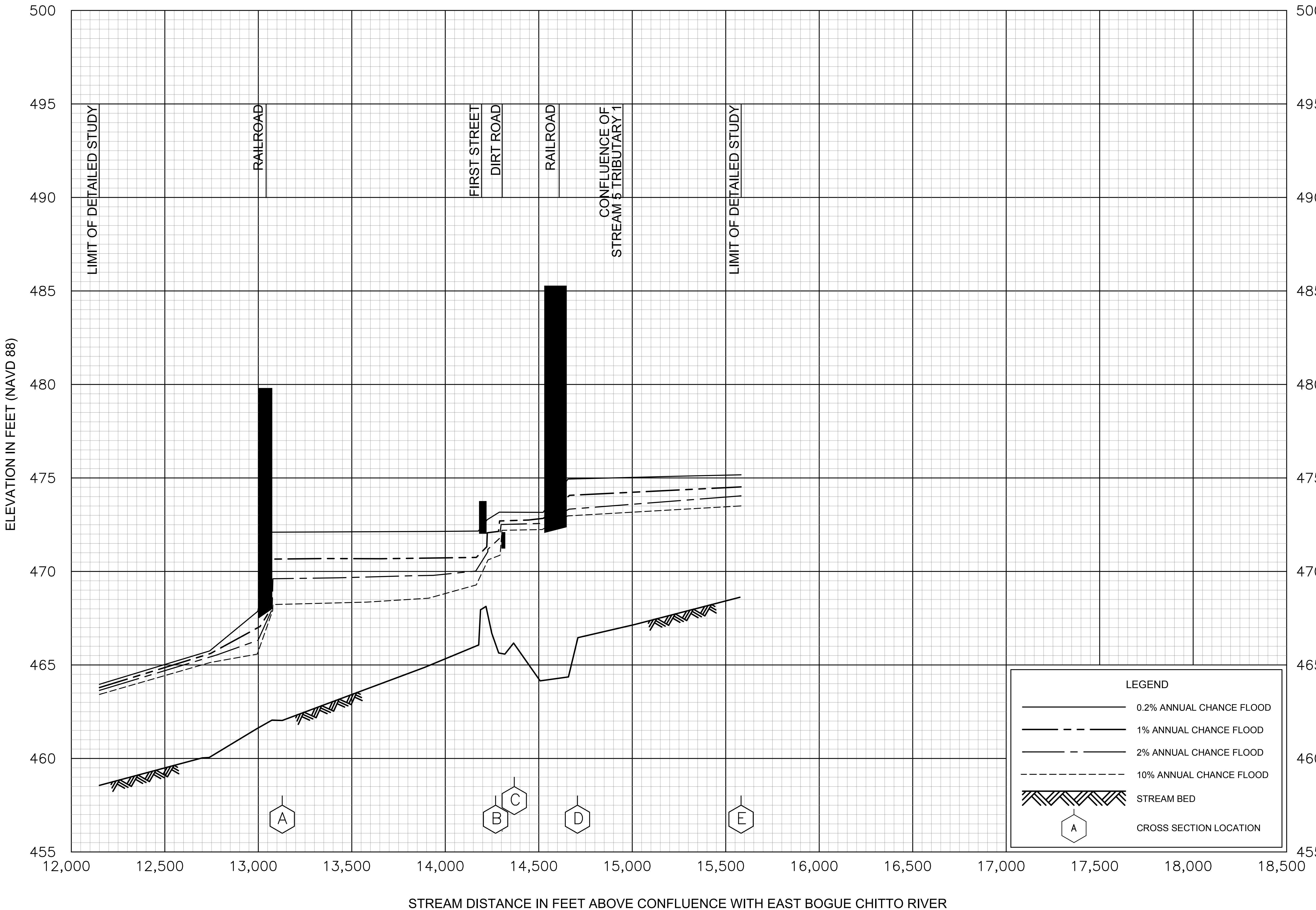
FLOOD PROFILES

STREAM 3 TRIBUTARY 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS
AND INCORPORATED AREAS

11P



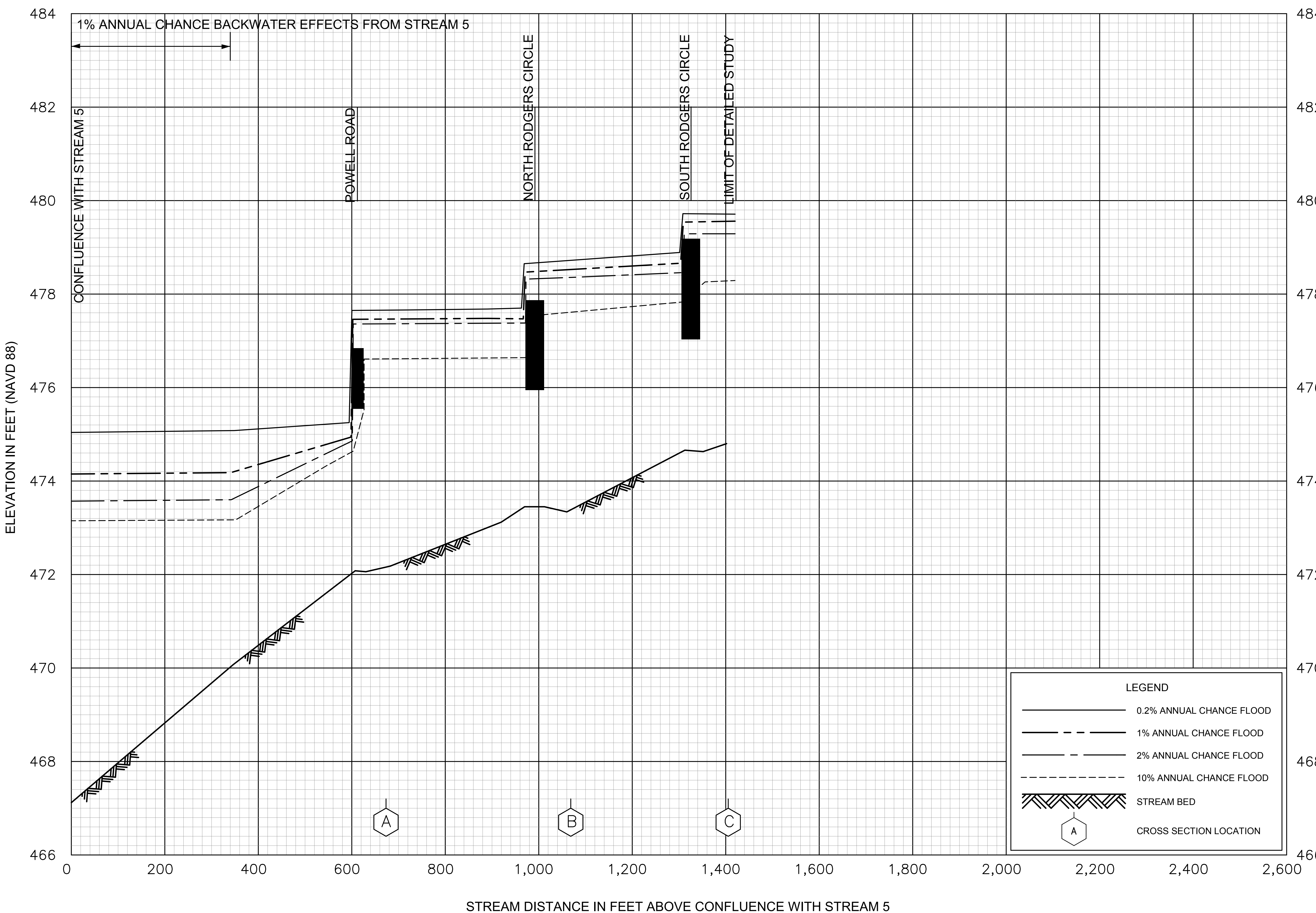
FLOOD PROFILES

STREAM 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS
AND INCORPORATED AREAS

12P



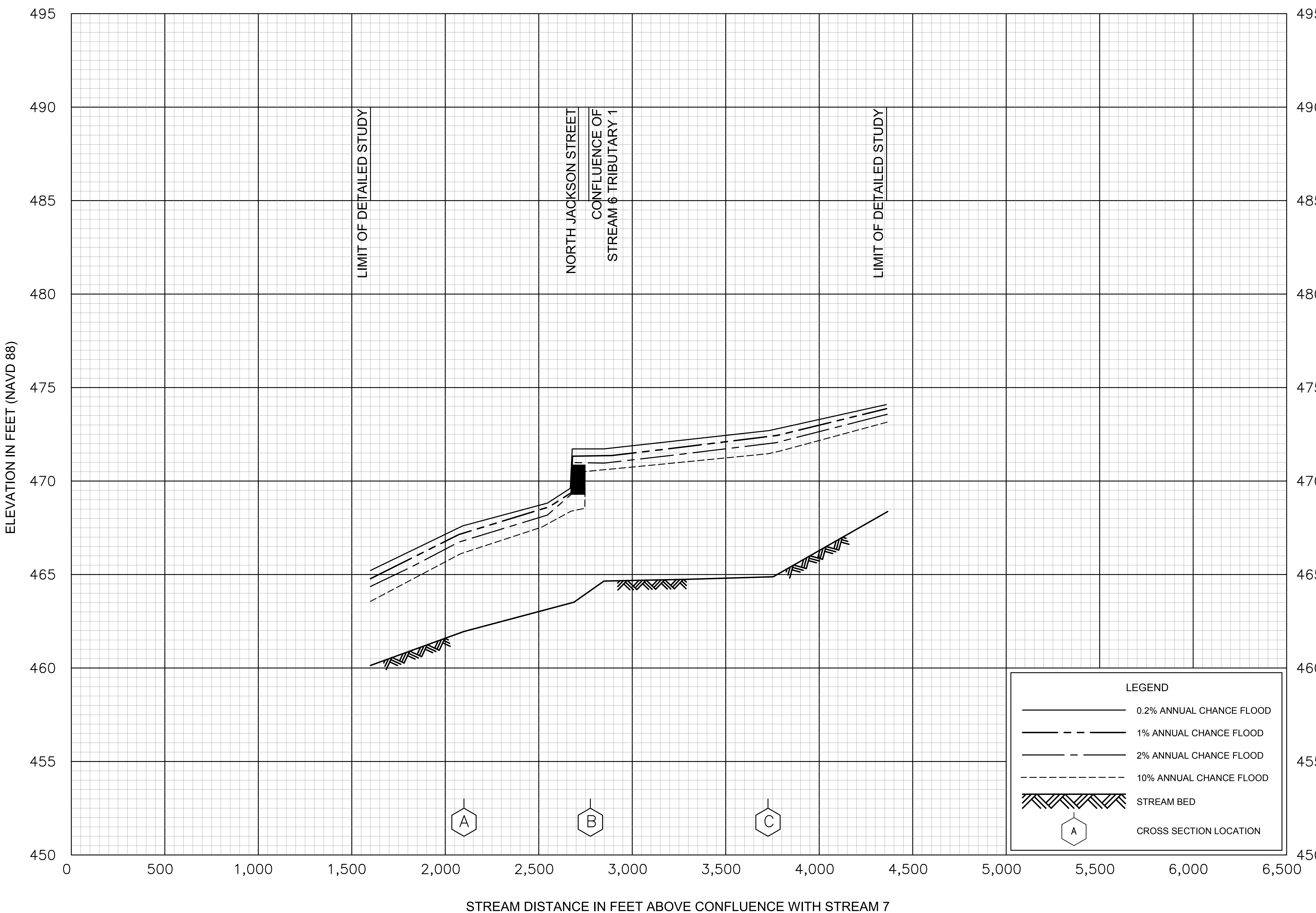
FLOOD PROFILES

STREAM 5 TRIBUTARY 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS
AND INCORPORATED AREAS

13P



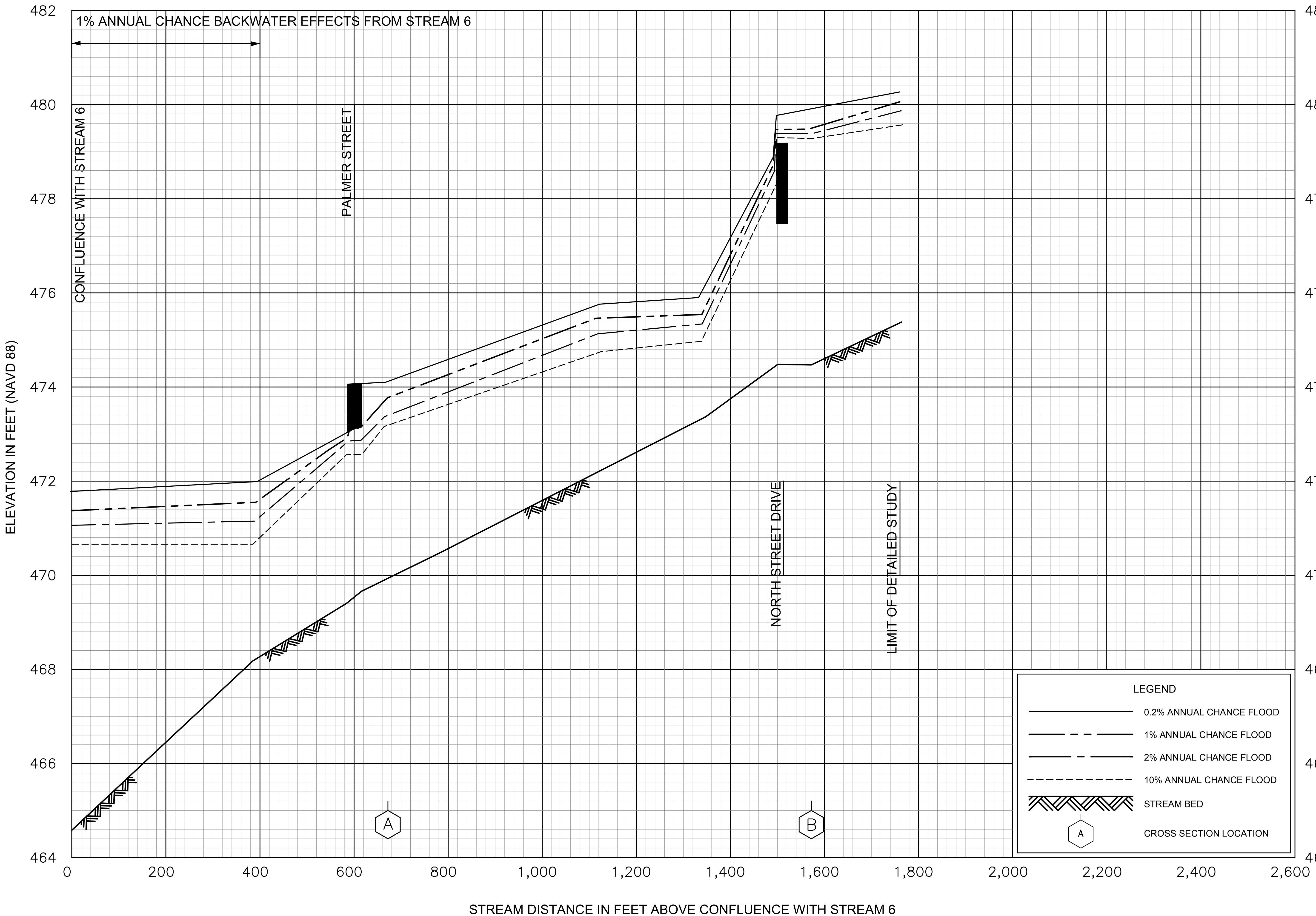
FLOOD PROFILES

STREAM 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS
AND INCORPORATED AREAS

14P



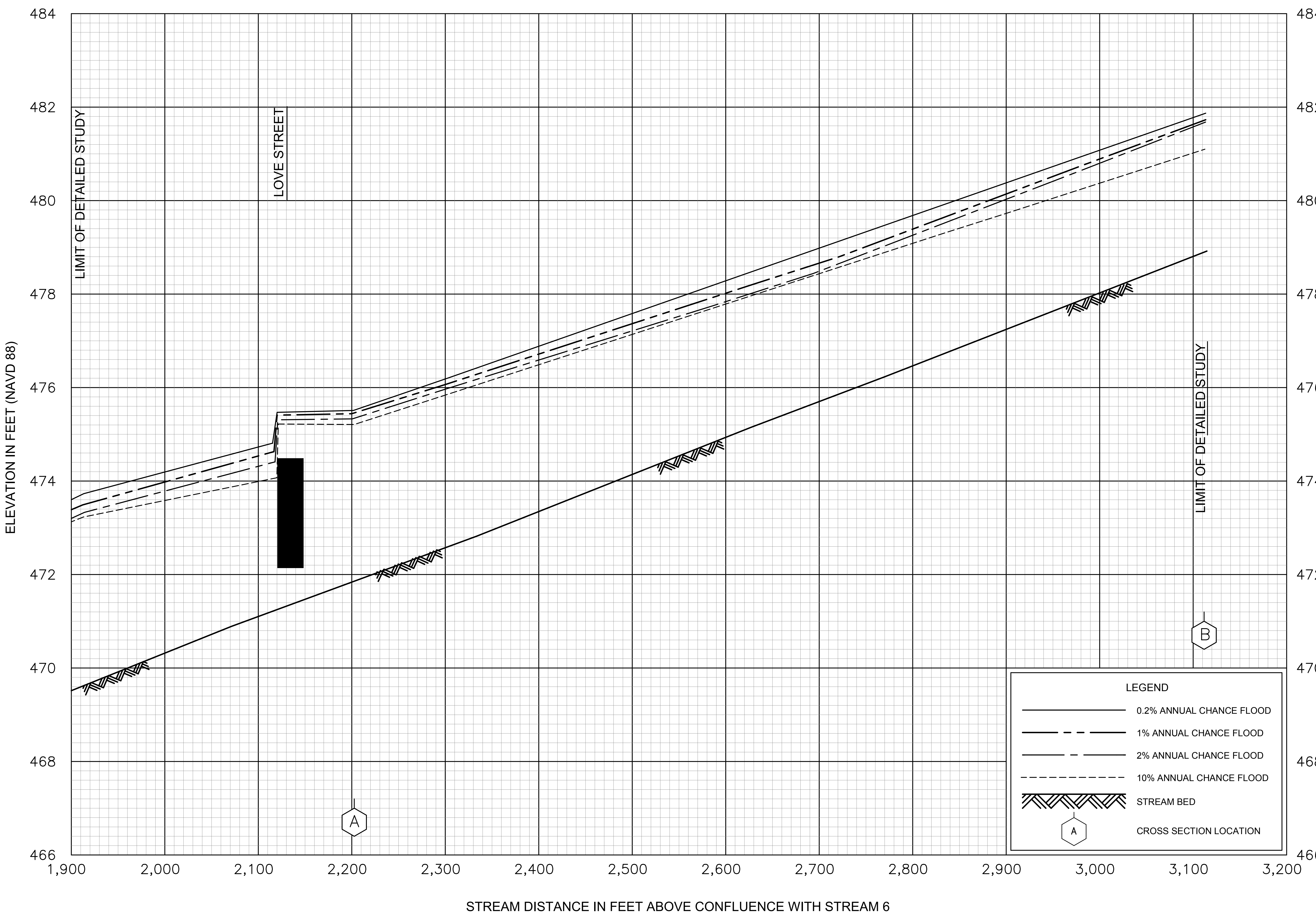
FLOOD PROFILES

STREAM 6 TRIBUTARY 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS
AND INCORPORATED AREAS

15P



FLOOD PROFILES

STREAM 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

LINCOLN COUNTY, MS

AND INCORPORATED AREAS

16P