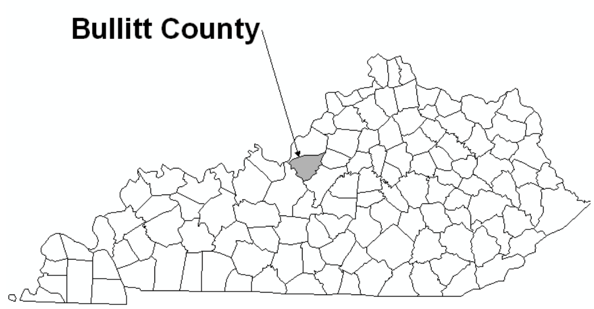
FLOOD INSURANCE STUDY

BULLITT COUNTY, KENTUCKY

AND INCORPORATED AREAS



COMMUNITY NAME	COMMUNITY NUMBER
BULLITT COUNTY (UNINCORPORATED AREAS)	210273
FOX CHASE, CITY OF	210385
HEBRON ESTATES, CITY OF	210386
HILLVIEW, CITY OF	210384
HUNTERS HOLLOW, CITY OF*	210387
LEBANON JUNCTION, CITY OF	210304
MOUNT WASHINGTON, CITY OF	210382
PIONEER VILLAGE, CITY OF*	210383
SHEPHERDSVILLE, CITY OF	210028

*No Special Flood Hazard Areas Identified

PRELIMINARY

10/25/2013

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
21029CV000B

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) report may not contain all data available within the Community Map Repository. It is advisable to 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 at any time. In addition, FEMA may revise part of this FIS report by the Letter of Map Revision (LOMR) 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.

Initial Countywide FIS Effective Date: December 16, 2004

Revised Countywide FIS Date:

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FLOOD INSURANCE STUDY

BULLITT COUNTY, KENTUCKY AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This countywide Flood Insurance Study (FIS) revises and supersedes the FIS reports and Flood Insurance Rate Maps (FIRMs) in the geographic area of Bullitt County, Kentucky, including the Cities of Fox Chase, Hebron Estates, Hillview, Lebanon Junction, Mount Washington, and Shepherdsville, and the unincorporated areas of Bullitt County (hereinafter referred to collectively as Bullitt County). No special flood hazard areas were identified in the City of Hunters Hollow and City of Pioneer Village. 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 county that will be used to establish actuarial flood insurance rates. This information will also be used by Bullitt 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 Acknowledgements

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

This FIS was prepared to include incorporated communities within Bullitt County and unincorporated areas within Bullitt County into a countywide FIS. For the City of Shepherdsville, Kentucky, January 2, 1987, FIS, the hydrologic and hydraulic analyses were prepared by the U.S. Army Corps of Engineers (USACE), Louisville District, for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-84-E-1506, Project Order No.1. That work was completed in July 1985.

The authority and acknowledgments for the Cities of Fox Chase, Hebron Estates, Hillview, Lebanon Junction, Mount Washington, Pioneer Village, and the unincorporated areas of Bullitt County are not included because there were no previously printed FIS reports for these communities.

For the initial countywide FIS, the hydrologic and hydraulic analyses were prepared by Ogden Environmental and Energy Services for FEMA, under Contract No. EMA-98-CO-0089. This work was completed in September 1999.

For this countywide FIS, the hydrologic and hydraulic analyses were prepared by Stantec Consulting Services, under Contract No. PON2-129-100000-1351. This work was completed in January 2011. The analyses for the Ohio River were taken from the Metropolitan Government of Louisville and Jefferson County, Kentucky and Incorporated Areas FIS (FEMA), and were prepared by the U.S. Army Corps of Engineers (USACE), Louisville District, for FEMA, under Inter-Agency Agreement No. EMA-2009-CA-5931, Project Order No. XX. This study was completed in Month, Year.

The digital base mapping information was provided by Louisville / Jefferson County Information Consortium (LOJIC), 700 West Liberty Street, Louisville, Kentucky 40203-1911. LOJIC represents a multi-agency effort between Louisville – Jefferson County Metro Government, MSD, the Property Valuation Administrator, and the Louisville Water Company. The coordinate system used for the production of this DFIRM is the Kentucky Coordinate System, Single Zone, North American Datum of 1983 (NAD83). All elevation data are based on the North American Vertical Datum of 1988 (NAVD88). The DFIRM units are in U.S. Feet. Differences in the datum and spheroid used in the production of FIRMs for adjacent counties may result in slight positional differences in map features at the county boundaries. These differences do not affect the accuracy of information shown on these new DFIRMs.

1.3 Coordination

Consultation Coordination Officer's (CCO) meetings may be held for each jurisdiction in this countywide FIS. An initial CCO meeting is held typically with representatives of 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 typically with representatives of FEMA, the community, and the study contractor to review the results of the study.

For the City of Shepherdsville, Kentucky, January 2, 1987, FIS, an initial CCO meeting was held in February 1984, and a final CCO meeting was held on December 10, 1985. Both of these meetings were attended by representatives of the City of Shepherdsville, the study contractor, and FEMA.

For the previous countywide FIS, an initial CCO meeting was held on May 18, 1998. This meeting was attended by representatives of the communities, the study contractor, and FEMA. All communities were notified of this countywide FIS by letters dated June 26, 2000.

A final CCO meeting was held on September 29, 2003, and was attended by representatives of the Cities of Lebanon Junction and Shepherdsville, the county, the State, and FEMA.

For this countywide FIS, an initial CCO meeting was held on April 13, 2010. This meeting was attended by representatives of Bullitt County, the City of Shepherdsville, Kentucky Division of Water, and Stantec Consulting Services.

The results of the study were reviewed at the final CCO meeting held on ________, and attended by representatives of FEMA, Bullitt County, and the study contractor. All problems raised at the meeting have been addressed.

2.0 AREA STUDIED

2.1 Scope of Study

This new FIS covers the geographic area of Bullitt County, Kentucky including the incorporated communities listed in Section 1.1 and unincorporated areas.

All or portions of the flooding sources listed in Table 1, "Flooding Sources Studied by Detailed Methods for 2004 FIS," were studied by detailed methods for the 2004 FIS and FIRMs. The floodplains for these flooding sources were redelineated for the new FIS and FIRMs using data from the 2004 FIS and FIRMs. Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRMs (Exhibit 2) where applicable.

TABLE 1 - FLOODING SOURCES STUDIED BY DETAILED METHODS FOR 2004 FIS

Brooks Run	Knob Creek Tributary (Curry Branch)
Bullitt Lick Creek	Long Lick Creek
Crooked Creek	Mud Run
Floyds Fork	Ohio River
Gravel Creek	Salt River
Knob Creek	Whittaker Run

As part of this countywide FIS, updated analyses were included for the flooding sources shown in Table 2, "Scope of Revision." The following streams were studied by detailed methods: Pennsylvania Run and Salt River

TABLE 2 - SCOPE OF REVISION

Flooding Source	Limits of New Detailed or Limited Detailed Study
Bethel Branch	From 1500 feet upstream of confluence with Floyds Fork to 1400 feet upstream of Bethel Church Road
Brier Creek	From CSX Railroad to 1.0 miles upstream of Bearcamp Road
Cedar Creek	From approximately 220 feet upstream of confluence with Floyds Fork to Thixton Lane
Floyds Fork	From just upstream of the confluence with Brooks Run to the county boundary
Pennsylvania Run	From the confluence with Cedar Creek to the county boundary
Sportsman Run	From approximately 840 feet upstream of the confluence with Floyds Fork to approximately 1.8 miles upstream of the Bardstown Road

Flooding Source	Limits of New Detailed or Limited Detailed Study
Wells Run	From approximately 1260 feet upstream of the confluence with Floyds Fork to approximately 0.7 miles upstream of confluence with Wells Run Tributary.

This study will refine and supersede the 2004 FIS in mapping, stream mile determination, drainage area subdivision, and discharges.

Table 3, "Stream Name Changes" lists streams that have names in this new FIS other than those used in the 2004 FIS.

TABLE 3 - STREAM NAME CHANGES

Old Name	New Name	Location
Bullitt Lick Creek	Gravel Creek	From confluence with Bullitt Lick Creek to confluence with Mud Run
Knob Creek Tributary	Curry Branch	From confluence with Upper Mill Creek to confluence with Big Run Creek and Big Run Diversion.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction.

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 Bullitt County.

2.2 Community Description

Bullitt County lies in north-central Kentucky and is bordered by Jefferson County to the south, Spencer County to the northeast, Nelson County to the southeast, and Hardin County to the southwest. The Ohio, Salt, and Rolling Rivers bound Bullitt County to the west, and West Fork and Wilson Creeks to the southeast. The Salt River bisects the county from east to west. Bullitt County's western tip touches the Ohio River. The City of Shepherdsville is the county seat and is centrally located within the county. Connecting Louisville, Kentucky, with Nashville, Tennessee, Interstate 65 bisects the county from north to south.

The topography of Bullitt County is diverse. The northeastern part of the county is in the Outer Bluegrass physiographic region, which is characterized by broad hilltops and sloping hillsides. The southern and western parts of Bullitt County are in the Knobs region, characterized by conical shaped hills and long, narrow sloping ridges in the southeast and very steep hillsides capped with broad ridges in the western part of the county. West of Shepherdsville, the Salt River valley opens into an area of broad, slack water stream terraces interrupted only by the knobs. The Rolling Fork River valley is also a broad area of slack water stream terraces.

Bullitt County was established in 1796 from parts of Jefferson and Nelson Counties. It was named in honor of Kentucky's first Lieutenant Governor, Alexander S. Bullitt. Bullitt's Lick, about 3 miles from Shepherdsville, was the first salt works established in Kentucky and was the most important salt works west of the Alleghenies during pioneer days. During the mid-1800s, deposits of low-grade iron ore were smelted into "pig iron" in three large furnaces located in the county. Shepherdsville, the county seat, was organized in 1973 by Adam Shepherd. Mount Washington, incorporated in 1882, was a major crossroad for stagecoach lines between Louisville, Bardstown, Shepherdsville, and Taylorsville. Lebanon Junction was established in the 1850s as a railroad station and prospered as a railroad town for many years.

In winter, the average temperature is 35 degrees Fahrenheit (°F), and the average daily minimum temperature is 25°F. The lowest temperature of record, which occurred at Bernheim Forest on January 17, 1977, was 19°F. In summer, the average temperature is 75°F, and the average daily maximum temperature is 87°F. The highest recorded temperature, which occurred at Bernheim Forest on July 17, 1980, was 102°F. The average seasonal rainfall is 50 inches.

Many residents of Bullitt County commute to work in the Louisville metropolitan area. Greater Louisville comprises seven counties: Jefferson, Oldham, and Bullitt Counties in Kentucky; and Clark, Floyd, Harrison, and Scott Counties across the Ohio River in Indiana. The combined population of the Greater Louisville area is estimated to exceed one million residents. As industry and the economy grow in Louisville, the surrounding counties are also experiencing growth.

Most manufacturing within Bullitt County occurs in Shepherdsville and is shipped throughout the eastern and Midwestern United States. Also, specialized lock systems are produced in Shepherdsville and shipped worldwide. The distilling industry is important to the economy of Bullitt County and employs about 600 people. Bourbon whiskey is shipped from the distillery at Clermont to all states and over 100 countries. Two limestone quarries are operated in Bullitt County. The limestone is used for road materials and agricultural lime. One quarry excavates soft greenish gray shale and refines it into materials to make light color concrete blocks. Another quarry removes black shale for landfill cover and road fill material.

2.3 Principal Flood Problems

Major floods have occurred in Bullitt County in January 1937, May 1961, March 1964, and March 1997. The maximum flood stage recorded was that of the 1937 flood, which reached an elevation of 453.88 feet National Geodetic Vertical Datum of 1929 (NGVD) in Shepherdsville. The May 1961 flood reached an elevation of 447.42 feet NGVD, the March 1964 flood crested at 448.08 feet NGVD, and the March 1997 flood crested at 447.50 feet NGVD. The most recent flood occurred in April 2011, and reached an elevation of 436.67 feet NGVD. These elevations were recorded at the State Highway 61 gaging station at the Salt River.

Many of the streams studies are impacted by backwater from the Salt River, Rolling Fork River, or Pond Creek.

Five United States Geological Survey (USGS) peak-flow gages exist in Bullitt County. The gages are listed in Table 4.

TABLE 4 - USGS GAGES IN BULLITT COUNTY

Watershed	Gage Number	Gage Name
Cedar Creek	03297800	Cedar Creek at Highway 1442 near Shepherdsville, KY
Floyds Fork	03298470	Floyds Fork near Shepherdsville, KY
Rolling Fork	03301630	Rolling Fork near Lebanon Junction, KY
Salt River	03298500	Salt River at Shepherdsville, KY
	03298550	Long Lick at Clermont, KY

2.4 Flood Protection Measures

A levee has been constructed along the Ohio River in the western tip of the county. Floodgates and a pump station have been installed along Pond Creek. Knob Creek joins Pond Creek approximately 0.5 mile upstream of the pump station. The levee and pump station are estimated to reduce the peak backwater stage of the Ohio River for the 1-percent-annual-chance flood event by 9 feet.

FEMA specifies that all levees must have a minimum of 3-foot freeboard against 1-percent-annual-chance flooding to be considered a safe flood protection structure. The levee along the Ohio River meets FEMA requirements for freeboard.

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

On the Salt River, approximately 35 miles upstream of Shepherdsville, the Taylorsville Lake flood control project was completed in the spring of 1983. The Taylorsville Lake project was authorized by the 1966 Flood Control Act for the purposes of flood control, general recreation, fish and wildlife recreation, and water conservation. The site of the Taylorsville Lake project is in Spencer, Nelson, and Anderson Counties. The dam site is in Spencer County and is approximately 60.0 miles above the confluence of the Salt River and the Ohio River. A seasonal pool between the elevations of 545 and 547 feet NGVD containing 5,980 acre-feet and covering 3,050 acres at an elevation of 547 feet NGVD will be maintained for recreational purposes. A storage capacity of 211,200 acre-feet between the elevations of 545 and 592 feet NGVD will be available for the temporary retention of flood flows. At full flood control pool, the lake will have a surface area of 6,350 acres and a total capacity of 291,700 acre-feet. The drainage area above the Taylorsville Lake dam site is 353 square miles.

At the top of the Crooked Creek watershed is a dam in the Boy Scout Campground. This impoundment was constructed primarily for recreational purposes, but storage was considered in estimating discharges within Crooked Creek.

In the Knob Creek watershed is the Bennett Lake Dam used for recreational purposes.

In the Long Lick watershed is the Jim Beam Distillery Dam near Clermont. It is used for distillery processes. Also within the Long Lick watershed are Lake Nevin, Bullitt County Sportsman Club Lake, and Everback Lake, which are used for recreational purposes. Lake Nevin and Everback Lake were considered within the hydrologic models. All others were considered to not have enough storage impact peak flows in the watersheds.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this FIS. Flood events of a magnitude which 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 which equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, 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 county at the time of completion of this FIS. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the county.

Precountywide Analyses

The only community that has a previously printed FIS report is the City of Shepherdsville. Within the City of Shepherdsville January 2, 1987, FIS, final discharge-frequency values for the Salt River were based on an analysis of discharges and stage/elevation data that involved two gages on the Ohio River and one gage on Rolling Fork and the Salt River. The Salt River at Shepherdsville gage can be affected by the Ohio River backwater and by flow from Rolling Fork (drainage area equals 1,449 square miles) entering the Salt River at river mile 11.4. A detailed analysis included an evaluation of Ohio River elevations and Rolling Fork discharges in the proper time sequence for the required frequency discharges at Shepherdsville.

The four frequency discharges were developed for Floyds Fork from river mile 13 through 45 as part of the FIS for the unincorporated areas of Jefferson County (FEMA, 1982). The data used in this earlier study were updated at the Floyds Fork at Fisherville gage (stream mile 32.7) and drainage data. Discharge relationships were revised and extended downstream to the mouth. Reasonableness of these frequency flows was obtained by comparing historical profiles and discharges of the 1961 and 1964 floods to the study area and at the gage.

U.S. Water Resources Council Bulletin No. 17 (U.S. Water Resources Council, 1976) guidelines were used in developing flow data at all gages discussed above. Consideration was given to the omission of low and high outliers, weighting with the generalized skew and historically adjusting the curves where possible.

2004 Countywide Analyses

The USACE HEC-1 Flood Hydrograph Package computer model (USACE, 1990) was used to calculate frequency discharges for all studied streams, with the exception of Floyds Fork. Existing discharges obtained by the Louisville District of the USACE in a 1994 study were used along Floyds Fork.

A 24-hour duration SCS Type II rainfall distribution was used to develop HEC-1 rainfall data. Storm depths were obtained from the U.S. Department of Commerce Technical Paper 40 (U.S. Department of Commerce, 1961). The SCS curve number (CN) procedure was used to calculate excess rainfall that contributes to runoff. Soils mapping and existing land use (U.S. Department of Agriculture, 1986) was assigned according to USGS quadrangle maps (USGS, no date available) and strip aerial photography (GRW Aerial Survey, Inc., 1999). The Clark Unit Hydrograph option in HEC-1 was used to convert runoff volumes to hydrographs for each sub-basin.

Discharges for the streams in the Pond Creek basin were determined using the USACE HEC-1 computer model. Initially, the USACE reviewed the basin models, developed for the Jefferson County Metropolitan Sewer District (MSD) under contract, which contained a number of subbasins to define the flow regime. SCS curve numbers based on drainage characteristics of soil group and land use, drainage area, time of concentration, and rainfall excess were used to compute flows for each subbasin. After initial review, adjustments to both the subbasin delineations and basin characteristics were required for each of the major basins. Discharge values for the 1-percent-annual-chance flood initially determined from the USACE HEC-1 model were used in the development of stream profiles for the USACE HEC-2 computer model computations (USACE, 1988). The plotting of the 1-percent-annual-chance floodplain showed bridges that had restrictive openings, which cause major ponding areas, and streams with large natural valley storage. Capacities of the ponding areas were determined, and storage routings were added to the HEC-1 model to recalculate discharges. Since each major basin had its own special characteristics, numerous trials were required before final surcharge values were adopted for the 1-percent-annual-chance flood. Interviews with property owners and records from the MSD's flooding compliant files provided verification of the 1-percent-annual-chance floodplain areas delineated using the final discharge values.

In the final analysis, the Pond Creek basin was divided into 34 subbasins. The Pond Creek basin consists of two major areas that combine to form the main stream. One area consists of Northern Ditch, which becomes Fern Creek in its upper reaches, and its numerous tributaries, having a total drainage of 29.0 square miles. The other area, 26.1 square miles, consists of Southern Ditch and its tributaries. Pond Creek flows in a southwesterly direction downstream of the confluence of the two ditches for 16.96 miles before entering the Salt River near its mouth at the Ohio River. Since construction of the Southwest Jefferson County Local Flood Protection Project (SJCLPP), a pumping plant is located at mile 1.52. The county has obtained land in easement to provide for a 1-percent-annual-chance level of ponding and to preserve valley storage below that level. This affects the lower reaches of Pond Creek, to about CSX railroad at mile 10.23, and its tributary Long Run. Coordination with FEMA negated the need for studying the reach of Pond Creek below mile 6.20.

There is one USGS gage located on Pond Creek at Manslick Road (mile 15.32), about 1.5 miles downstream of the confluence of Northern and Southern Ditches. The gage has been in operation for over 46 years (August 1944 to present). A major change in the magnitude of all maximum annual discharge peaks is evident following the enlargement of Northern and Southern Ditches in the early 1960s.

The discharges developed for the final USACE HEC-1 model (USACE, 1987) were verified by two separate methods. Highwater marks were available on Pond Creek and Northern Ditch for the 1964 flood. SCS curve numbers were adjusted to reflect land use at that time.

Hourly rainfall values were divided into smaller increments. These data were inserted into the HEC-1 model and discharges determined. These discharges were used in the HEC-2 program, and a profile was developed. The profiles for Pond Creek and Northern Ditch reproduced the 1964 highwater mark profile within allowable tolerance.

To compute 1-percent-annual-chance flood discharges, the HEC-1 model variables were adjusted for present basin characteristics and 1-percent-annual-chance rainfall distribution. Profiles were developed from the HEC-2 computer model (USACE, 1988) utilizing those present-day flows. It was found that the elevations for Northern Ditch and Southern Ditch, from their confluence to Interstate 65, produce similar elevations across the floodplain. This provided confidence to the basin model.

For the second method of verification, a discharge frequency curve using log Pearson Type III methodology (U.S. Department of the Interior, 1982) was developed for Pond Creek at the Louisville gage. The 1-percent-annual-chance discharge of 8,360 cubic feet per second (cfs) computed by this analysis compared favorably with the 8,250 cfs discharge obtained from the model.

The HEC-1 model results are compatible with the log-Pearson Type III results. Since the HEC-1 model utilizes all known factors in computing 1-percent-annual-chance frequency discharges at the numerous locations along the tributaries of Pond Creek, it is considered the most accurate method of determining these discharges and modifying these discharges as conditions change in the future.

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 4, "Summary of Discharges."

New Countywide Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed, limited detailed, and approximate methods affecting the community.

For all of the streams, flow change locations were chosen at confluences, upstream of regulatory structures, and at additional locations such that the increase in flow was less than 20 percent between flow changes. For each of the study reaches, watershed boundaries were delineated using the GIS based program ArcHydro. Watersheds were delineated based off HUC-12 watershed boundaries along with 5 foot Digital Elevation Models (DEMs) produced from Light Detection and Ranging (LiDAR) data with a post spacing of approximately 1 meter and 10 meter DEMs derived from the USGS National Elevation Data Set.

There are 83 approximate study streams totaling 164 stream miles within Bullitt County. The 10-, 2-, 1- and 0.2-percent-annual-chance discharges were calculated using the methodology described in *Estimating the Magnitude of Peak Flows for Streams in Kentucky for Selected Recurrence Intervals* (Hodgkins and Martin 2003) with the exception of Weaver Run and a portion of Salt River. The report specifies regression equations for seven separate hydrologic regions of the state. Bullitt County is divided by both Region 1, 2, and 5. Weaver Run flows were derived from the Pond Creek HMS model from the 2006 Jefferson County FIS. The flows for the approximate portion of Salt River, Plum Creek, and Rolling Fork were determined through gage analysis.

There are six limited detailed study streams totaling 32 stream miles within Bullitt County. These include Bethel Branch, Cedar Creek, Floyds Fork, Wells Run, Sportsman Run, and Brier Creek. The 10-, 2-, 1 and 0.2-percent-annual-chance discharges for the seven streams were calculated using the same methodology as the approximate study streams with the exception of Floyds Fork and Brier Creek. Floyds Fork flows were derived from the Floyds Fork HMS model and Brier Creek flows were derived from the Pond Creek HMS model; both of these studies are from the 2006 Jefferson County FIS. All of the watersheds fell within Hydrologic Region 1.

There are two detailed study streams totaling 39 miles within Bullitt County. These include Pennsylvania Run and Salt River. For Salt River, the 10-, 2-, 1-

and 0.2-percent-annual-chance peak discharge estimates were calculated using HEC-SSP Bulletin 17B gage analysis of USGS gage 03298500. The USGS gage 03298500 is located on the regulated portion of Salt River downstream of the Taylorsville Lake Dam. The gage contains 70 years of data with 70 percent of the gage readings prior to regulation (1983) and 30 percent after regulation. The operation of Taylorsville Lake Dam fluctuates depending on season, Salt River gage readings at Shepherdsville, and the flood level of the Ohio River.

The Salt River basin has been subject to growth and development over the years of gage record. As a result, an analysis was performed to project the increase in impervious area. It was determined that while the basin has seen large increases in impervious area, the gage record could be used without adjustments for urbanization.

Bulletin 17B analysis using Log Pearson Type III distribution is not typically performed on regulated streams; however four different scenarios were performed to determine the regulation effects of the Taylorsville Lake Dam on the Salt River. The station skew was used for the Bulletin 17B analysis due to both the length of record and the impacts of regulation. The four scenarios include: (1) Unregulated Flows: 1937-1983, (2) Regulated Flows: 1984-2007, (3) All Flows: 1937-2007, and (4) Adjusted Unregulated + Regulated Flows: 1937-1983 adjusted + 1983-2007. The adjusted unregulated flows were adjusted to be equivalent to the regulated flows by applying the weighting equation below. The equation was used where Q_{ug} is the modified flow, Q_g is the regulated flow, A_u is the drainage not regulated, and A_g is the total drainage area.

$$Q_u = \left(\frac{A_u}{A_g} \right)^b Q_g$$

Where:

Q_u = Area-weighted estimate at the ungaged site;
Q_g = Discharge estimate at gaged site based on historic records;
A_u = drainage area at ungaged site;
A_g = drainage area at gaged site; and
b = Exponent dependent on hydrologic region and recurrence interval.

After running the gage analysis, a comparison was made between the four scenarios. In this comparison, it was determined that the impacts of regulation on the peak flows were reasonably consistent with a Log Pearson Type III distribution. It was further determined that using All Flows provided the best representation of peak discharges.

The theory behind the application of the equation above is to equate unregulated flows to regulated flows by assuming Taylorsville Lake Dam provides a significant amount of storage to flows upstream of the dam. The recommended procedure is to route the flow through a stage-storage-discharge curve to determine the flows. As stated above, the stage-storage-discharge relationship is contingent on watershed conditions and was not developed for this analysis. A sensitivity analysis was performed using modified flows developed by the USACE for the unregulated period (1938-1982) during the 1985 analysis of the Salt River. After performing a separate analysis using the modified record, the 1% annual chance discharge reported in this countywide FIS was within 1% of the sensitivity analysis using the modified record and the discharge reported in the USGS Water-Resources Investigations Report 03-4180 - Estimating the Magnitude of Peak Flows for Streams in Kentucky for Selected Recurrence Intervals.

To develop flows at ungaged sites along Salt River the Bulletin 17B 10-, 2-, 1- and 0.2-percent-annual-chance discharge estimates at the gaged site were weighted based on the ratio of the areas of the gaged and ungaged site. This gage weighting is performed when the ratio of drainage areas is between 0.5 and 2.0.

For Pennsylvania Run, the 10-, 2-, 1- and 0.2-percent annual chance peak discharge estimates were calculated using HEC-HMS. A HEC-HMS model was developed in 2004 for FEMA map revisions and was used as the base for the new Pennsylvania Run hydrology model. The original model contained only subbasins within Jefferson County; therefore additional subbasins were added to extend the model downstream to the confluence with Cedar Creek. Soil Conservation Service (SCS) Curve Number (CN) methodology was used to simulate the infiltration and runoff relationships among the added subbasins. The time of concentration for each added subbasin was determined using standard TR-55 methodology and Manning's equation relationships. The longest flow path for each subbasin was determined and different flow regimes were assigned to segments of these flowpaths. The regimes consisted of overland sheet flow, shallow concentrated flow, and main channel flow. To simulate the hydrograph generation and transformation, SCS Unit Hydrograph methodology was used. The SCS hydrograph method requires a lag time for each subbasin, which is 60% of the calculated times of concentration. The CN of the existing basins in Jefferson County were compared against the new calculated CN's to insure the CN's did not change significantly since 2004. Additionally, the rating curve for the spillway at McNeely Lake Dam was updated using survey data collected in 2010.

Peak Discharges for the 10-, 2-, 1-, and 0.2-percent-chance flood events are shown in Table 5.

TABLE 5 - SUMMARY OF DISCHARGES

Flooding Source and Location	DA (mi^2)	10-Percent-Annual-Chance Event	2-Percent-Annual-Chance Event	1-Percent-Annual-Chance Event	0.2-Percent-Annual-Chance Event
BETHEL BRANCH					
0.05 miles upstream of confluence with Floyds Fork	2.28	1,300	2,020	2,340	3,170
0.35 miles upstream of	2.22	1,260	1,940	2,250	3,040

Flooding Source and Location	DA (mi^2)	10-Percent-Annual-Chance Event	2-Percent-Annual-Chance Event	1-Percent-Annual-Chance Event	0.2-Percent-Annual-Chance Event
confluence with Floyds Fork					
0.50 miles upstream of confluence with Floyds Fork	2.18	1,230	1,900	2,200	2,960
0.65 miles upstream of confluence with Floyds Fork	2.09	1,070	1,610	1,840	2,430
0.70 miles upstream of confluence with Floyds Fork	2.07	1,010	1,480	1,690	2,210
0.75 miles upstream of confluence with Floyds Fork	2.06	930	1,340	1,520	1,950
1.0 mile upstream of confluence with Floyds Fork	1.50	710	1,000	1,120	1,420
downstream of Bethel Church Road	1.22	620	880	990	1,260
upstream of Bethel Church Road	1.07	570	820	920	1,170
BRIER CREEK					
0.5 miles downstream of Pendleton Road	4.49	2,010	3,040	3,530	4,760
0.2 miles upstream of Pendleton Road	4.05	1,990	2,960	3,440	4,680
0.4 miles downstream of Scotts Gap Road	3.61	1,820	2,790	3,220	4,360
0.3 miles upstream of Scotts Gap Road	2.65	1,420	2,160	2,470	3,320
1.6 miles upstream of Scotts Gap Road	1.61	960	1,430	1,690	2,490
BROOKS RUN					
At mouth	9.52	2,880	4,020	4,670	6,650
At Interstate 65	3.22	1,260	1,950	2,300	3,330
BULLITT LICK CREEK					
At mouth	9.06	1,280	2,050	2,480	3,790
CEDAR CREEK					
0.15 miles upstream of confluence with Floyds Fork	27.3	5,120	7,200	8,110	10,350
1.2 miles upstream of confluence with Floyds Fork	26.7	5,050	7,100	8,000	10,210
0.15 miles upstream of confluence with Tanyard Branch	25.8	4,940	6,940	7,830	9,990
0.4 miles upstream of confluence with Tanyard Branch	22.7	4,390	6,120	6,880	8,720

Flooding Source and Location	DA (mi²)	10-Percent-Annual-Chance Event	2-Percent-Annual-Chance Event	1-Percent-Annual-Chance Event	0.2-Percent-Annual-Chance Event
upstream of Zoneton Road	22.0	4,210	5,840	6,550	8,270
0.1 miles upstream of Pennsylvania Run	13.6	2,810	3,810	4,240	5,280
0.9 miles upstream of Pennsylvania Run	13.4	2,740	3,690	4,110	5,090
0.3 miles upstream of Cedar Creek Road	12.3	2.510	3,360	3,730	4,590
1.0 mile upstream of Cedar Creek Road	12.0	2,480	3,330	3,690	4,540
1.9 miles upstream of Cedar Creek Road	11.3	2,370	3,160	3,500	4,310
CROOKED CREEK					
At Fort Knox Military Reservation	29.51	4,600	8,480	10,600	17,200
At Cupio Road	8.43	2,990	4,780	5,750	8,610
At State Route 44	4.04	1,360	2,160	2,580	3,490
FLOYDS FORK					
At mouth	284	23,600	41,600	49,200	70,000
0.2 miles upstream of confluence with Brooks Run	273	23,230	33,900	41,330	54,870
Just downstream of Bells Mill Road	260	23,530	34,220	41,660	55,250
0.15 miles downstream of confluence with Bethel Branch	230	23,130	33,560	40,760	53,860
0.2 miles downstream of confluence with Wells Run	226	23,490	34,230	41,600	55,120
0.9 miles downstream of Bardstown Road	217	24,040	35,650	43,770	58,400
GRAVEL CREEK					
See Mud Run	-	-	-	-	-
KNOB CREEK					
At mouth	30.62	6,350	10,100	11,900	17,500
At Cupio Road	25.67	7,160	10,800	12,600	18,300
At State Route 44	18.93	6,530	10,000	11,700	16,900
LONG LICK CREEK					
At mouth	31.02	4,740	7,750	9,440	14,500
At Interstate 65	15.04	5,040	7,910	9,580	14,200
At Route 1329	10.07	4,080	6,570	7,850	11,700

Flooding Source and Location	DA (mi^2)	10-Percent-Annual-Chance Event	2-Percent-Annual-Chance Event	1-Percent-Annual-Chance Event	0.2-Percent-Annual-Chance Event
MUD RUN					
At confluence of Gravel Creek	5.37	850	1,370	1,660	2,550
PENNSYLVANIA RUN					
0.1 miles upstream of confluence with Cedar Creek	8.38	2,360	3,350	3,850	4,950
0.5 miles upstream of confluence with Cedar Creek	8.17	2,350	3,350	3,790	4,870
0.9 miles upstream of confluence with Cedar Creek	8.03	2,320	3,300	3,730	4,790
1.0 mile upstream of confluence with Cedar Creek	7.04	2,130	3,140	3,560	4,600
1.0 mile downstream of Mt Washington Road	6.95	2,110	3,120	3,530	4,560
0.25 miles downstream of Mt Washington Road	6.61	2,100	3,020	3,420	4,420
SALT RIVER					
upstream of confluence with Ohio River	2918	76,980	109,770	125,780	168,700
downstream of Rolling Fork	2706	73,340	104,680	119,990	161,010
USGS Gage 03298500	1197	43,450	62,670	72,070	97,260
downstream of Cedar Creek	904	39,300	56,200	64,140	84,770
upstream Limit of Study	763	35,930	51,060	57,920	75,340
SPORTSMAN RUN					
just downstream of Bardstown Road	3.42	1,710	2,660	3,090	4,180
0.40 miles downstream of confluence with Sportsman Run Trib	3.08	1,610	2,510	2,910	3,950
1250 feet downstream of confluence with Sportsman Run Trib	3.00	1,580	2,460	2,870	3,890
just downstream of confluence with Sportsman Run Trib	1.79	1,040	1,600	2,140	2,930
0.56 miles upstream of confluence with Sportsman Run Trib	1.43	1,000	1,590	1,860	2,540
0.82 miles upstream of confluence with Sportsman Run Trib	1.13	850	1,350	1,570	2,150
1.0 miles upstream of confluence with Sportsman Run Trib	1.01	800	1,270	1,480	2,030
1.3 miles upstream of	0.73	480	700	790	1,020

Flooding Source and Location	DA (mi²)	10-Percent-Annual-Chance Event	2-Percent-Annual-Chance Event	1-Percent-Annual-Chance Event	0.2-Percent-Annual-Chance Event
confluence with Sportsman Run Trib					
WELLS RUN					
0.1 miles upstream of confluence with Floyds Fork	3.77	1,890	2,960	3,450	4,850
0.6 miles upstream of confluence with Floyds Fork	3.58	1,860	2,940	3,430	4,700
0.1 miles downstream of confluence with Wells Run Trib 1	3.23	1,750	2,770	3,240	4,440
0.25 miles downstream of confluence with Wells Run Trib 1	1.53	1,080	1,720	2,010	2,770
0.4 miles downstream of confluence with Wells Run Trib 1	1.26	920	1,460	1,710	2,340
0.6 miles downstream of confluence with Wells Run Trib 1	1.06	800	1,260	1,470	2,000
WHITTAKER RUN					
At mouth	4.79	4,070	5,870	6,780	9,340

TABLE 6 - SUMMARY OF STILLWATER ELEVATIONS

Flooding Source & Location	1% Annual Chance Event	1% Annual Chance Fully Developed Event	0.2% Annual Chance Event
Pond Creek			
Just upstream of pumping plant (stream mile 1.343)	429.7	-	-
Sportsman Run			
Mount Washington Dam Lake	537.0	-	-

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. For construction and/or floodplain management purposes, users are encouraged to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Cross-section data for the streams studied by detailed methods were field surveyed. Cross sections were located at close intervals above or below bridges and culverts in order to compute the significant backwater effects of these structures. All bridges, dams and culverts were surveyed to obtain elevation data and structural geometry.

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).

Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

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 the hydraulic structures remain unobstructed, operate properly, and do not fail.

All qualifying bench marks within a given jurisdiction that are catalogued 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.

Bench marks catalogued 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 most reliable nature, expected to hold position/elevation well (e.g., mounted in bedrock)

- Stability B: Monuments which generally hold their position/elevation well (e.g., concrete bridge abutment)

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

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

In addition to NSRS bench marks, the FIRM may also show vertical control monuments established by 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 correct elevation, description and location information for bench marks shown on the FIRM for this jurisdiction, contact the National Geodetic Survey at

(301) 713-3242, or visit their website at www.ngs.noaa.gov.

It is important to note that 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 this FIS and FIRM. Interested individuals may contact FEMA to access this data.

Precountywide Analyses

For the City of Shepherdsville January 2, 1987, FIS, cross sections were obtained from field surveys. All bridges were field surveyed to obtain elevations and structural geometry. These data were supplemented by as-built drawings from the State Highway Department. Water-surface profiles were developed using the HEC-2 step-backwater computer model (USACE, 1982).

Because of the Ohio River backwater effect on the Salt River at the downstream limit of Shepherdsville, an in-depth study was made of the Salt River basin to determine required starting elevations at the mouth of the Salt River at the time of each of the four frequency floods. Therefore, in lieu of starting with elevations obtained by the slope/area method at the downstream end of Shepherdsville, elevations were set at the mouth of the Salt River for each frequency flood and HEC-2 runs made upstream to the corporate limit.

Starting water-surface elevations for Floyds Fork were determined by the slope/area method. A range of starting slopes were used to test the sensitivity and reasonableness of the adopted values.

2004 Countywide Analyses

Cross sections for the Ohio River were determined in the Jefferson County and incorporated areas 1994 FIS from detailed mapping developed for Ohio River navigation studies (USACE, 1964). The Ohio River stream mileage as depicted in this study is "Official Stream Mileage" as agreed upon between Federal, State, and local agencies with jurisdiction within the study area. The Ohio River is unique in that the stream mileage runs from upstream (Pittsburgh, Pennsylvania) to the downstream terminus at the Mississippi River. Lettered cross-sections for the Ohio River were not included on the FIRM since they fall outside the Bullitt County boundary.

Along certain portions of Crooked Creek, a profile base line is shown on the maps to represent channel distances as indicated on the flood profiles and floodway data tables.

Water-surface elevations of floods of the selected recurrence intervals were computed using the HEC-RAS v2.2 step-backwater computer model (USACE, 1998).

For streams in this study that were previously studied, elevations were computed using the USACE HEC-2 step-backwater program (USACE, 1991). For previously unstudied streams, the flood elevations were computed using the USACE HEC-RAS step-backwater program (USACE, 1998). Starting water surface elevations were calculated using the slope/area method, with the exception of Floyds Fork. Floyds Fork starting water-surface elevations were obtained from a USACE study in 1994. Starting water-surface elevations for Crooked Creek and Whittaker Run are based on Salt River backwater elevations derived from the USACE, Louisville District, Salt River HEC-2 hydraulic model dated June 21, 1985, as described in the June 1, 2001, Best Available Data Letter issued to Bullitt County by FEMA.

Roughness factors (Manning's "n") used in the hydraulic computations were chosen based on field inspection. In conjunction with this approach, known roughness factors for comparable streams in adjacent watersheds were considered. The following tabulation shows the channel and overbank "n" values for the streams studied by detailed methods.

New Countywide Analyses

The detailed Salt River study contains surveyed cross section data performed by Jacobi, Toombs, and Lanz, Incorporated in June and July, 2010. The cross section geometric data consists of surveyed channel sections and unsurveyed overbank sections. Unsurveyed overbank sections were extracted from 5-foot Digital Elevation Models (DEMs) produced from LiDAR data supplied by the Louisville/Jefferson County Information Consortium (LOJIC). The density of points collected supports the creation of two-foot contours (Reference 1). Structures (i.e. bridges) were included in the modeling based off field survey data.

As part of the Bullitt County study, the portion of Salt River that outlets to the Ohio River was modeled as an approximate study since it is located in the Fort Knox area where data is limited. The most upstream cross section of the approximate study, 93903, is the same cross section as the most downstream cross section of the detailed study. The surveyed channel geometry of section 93903 was applied to all the cross sections within the Salt River approximate model at a channel slope of 0.007%. The water surface elevations for the 10-, 2-, 1-, and 0.2-annual-percent-discharges for the approximate study station 93903 were then applied as a known water surface elevation downstream boundary condition for the detailed study station 93903.

Due to the flat terrain near the Ohio River, slight changes to the downstream boundary condition for the approximate study resulted in significant differences in water surface elevations which impacted the detailed study. Since flows for Salt River were developed using a gage analysis, hydrologic calibration was not required, however, hydraulic model calibration was performed using a gage analysis on the Salt River Gage 03298500. Discharges values and measured gage heights were plotted to develop a logarithmic relationship. Gage heights had a vertical datum of NGVD 29 and had to be converted to NAVD 88 since the hydraulic model is referenced to NAVD 88. The gage heights were interpolated using flows values developed for the 10-, 2-, 1- and 0.2-percent-annual-chance peak discharges. The downstream boundary conditions for the hydraulic model were calibrated at the location of the Salt River Gage 03298500, (just downstream of the Preston Highway Bridge at station 120415 in the HEC-RAS model). Separate boundary conditions were set for the 10-, 1-, 2-, and 0.2-percent annual chance profiles.

The Pennsylvania Run detailed study contains channel geometry from the 2004 effective model in addition to new surveyed channel cross sections to supplement the existing data and to extend the model downstream to the confluence with Cedar Creek. The additional survey data was gathered by Stantec Consulting in August and September of 2010. Unsurveyed overbank sections were extracted from 5-foot DEMs produced from LiDAR data supplied by LOJIC. There was only one structure along the modeled section of Pennsylvania Run and this was included as part of the 2004 effective study. The structure from the 2004 effective model was incorporated into the new model and the bridge opening dimensions for the structure were field verified during an August 2010 field visit. Two additional weir structures were located during the August 2010 field visit and were added to the model.

The limited detailed study (Bethel Branch, Brier Creek, Cedar Creek, Floyds Fork, Sportsman Run, and Wells Run) cross section geometric data was created using 5-foot DEMs developed from the LiDAR data supplied by LOJIC (Reference 1). Structures (i.e. bridges and culverts) were included in the modeling based off relative measurements made in the field of features such as opening dimensions, structure height, and structure material. Approximate channel dimensions were measured while performing structure measurements using a tape and surveying rod to determine bank width and height. These dimensions were applied to cross sections upstream and downstream of the structure.

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.

Detail-studied streams that were not restudied as part of this map update may include a "profile base line" on the maps. This "profile base line" provides a link to the flood profiles included in the FIS report. The detailed study stream centerline may have been digitized or redelineated as part of this revision. The "profile base lines" for these streams were based on the best available data at the time of their study and are depicted as they were on the previous FIRMs. In some cases where improved topographic data was used to redelineate floodplain boundaries, the "profile base line" may deviate significantly from the channel centerline or may be outside the Special Flood Hazard Area (SFHA).

Channel roughness factors (Manning's "n") used in the hydraulic computations for all detailed and limited detailed study streams in this study were selected based on visual observation of 2009 aerial photography (Reference 2), photographs from the field survey, and standard values published in Open-Channel Hydraulics by V.T. Chow (Reference 3). Table 7 shows the channel and overbank "n" values for the flooding sources studied by detailed methods.

TABLE 7 - MANNING'S VALUES

Stream	Channel "n"	Left Overbank "n"
Bethel Branch	0.060 – 0.080	0.060 – 0.120
Brier Creek	0.013 – 0.094	0.013 – 0.120
Brooks Run	0.050 – 0.060	0.040 – 0.100
Bullitt Lick Creek	0.055 – 0.075	0.058 – 0.100
Cedar Creek	0.045	0.050 – 0.120
Crooked Creek	0.060	0.060 – 0.100
Floyds Fork	0.056	0.100 – 0.120
Gravel Creek	0.055	0.058 – 0.100
Knob Creek	0.045	0.060 – 0.100
Mud Run	0.050 – 0.055	0.050 – 0.075
Salt River	0.030	0.040 – 0.100
Sportsman Run	0.060 – 0.080	0.060 – 0.100
Wells Run	0.070 – 0.088	0.060 – 0.120
Whittaker Run	0.035 – 0.045	0.080 – 0.100

The methods for determining starting water-surface elevations were selected in accordance with *Guidelines and Specifications for Flood Hazard Mapping Partners* (Reference 4). The slope-area method was used in all cases in this study with the exception of the Bethel Branch and Floyds Fork limited detailed studies. For Bethel Branch, a 22-foot drop in ground surface elevation exists between stations 4,825 and 4,857 which results in several critical depth calculations near the drop. It was determined that the drop between the two cross sections could be omitted from the study since it did not affect floodplain delineation in the area and because the critical depths near the drop presented problems with floodway calculations. Therefore, Bethel Branch was split into two reaches, one upstream and one downstream of the drop. Boundary conditions of normal and critical depths were used for the lower and upper reaches, respectively. Floyds Fork downstream boundary conditions were set to a known water surface elevation of 454.2 based off the existing FIS downstream of the study area. In addition, a Jefferson County study of Floyds Fork exists upstream of the Bullitt County study. The model was calibrated in order to have the most upstream water surface elevation to be within 0.5 feet of the most downstream water surface elevation of the Jefferson County study.

All water-surface profiles for floods of the selected recurrence intervals in this study were computed with the USACE HEC-RAS version 4.1.0 computer program using the step-backwater method (References 5).

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles (Exhibit 1) are, therefore, considered valid only if hydraulic structures remain unobstructed, operate properly, do not fail, and if channel and overbank conditions remain essentially the same as ascertained during this study.

Flood profiles were drawn showing the computed water-surface elevations to an accuracy of 0.5-foot for floods of the selected recurrence intervals. In cases where two (2) or more profiles are close together, due to limitations of the profile scale, only the higher profile has been shown.

Channel cross sections for approximate study streams were created using 5-foot DEMs produced from LIDAR data and 10-meter DEMs derived from the USGS National Elevation Data Set in the Fort Knox area (References 1 and 7). No structures (i.e. bridges or culverts) were included in the models. Channels were approximated using aerial photography and approximate 50-percent-annual-chance (2-year) flows for sizing. Separate overbank and channel roughness values were selected for each stream reach based on 2009 and 2006 aerial photography (References 2 and 6). Starting water-surface elevations were selected in accordance with *Guidelines and Specifications for Flood Hazard Mapping Partners* (Reference 4). Crooked Creek, Curry Branch, Knob Creek, Long Lick Creek, and Whittaker Run used a known water surface elevation for the boundary condition which was based off existing studies downstream of the study area. The normal depth reach boundary condition was used for all other approximate study streams within Bullitt County. . The USACE HEC-RAS computer program, Version 4.1.0 (Reference 5), was used to generate water-surface elevations using the step-backwater method.

All elevations in this study are referenced from NAVD88; elevation reference marks used in the study are shown on the maps.

3.3 Vertical Datum

All FISs 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 FISs and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD 29). With the finalization of the North American Vertical Datum of 1988 (NAVD 88), many FIS reports and FIRMs are being prepared using NAVD 88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD 88. Structure and ground elevations in the community must, therefore, be referenced to NAVD 88. It is important to note that adjacent communities may be referenced to NGVD 29. This may result in differences in base flood elevations across the corporate limits between the communities.

The conversion from NGVD 29 to NAVD 88 ranged between -0.43 and -0.48 for the Ohio River, Pond and Brier Creeks, and the Salt River. Accordingly, due to the statistically significant range in conversion factors, an average conversion factor could not be established for the entire community. The elevations shown in the FIS report and on the FIRM were, therefore, converted to NAVD 88 using a stream-by-stream approach. In this method, an average conversion was established for each flooding source and applied accordingly. The conversion factor for the Ohio River, Pond and Brier Creeks, and the Salt River may be found in the following table as well as on the FIRM. The BFEs shown on the FIRM represent whole-foot rounded values. For example, a BFE of 102.4 will appear as 102 on the FIRM and 102.6 will appear as 103. Therefore, users that wish to convert the elevations in this FIS to NGVD 29 should apply the stated conversion factor(s) to elevations shown on the Flood Profiles and supporting data tables in the FIS report, which are shown at a minimum to the nearest 0.1 foot.

TABLE 8 - DATUM CONVERSIONS PER WATERSHED

Stream Name	Average Conversion Factor
Ohio River	0.43 feet
Pond and Brier Creeks	0.44 feet
Salt River	0.48 feet

For more information on NAVD 88, see Converting the National Flood Insurance Program to the North American Vertical Datum of 1988, FEMA Publication FIA20/June 1992, 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 the 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 DFIRM and in many components of the FIS report, including Flood Profiles, Floodway Data Tables, and Summary of Stillwater Elevations Table. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

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

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 LiDAR data supporting a contour interval of 2 feet (LOJIC, 2009). The Fort Knox area was mapped from USGS 10m DEMs (USGS, 2009).

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the DFIRMs (Exhibit 2). On these maps, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of the 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 FIRMs (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 1.0 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. Per an agreement with KDOW, the non-encroachment width was modeled as a 0.7 foot rise for limited detailed studies as shown in the Appendices and the regulatory floodway was modeled as a 1.0 foot rise for detailed studies as shown in the Floodway Data tables.

The floodways presented in this FIS report and on the FIRM was computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations have been tabulated for selected cross sections (Table 8).

1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage, and heightens potential flood hazards by further increasing velocities. A listing of stream velocities at selected cross sections is provided in Table 8, "Floodway Data." To reduce the risk of property damage in areas where the stream velocities are high, the community may wish to restrict development in areas outside the floodway.

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 8 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.

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 by more than 1.0 foot for the detailed studies and 0.7 feet for limited detailed studies. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1, "Floodway Schematic."

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BROOKS RUN								
A	1,570	61	811	5.8	454.0	431.7[2]	432.7	1.0
B	2,728	57	713	6.6	454.0	433.9[2]	434.8	0.9
C	5,635	119	1,672	2.8	454.0	436.7[2]	437.6	0.9
D	7,706	77	822	5.7	454.0	438.1[2]	438.8	0.7
E	10,076	112	1,224	3.6	454.0	442.3[2]	443.2	0.9
F	11,638	75	933	4.7	454.0	445.8[2]	446.7	0.9
G	12,898	92	1,136	3.4	454.0	447.3[2]	448.1	0.8
H	14,959	94	1,056	3.6	454.0	449.0[2]	449.9	0.9
I	16,306	77	777	4.9	454.0	450.9[2]	451.8	0.9
J	17,846	60	507	7.5	455.1	455.1	456.0	0.9
K	19,623	120	1,054	3.0	465.8	465.8	465.8	0.0
L	20,765	88	733	4.3	466.9	466.9	467.4	0.5
M	22,257	60	409	7.7	470.8	470.8	471.8	1.0
N	23,428	65	425	4.2	476.7	476.7	477.1	0.4
O	25,739	101	873	2.0	490.5	490.5	490.6	0.1
P	27,251	66	355	6.5	491.2	491.2	492.2	1.0
Q	28,146	234	928	2.5	495.7	495.7	496.6	0.9
R	29,318	100	469	3.4	501.3	501.3	502.3	1.0
S	30,545	100	275	5.8	509.2	509.2	509.5	0.3
T	31,648	56	216	2.8	515.2	515.2	516.2	1.0

[1] FEET ABOVE CONFLUENCE WITH FLOYDS FORK
[2] ELEVATION COMPUTED WITHOUT CONSIDERATION OF BACKWATER EFFECTS FROM FLOYDS FORK

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

FLOODWAY DATA

BROOKS RUN

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BULLITT LICK CREEK								
A	1,147	130	613	4.0	447.2	419.6[2]	420.6	1.0
B	5,320	250	2,039	1.2	447.4	423.2[2]	424.1	0.9
C	9,404	373	3,808	0.7	447.5	423.7[2]	424.7	1.0
D	11,284	448	3,177	1.0	447.5	424.5[2]	425.4	0.9
GRAVEL CREEK								
E	14,214	204	712	2.3	447.6	425.6[2]	426.6	1.0
MUD RUN								
F	15,173	58	344	3.2	447.6	427.1[2]	428.1	1.0
G	18,927	89	318	3.4	447.6	435.0[2]	435.5	0.5
H	20,547	132	820	1.1	447.6	440.6[2]	441.5	0.9
I	21,914	229	1,137	0.8	447.6	440.7[2]	441.7	1.0
J	23,307	55	263	3.4	447.6	442.1[2]	443.0	0.9
K	24,807	189	834	0.6	447.6	443.0[2]	444.0	1.0
L	26,187	157	342	1.6	447.6	445.6[2]	446.4	0.8

[1] FEET ABOVE CONFLUENCE WITH SALT RIVER
[2] ELEVATION COMPUTED WITHOUT CONSIDERATION OF BACKWATER EFFECTS FROM SALT RIVER

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

FLOODWAY DATA

BULLITT LICK CREEK-GRAVEL CREEK-MUD RUN

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
CROOKED CREEK								
A	20,000	235	2,140	3.6	444.2	430.0[2]	431.0	1.0
B	21,915	311	2,970	2.6	444.2	432.6[2]	433.5	0.9
C	24,449	457	3,290	1.9	444.2	434.9[2]	435.8	0.9
D	28,009	581	4,531	1.4	444.2	436.4[2]	437.3	0.9
E	31,988	497	2,777	2.3	444.2	438.8[2]	439.7	0.9
F	37,846	430	2,303	2.5	446.5	446.5	447.2	0.7
G	40,174	625	2,809	2.1	449.7	449.7	450.7	1.0
H	42,093	397	1,851	2.3	451.8	451.8	452.7	0.9
I	43,242	442	1,954	2.2	453.3	453.3	454.2	0.9
J	46,271	83	515	5.0	461.5	461.5	462.3	0.8
K	48,358	58	323	8.0	472.1	472.1	473.1	1.0

[1] FEET ABOVE CONFLUENCE WITH ROLLING FORK
[2] ELEVATION COMPUTED WITHOUT CONSIDERATION OF BACKWATER EFFECTS FROM ROLLING FORK

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

FLOODWAY DATA

CROOKED CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
CURRY BRANCH								
A	1,160	150	696	6.6	446.7	446.7	447.3	0.6
B	3,182	185	886	5.2	456.7	456.7	457.7	1.0
C	4,162	125	648	5.6	463.0	463.0	463.5	0.5
D	5,872	155	837	4.3	471.8	471.8	472.1	0.3
E	7,502	125	442	5.5	481.3	481.3	482.1	0.8
F	8,762	43	291	8.3	494.3	494.3	495.2	0.9

[1] FEET ABOVE CONFLUENCE WITH KNOB CREEK

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

FLOODWAY DATA

CURRY BRANCH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
FLOYDS FORK								
A	450	243	5,933	8.3	449.7	438.3[2]	439.3	1.0
B	2,018	237	5,521	8.9	449.7	440.2[2]	441.2	1.0
C	2,465	236[3]	7,092	6.9	449.7	442.0[2]	442.7	0.7
D	4,405	256	6,811	7.2	449.7	443.6[2]	444.5	0.9
E	6,121	398	7,252	6.8	449.7	445.1[2]	445.9	0.8
F	7,695	238	5,947	8.3	449.7	446.5[2]	447.3	0.8
G	9,907	429	8,949	5.5	449.7	448.8[2]	449.7	0.9
H	11,406	255	7,296	6.7	449.7	449.6[2]	450.5	0.9
I	13,841	488	11,121	4.4	451.2	451.2	452.1	0.9
J	14,605	428	9,734	5.1	451.4	451.4	452.3	0.9
K	16,587	404	9,718	5.1	452.3	452.3	453.2	0.9
L	17,257	396	8,592	5.7	452.5	452.5	453.4	0.9
M	19,466	566	11,243	4.4	453.9	453.9	454.9	1.0
N	19,966	651	13,914	3.5	454.2	454.2	455.2	1.0

[1] FEET ABOVE CONFLUENCE WITH SALT RIVER
[2] ELEVATION COMPUTED WITHOUT CONSIDERATION OF BACKWATER EFFECTS FROM SALT RIVER
[3] FLOODWAY WIDTH IN 2004 FIS SHOWN AS 306 FEET. DURING 2011 STUDY IT WAS DETERMINED THAT THE FLOODWAY WIDTH IS 236 FEET

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

FLOODWAY DATA

FLOYDS FORK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
KNOB CREEK								
A	810	113	1,682	7.1	429.7	408.9[2]	409.7	0.8
B	1,425	81	1,447	8.2	429.7	409.7[2]	410.7	1.0
C	4,040	780	7,443	1.6	429.7	412.1[2]	413.1	1.0
D	6,970	136	1,376	8.6	429.7	413.0[2]	413.6	0.6
E	7,900	465	4,510	2.8	429.7	418.9[2]	419.7	0.8
F	9,620	378	3,503	3.6	429.7	421.3[2]	422.3	1.0
G	13,395	478	3,984	3.2	429.7	425.5[2]	426.3	0.8
H	20,080	372	4,665	2.7	431.8	431.8	432.7	0.9
I	26,967	231	2,861	4.4	438.8	438.8	439.7	0.9
J	27,917	475	5,713	2.4	439.6	439.6	440.6	1.0
K	30,697	394	3,200	3.9	441.1	441.1	441.9	0.8
L	32,796	417	2,767	4.5	442.9	442.9	443.8	0.9
M	34,506	300	2,097	5.6	447.1	447.1	448.0	0.9
N	37,051	734	3,906	3.0	451.6	451.6	452.2	0.6
O	39,026	610	3,395	3.4	453.7	453.7	454.7	1.0
P	40,606	446	2,868	4.2	456.2	456.2	457.2	1.0

[1] FEET ABOVE CONFLUENCE WITH POND CREEK
[2] ELEVATION COMPUTED WITHOUT CONSIDERATION OF BACKWATER EFFECTS FROM THE OHIO RIVER

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

FLOODWAY DATA

KNOB CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
LONG LICK CREEK								
A	700	45	611	15.5	446.4	405.6[2]	406.6	1.0
B	3,145	253	2,507	3.8	446.4	422.0[2]	422.7	0.7
C	7,696	593	7,431	1.3	446.4	425.3[2]	426.2	0.9
D	11,006	525	6,341	1.5	446.4	425.8[2]	426.7	0.9
E	13,096	143	1,742	5.5	446.4	425.9[2]	426.9	1.0
F	20,016	721	9,233	0.9	446.4	428.5[2]	429.4	0.9
G	23,121	427	6,137	1.4	446.4	428.7[2]	429.7	1.0
H	27,556	489	4,984	1.7	446.4	429.5[2]	430.4	0.9
I	31,016	131	1,400	6.3	446.4	431.2[2]	432.1	0.9
J	35,361	373	2,776	3.2	446.4	438.5[2]	439.1	0.6
K	39,861	749	5,231	1.8	446.4	441.4[2]	442.3	0.9
L	41,682	700	5,918	4.6	446.4	444.9[2]	445.4	0.5
M	42,901	787	5,416	1.8	446.4	445.1[2]	445.7	0.6
N	44,662	750	4,956	1.9	446.4	445.5[2]	446.3	0.8
O	45,982	706	4,580	2.0	446.4	446.2[2]	447.0	0.8
P	47,972	700	7,238	1.3	449.8	449.8	450.3	0.5
Q	51,152	326	1,417	5.5	451.6	451.6	452.4	0.8
R	52,472	328	2,962	2.7	454.4	454.4	455.3	0.9
S	53,832	140	1,061	7.4	457.5	457.5	457.6	0.1
T	54,812	100	902	8.7	461.5	461.5	461.7	0.2
U	55,652	220	2,524	3.1	465.5	465.5	466.1	0.6
V	56,842	320	3,179	2.3	465.9	465.9	466.9	1.0
W	59,352	232	1,926	3.8	469.7	469.7	470.4	0.7
X	60,572	60	628	11.3	471.0	471.0	471.9	0.9
Y	62,082	82	814	8.7	477.7	477.7	478.5	0.8
Z	63,682	95	930	6.1	482.5	482.5	483.2	0.7
AA	65,332	57	539	10.6	487.0	487.0	487.9	0.9

[1] FEET ABOVE CONFLUENCE WITH SALT RIVER

[2] ELEVATION COMPUTED WITHOUT CONSIDERATION OF BACKWATER EFFECTS FROM SALT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

FLOODWAY DATA

LONG LICK CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
OHIO RIVER								
A	629.5	5353	215,250	5.0	442.6	442.6	443.6	1.0
B	629.0	5384	209,182	5.4	442.7	442.7	443.7	1.0

[1] MILES BELOW HEADWATERS AT PITTSBURGH

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

FLOODWAY DATA

OHIO RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
PENNSYLVANIA RUN								
A	98	88	459	6.8	491.4	487.9[2]	488.1	0.2
B	1,682	42	277	11.2	494.7	494.7	494.7	0.0
C	2,053	60	432	7.2	497.3	497.3	497.6	0.3
D	3,484	201	867	3.4	501.3	501.3	501.5	0.2
E	5,421	60	493	5.8	506.1	506.1	506.9	0.8
F	6,930	66	455	6.3	509.8	509.8	510.5	0.7
G	7,765	124	448	6.4	513.0	513.0	513.2	0.2
H	8,769	85	604	4.7	518.3	518.3	519.2	0.9
I	9,208	104	653	4.4	519.4	519.4	520.3	0.9

[1] FEET ABOVE CONFLUENCE WITH CEDAR CREEK

[2] ELEVATIONS COMPUTED WITHOUT CONSIDERATION OF BACKWATER EFFECTS FROM CEDAR CREEK

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

FLOODWAY DATA

PENNSYLVANIA RUN

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
SALT RIVER								
A	93,903	1,940	46,427	1.6	446.4	446.4	447.4	1.0
B	100,742	640	22,237	3.2	446.7	446.7	447.7	1.0
C	107,979	1,990	46,837	1.5	447.4	447.4	448.4	1.0
D	108,920	2,675	53,207	1.4	447.5	447.5	448.5	1.0
E	114,385	1,580	36,973	2.0	447.6	447.6	448.6	1.0
F	119,969	916	22,217	3.2	447.8	447.8	448.8	1.0
G	121,329	869	22,801	3.2	448.5	448.5	449.5	1.0
H	122,436	1,500	27,433	2.6	448.7	448.7	449.6	0.9
I	125,183	877	24,361	3.0	448.9	448.9	449.9	1.0
J	126,318	846	20,951	3.4	449.1	449.1	450.0	0.9
K	133,763	725	18,293	3.9	449.7	449.7	450.7	1.0
L	139,908	450	13,520	4.7	450.6	450.6	451.4	0.8
M	145,323	540	15,122	4.2	451.7	451.7	452.6	0.9
N	152,107	510	14,716	3.9	452.7	452.7	453.6	0.9
O	158,502	737	18,494	3.1	453.8	453.8	454.6	0.8
P	163,231	919	21,940	2.6	454.1	454.1	455.0	0.9
Q	168,528	1,654	36,718	1.6	455.1	455.1	455.9	0.8
R	172,882	1,713	30,251	1.9	455.2	455.2	456.1	0.9
S	177,308	4,052	59,135	1.0	455.5	455.5	456.4	0.9
T	179,264	5,724	87,466	0.7	455.5	455.5	456.4	0.9
U	183,710	2,158	29,535	2.0	455.5	455.5	456.4	0.9
V	188,233	1,811	28,717	2.0	455.9	455.9	456.8	0.9
W	193,300	3,560	41,866	1.4	456.2	456.2	457.1	0.9
X	198,216	391/2,412[3]	32,356	1.8	456.4	456.4	457.2	0.8

[1] FEET ABOVE CONFLUENCE WITH OHIO RIVER
[2] ELEVATIONS COMPUTED WITHOUT CONSIDERATION OF BACKWATER EFFECTS FROM OHIO RIVER
[3] WIDTH WITHIN BULLITT COUNT/TOTAL FLOODWAY WIDTH

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

FLOODWAY DATA

SALT RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
SALT RIVER								
Y	199,393	286/507[3]	11,719	4.9	456.6	456.6	457.5	0.9

[1] FEET ABOVE CONFLUENCE WITH OHIO RIVER

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

FLOODWAY DATA

SALT RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
WHITTAKER RUN								
A	5,110	210	1,502	4.5	456.3	447.7[2]	448.5	0.8
B	6,510	101	758	7.9	456.3	452.5[2]	453.4	0.9
C	7,810	74	534	10.5	460.7	460.7	460.7	0.0
D	8,780	115	972	5.8	473.1	473.1	473.5	0.4
E	10,900	100	431	7.7	490.1	490.1	490.1	0.0

[1] FEET ABOVE CONFLUENCE WITH SALT RIVER
[2] ELEVATION COMPUTED WITHOUT CONSIDERATION OF BACKWATER EFFECTS FROM THE SALT RIVER

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

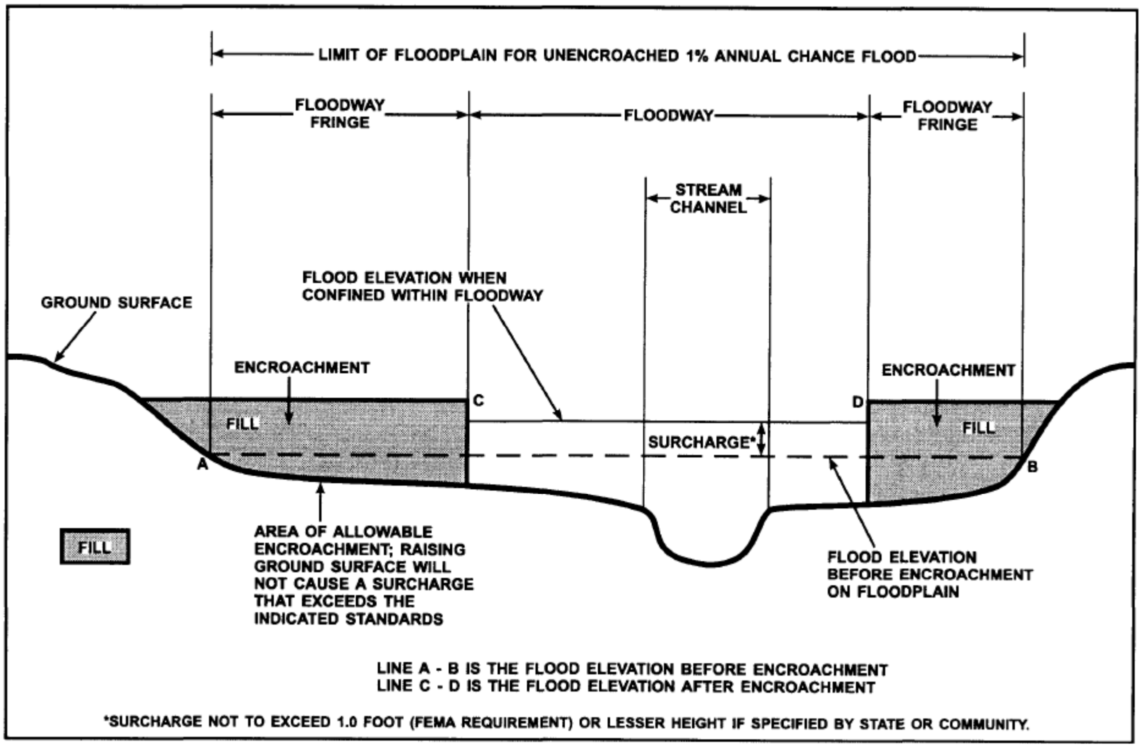
BULLITT COUNTY, KY

AND INCORPORATED AREAS

FLOODWAY DATA

WHITTAKER RUN

FIGURE 1 - FLOODWAY SCHEMATIC



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 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 DFIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the maps designate 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, the 1-percent-annual-chance fully developed floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The current FIRM presents flooding information for the entire geographic region of Bullitt County. Previously, separate FIRMs were prepared for the Cities of Shepherdsville and Lebanon Junction and the unincorporated areas of the county. Historical data relating to the maps prepared for each community, up to and including this countywide FIS, are presented in Table 9, "Community Map History."

7.0 OTHER STUDIES

FIS reports have been prepared for the unincorporated areas of Jefferson County, Kentucky (FEMA, 2010), Spencer County, Kentucky (FEMA, 1986), Nelson County, Kentucky (FEMA, 1980), and Hardin County, Kentucky (FEMA, 1988).

Because it is based on more up-to-date analyses, this 2005 FIS report either supersedes or is compatible with the 1994 FIS for Jefferson County, Kentucky and Incorporated Areas (Reference 1).

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

8.0 LOCATION OF DATA

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

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Bullitt County (Unincorporated Areas)	May 20, 1977	None	July 1, 1991	December 16, 2004
Fox Chase, City of	December 16, 2004	None	December 16, 2004	
Hebron Estates, City of	December 16, 2004	None	December 16, 2004	
Hillview, City of	December 16, 2004	None	December 16, 2004	
Hunters Hollow, City of*	N/A	None	N/A	None
Lebanon Junction, City of	March 15, 1974	June 18, 1976 April 15,1977	July 16, 1987	June 18, 1990 December 16, 2004
Mount Washington, City of	December 16, 2004	None	December 16, 2004	
Pioneer Village, City of*	N/A	None	N/A	None
Shepherdsville, City of	May 24, 1974	March 5, 1976 June 15, 1979 October 16, 1984	January 2, 1987	December 16, 2004

*No Special Flood Hazard Areas Identified

Table 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

9.0 BIBLIOGRAPHY AND REFERENCES

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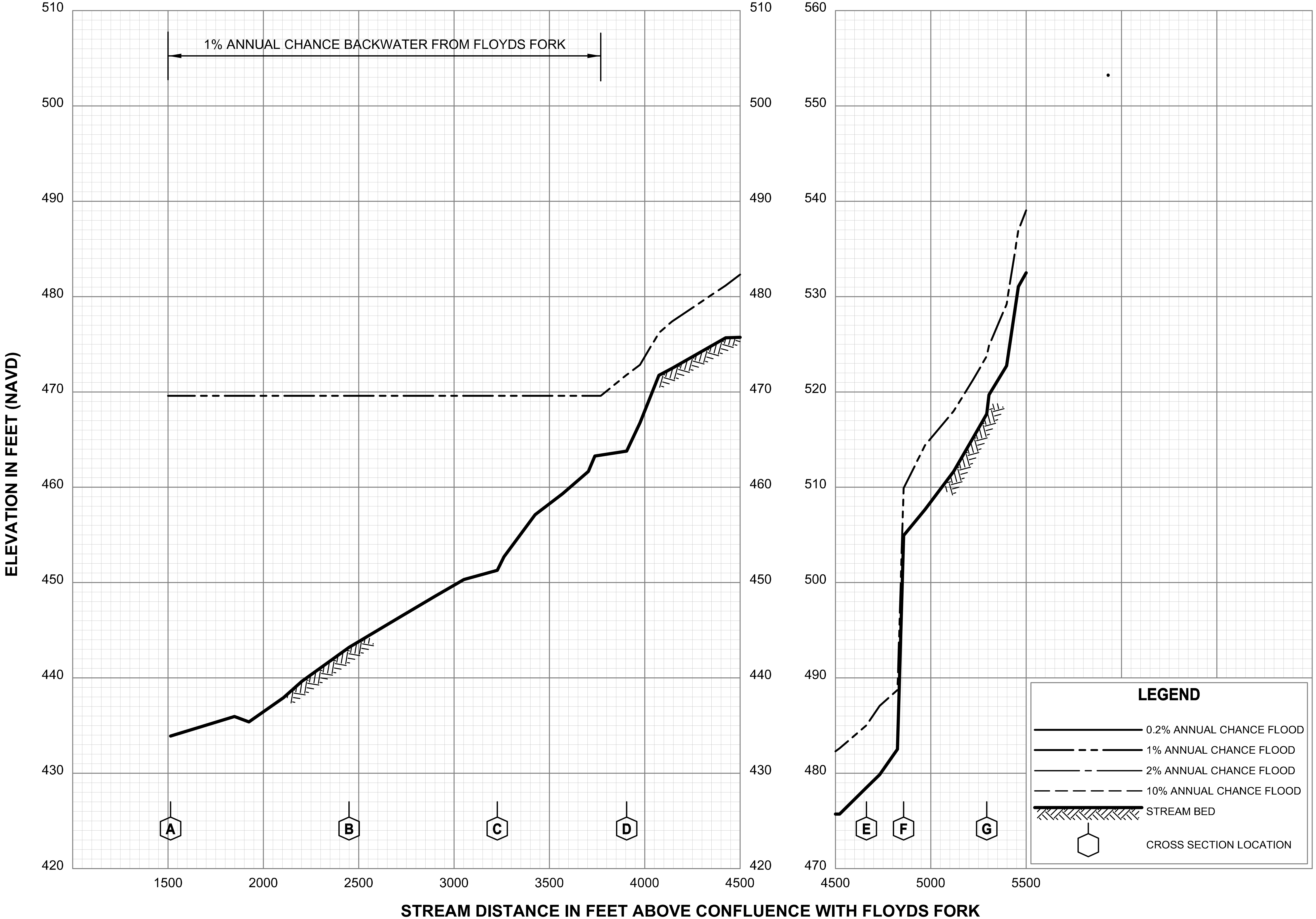


FLOOD PROFILES

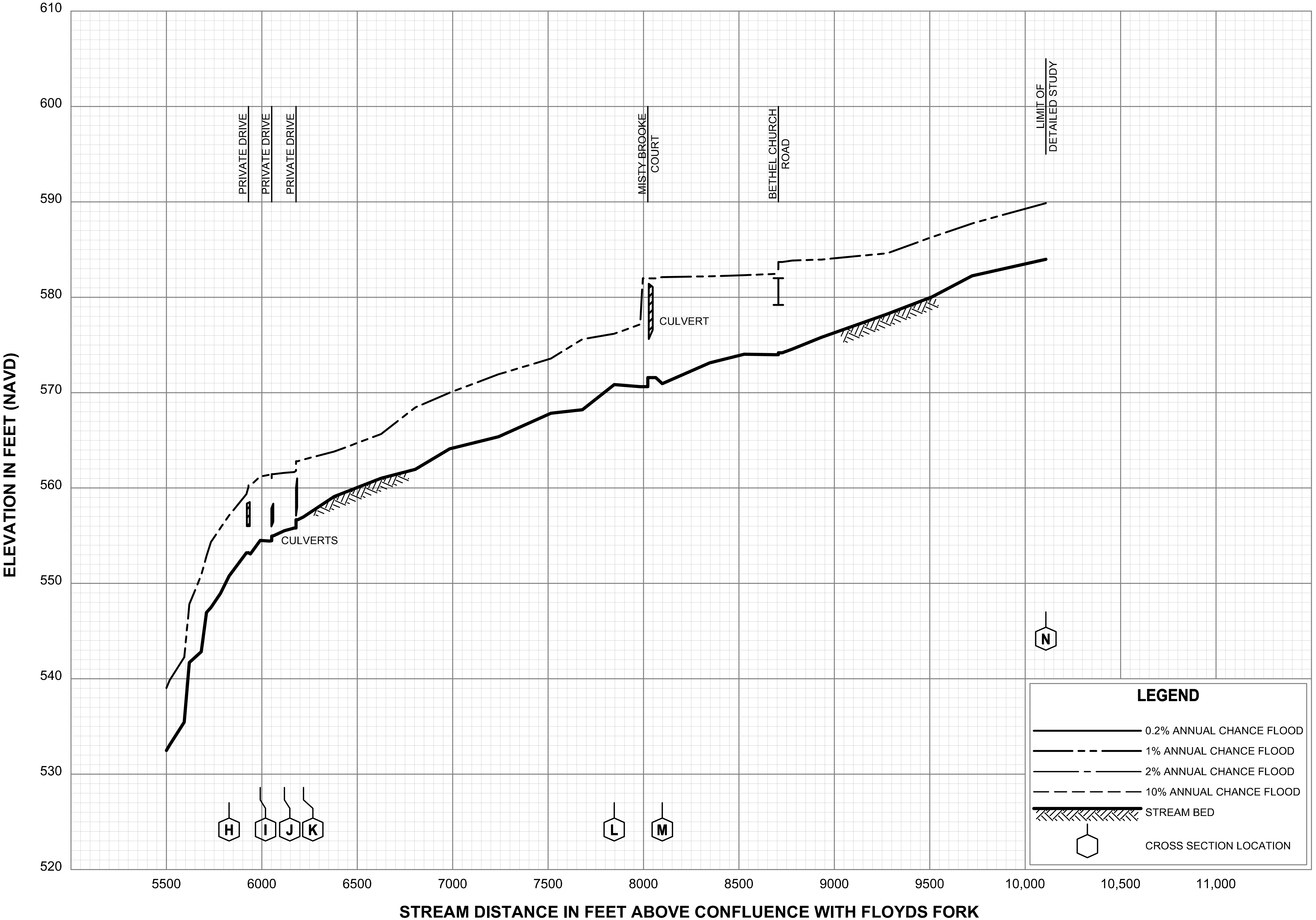
BETHEL BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

01P



FLOOD PROFILES

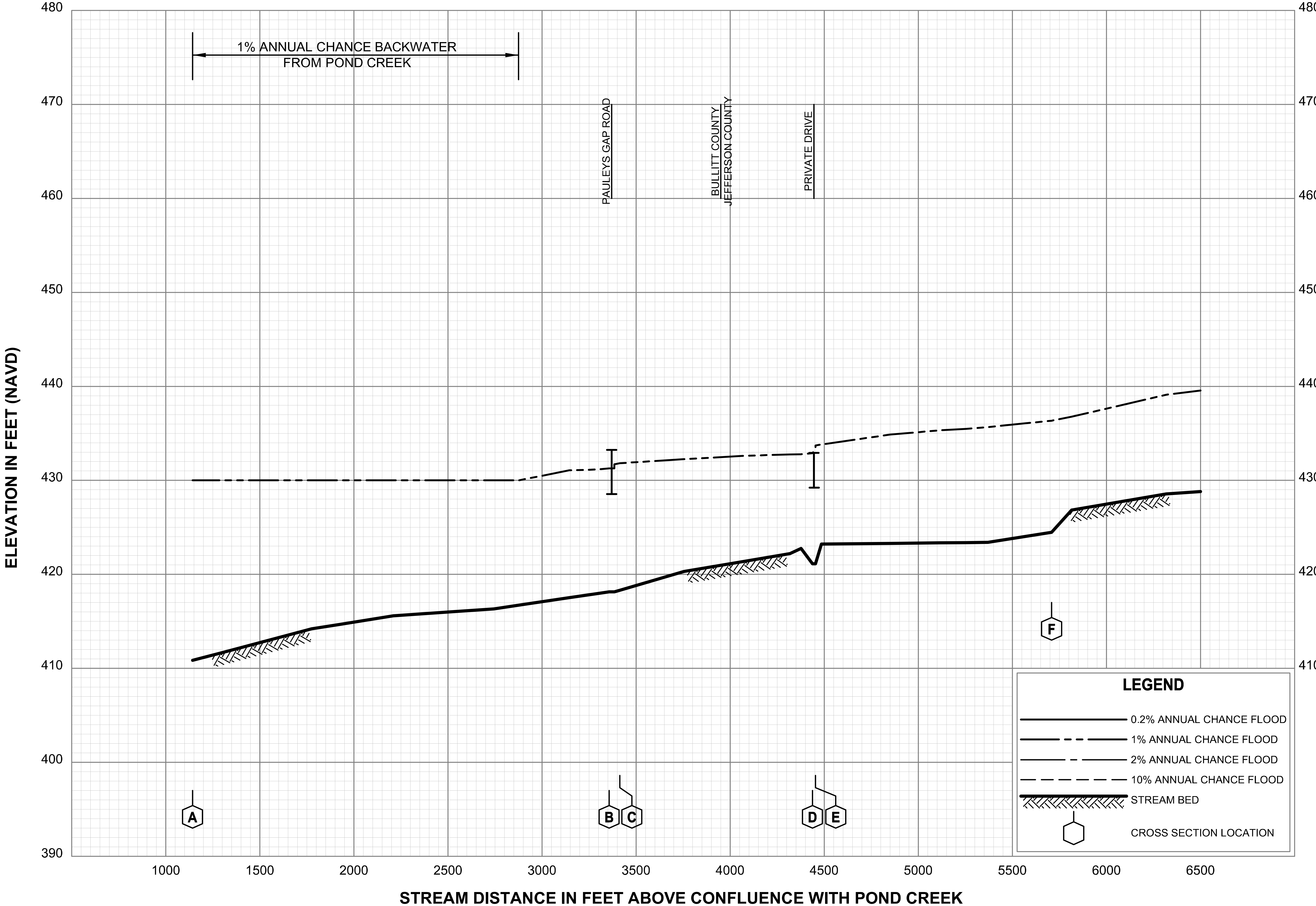
BETHEL BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

02P



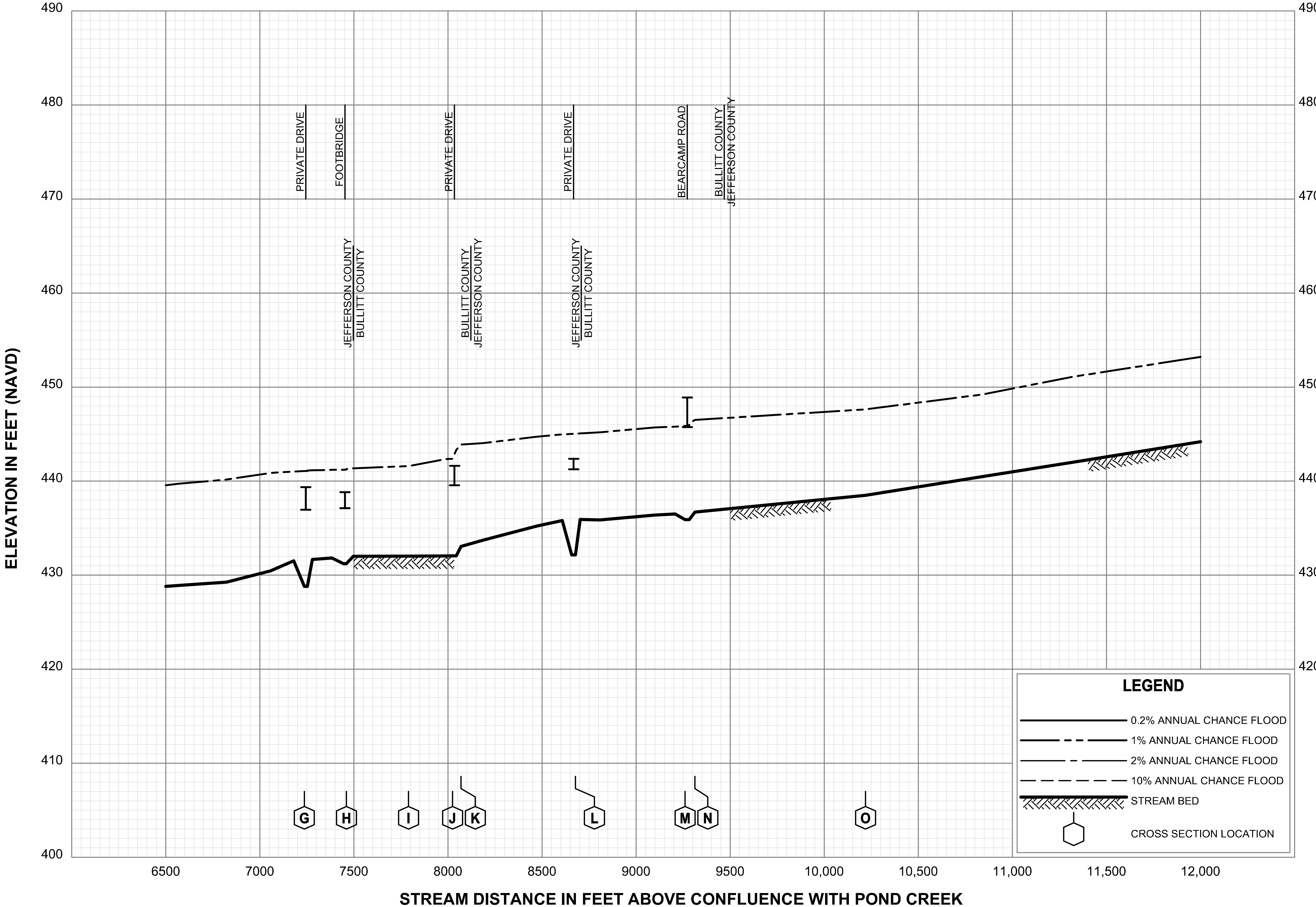
FLOOD PROFILES

BRIER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



FLOOD PROFILES

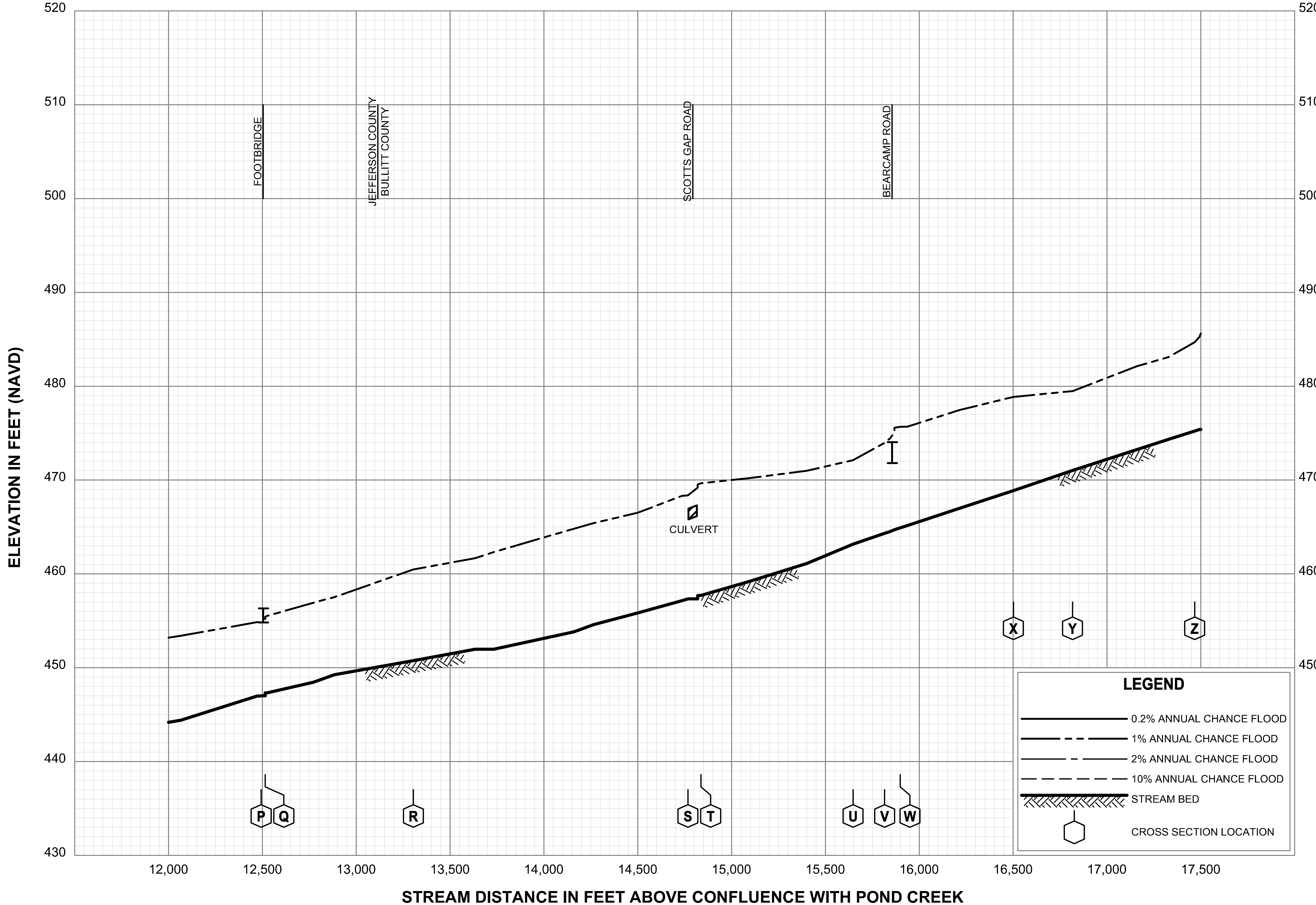
BRIER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

04P



FLOOD PROFILES

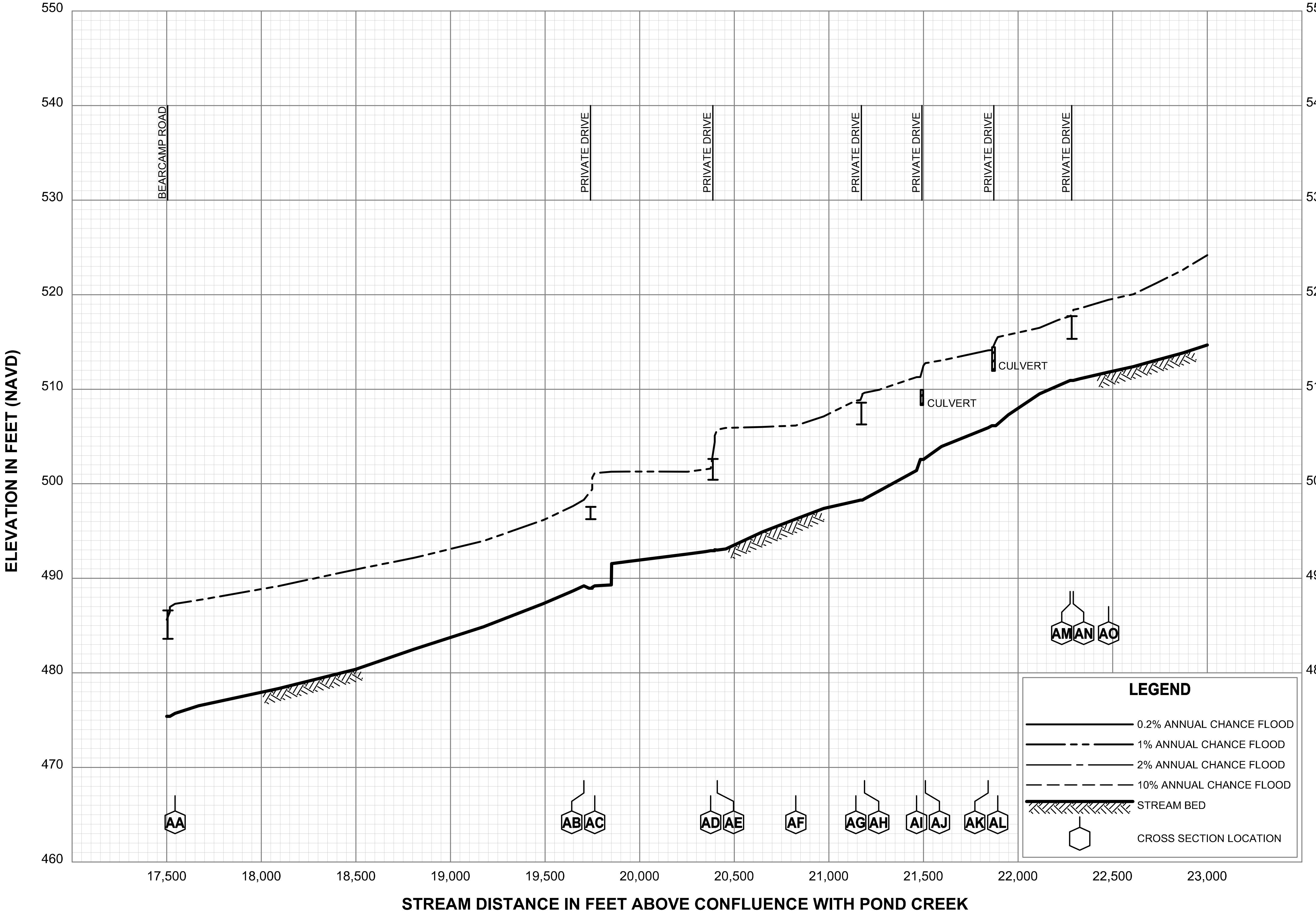
BRIER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

05P



FLOOD PROFILES

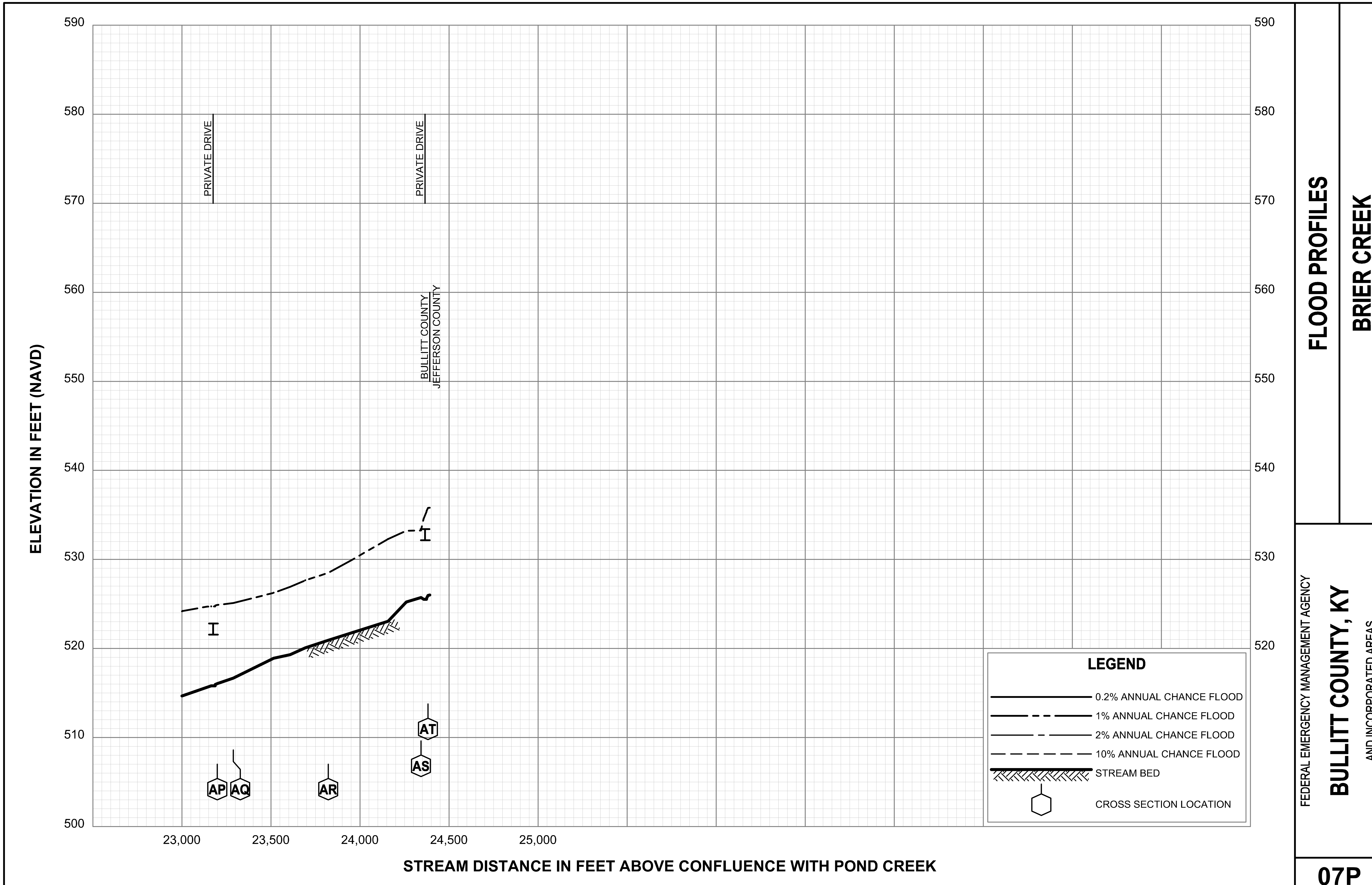
BRIER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

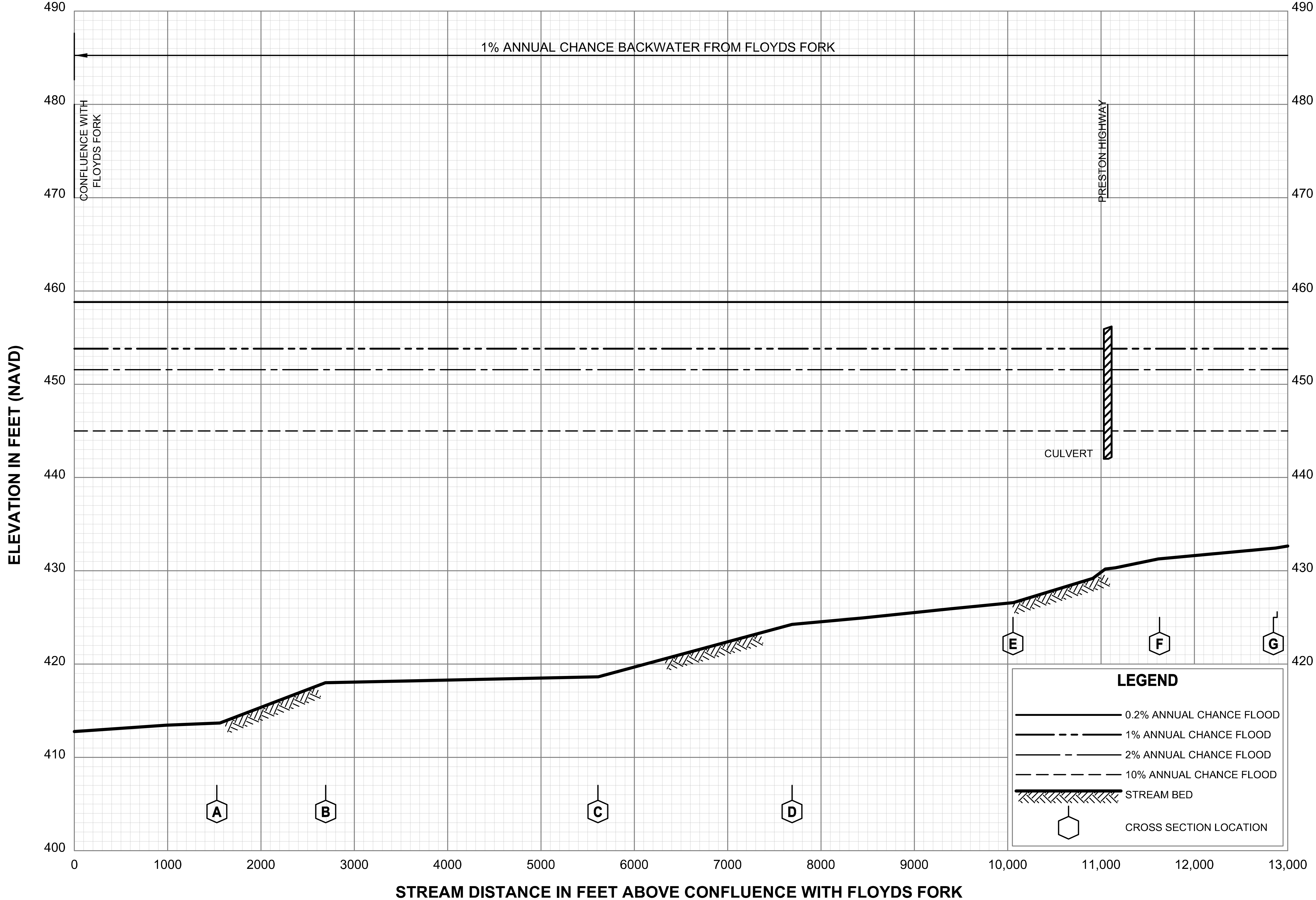
BULLITT COUNTY, KY

AND INCORPORATED AREAS

06P



FLOOD PROFILES
BRIER CREEK
FEDERAL EMERGENCY MANAGEMENT AGENCY
BULLITT COUNTY, KY
AND INCORPORATED AREAS
07P
ELEVATION IN FEET (NAVD)
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH POND CREEK
590
580
570
560
550
540
530
520
510
500
23,000
23,500
24,000
24,500
25,000
PRIVATE DRIVE
PRIVATE DRIVE
BULLITT COUNTY
JEFFERSON COUNTY
AP
AQ
AR
AS
AT
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION



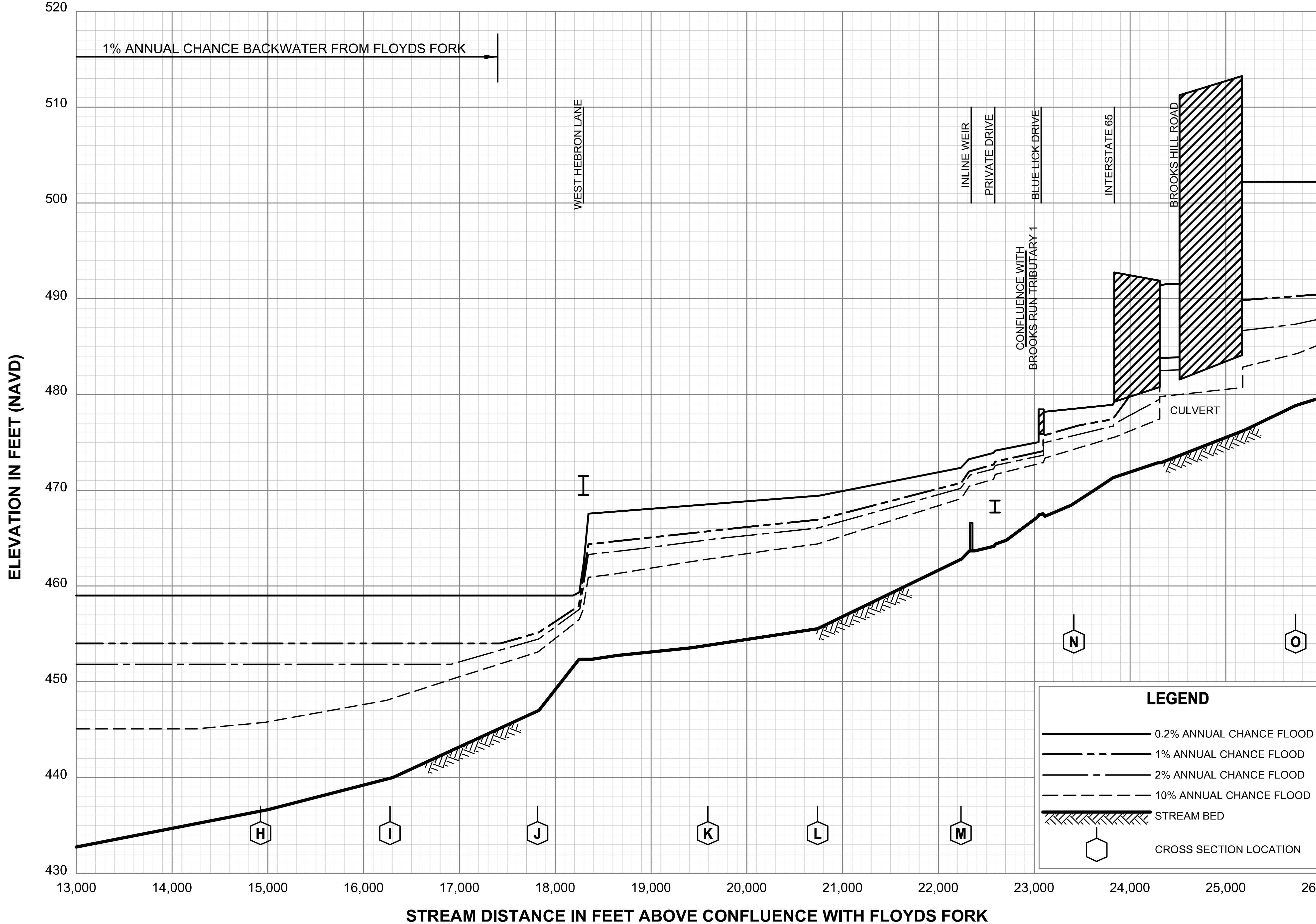
FLOOD PROFILES

BROOKS RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



FLOOD PROFILES

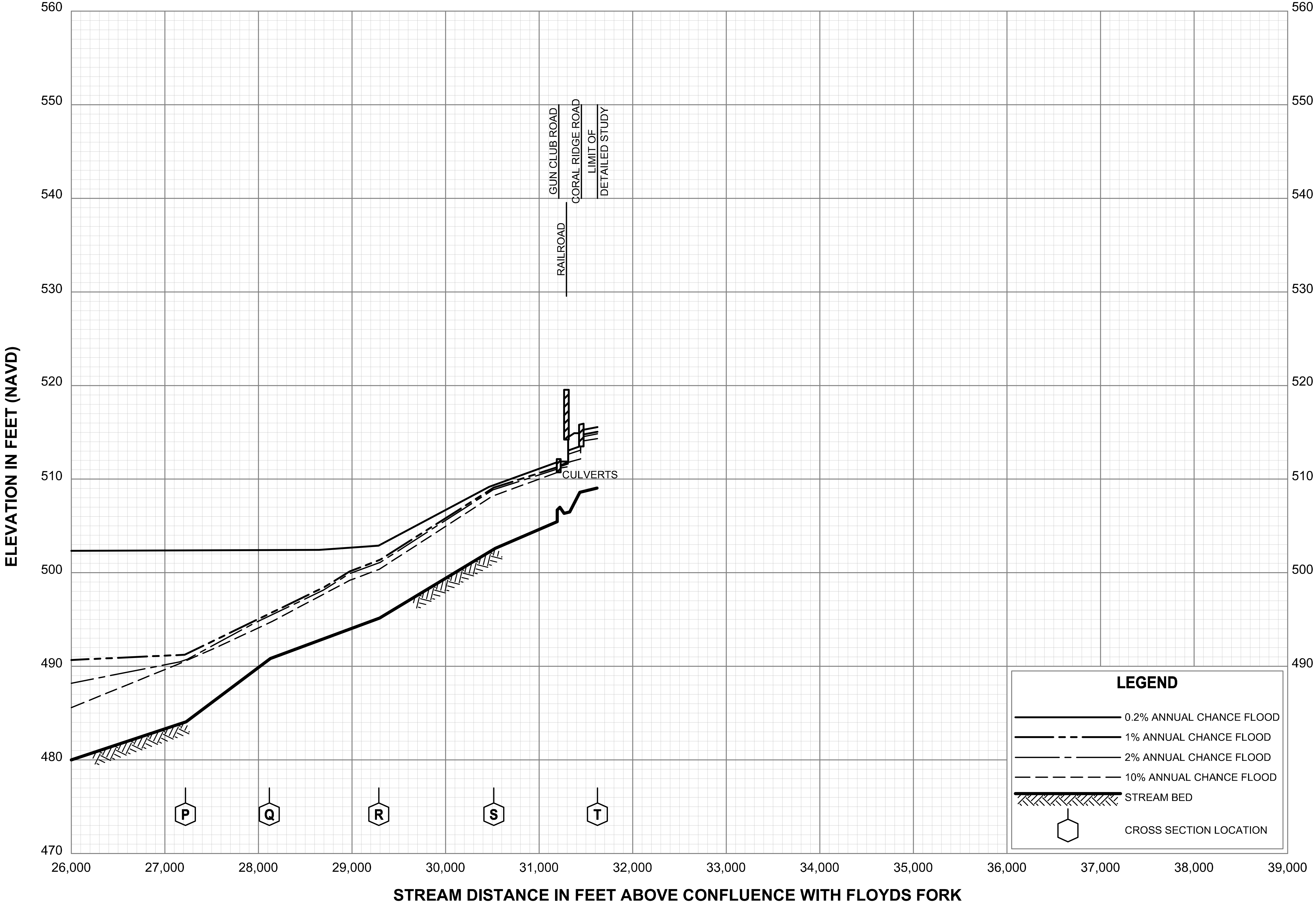
BROOKS RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

09P



FLOOD PROFILES

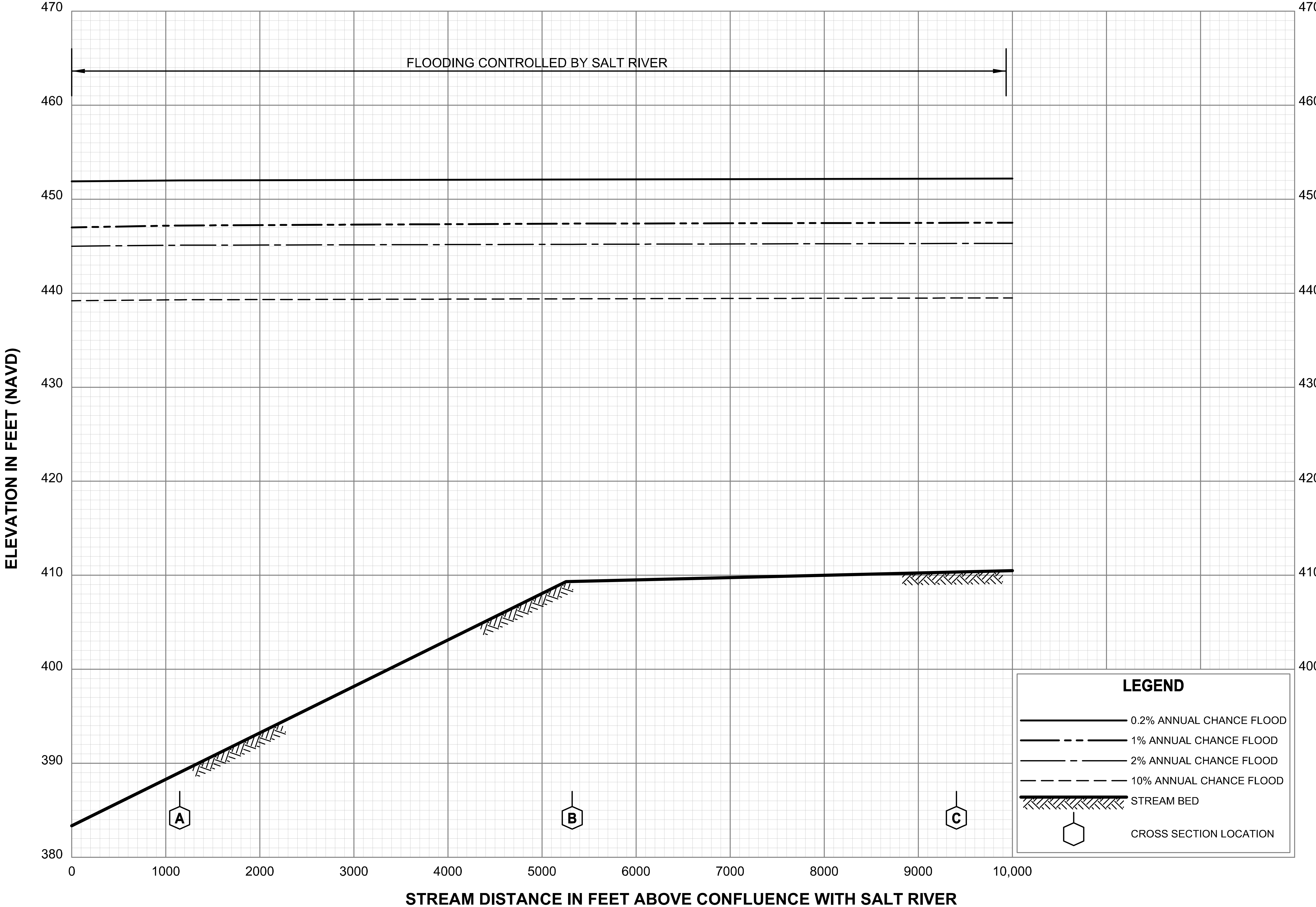
BROOKS RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

10P



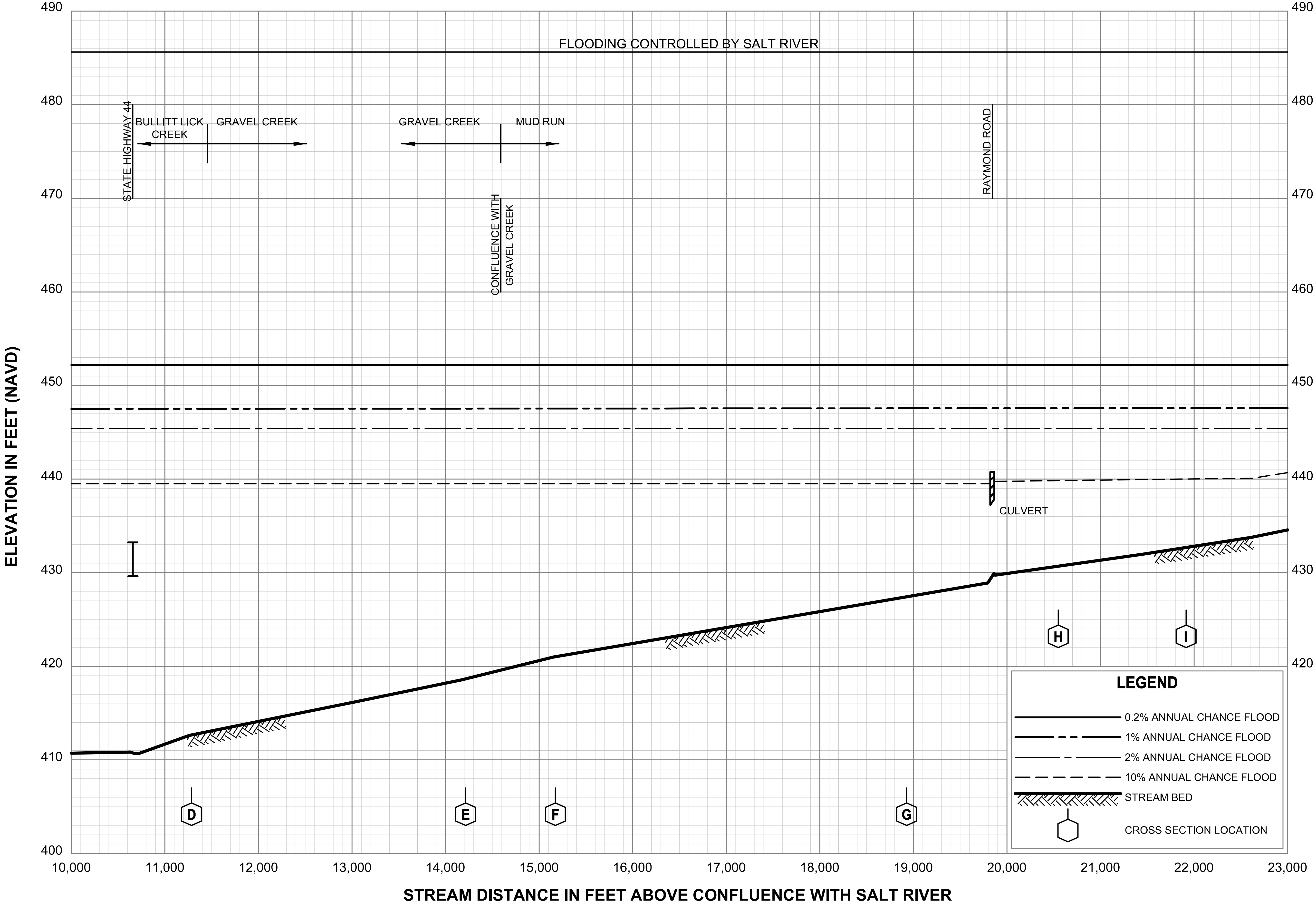
FLOOD PROFILES

BULLITT LICK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



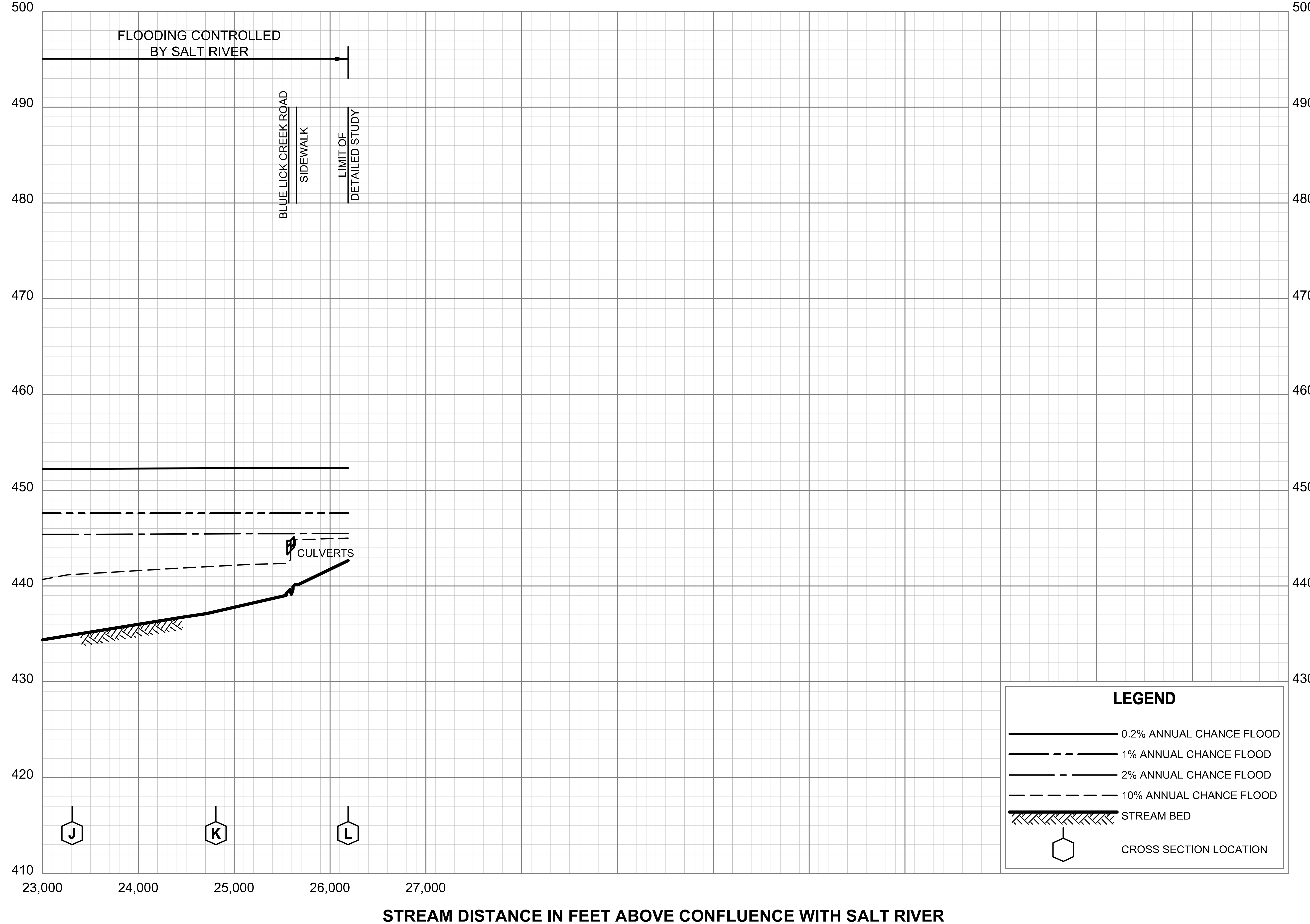
FLOOD PROFILES

BULLITT LICK CREEK - GRAVEL CREEK - MUD RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



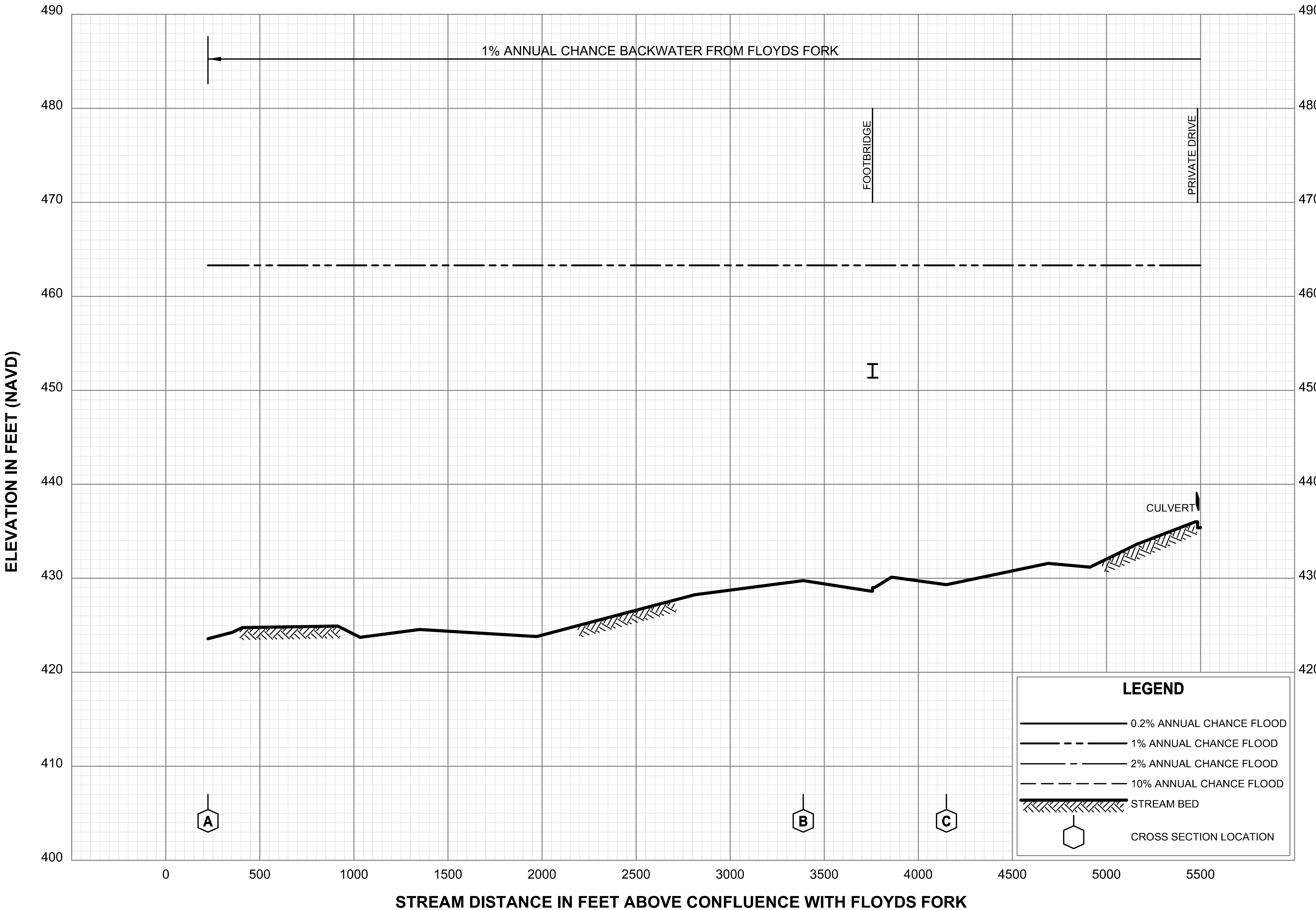
FLOOD PROFILES

MUD RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



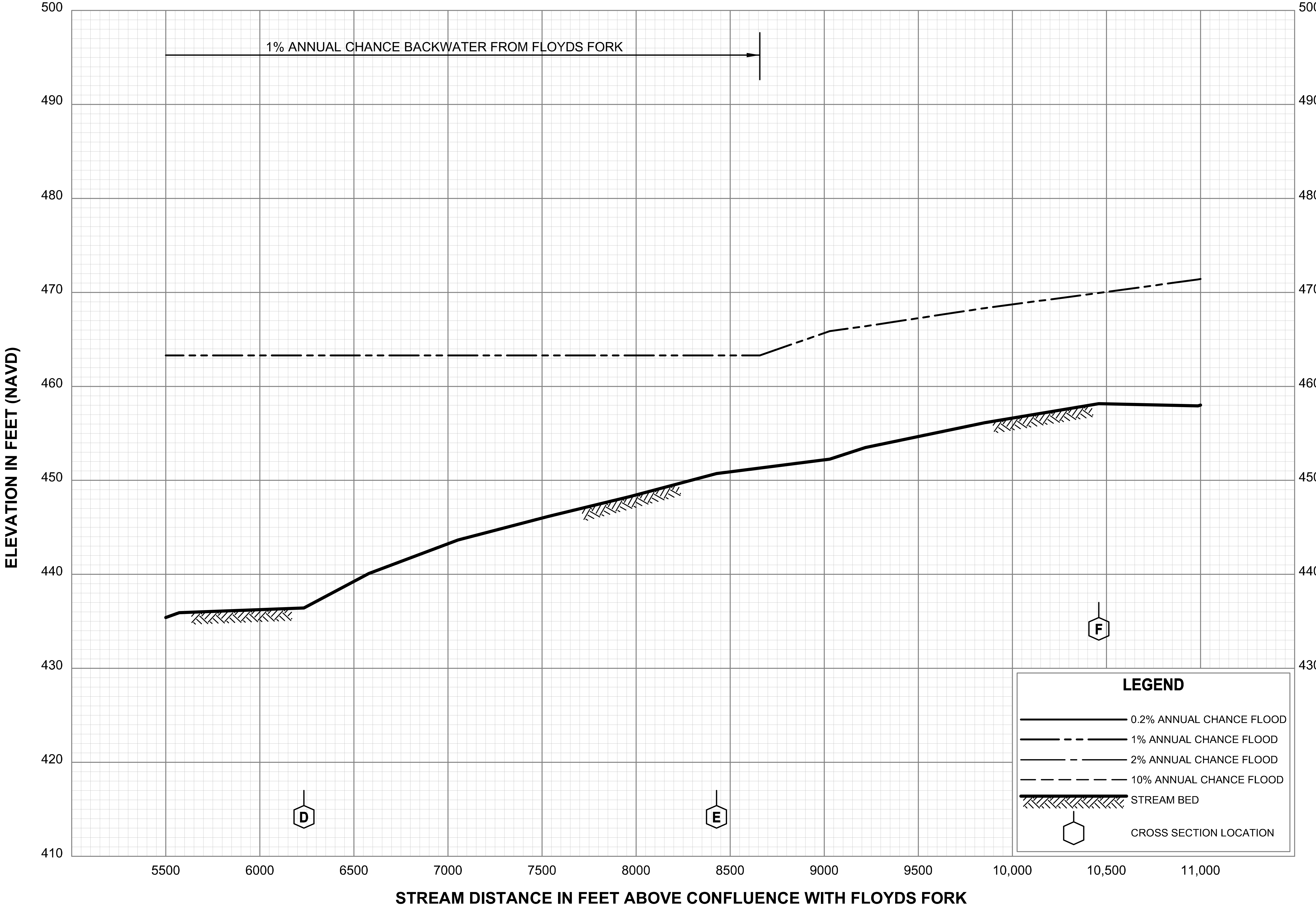
FLOOD PROFILES

CEDAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



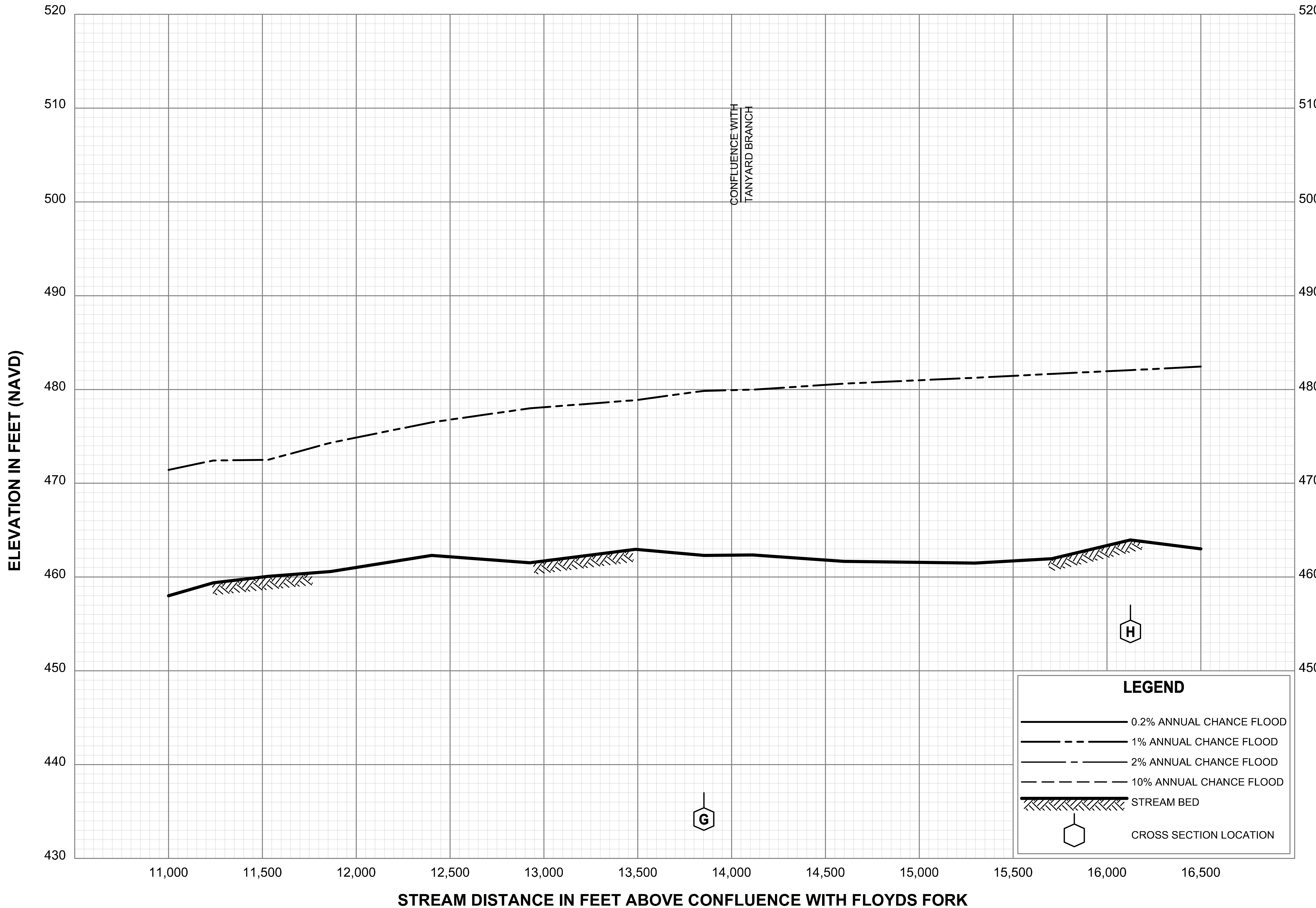
FLOOD PROFILES

CEDAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



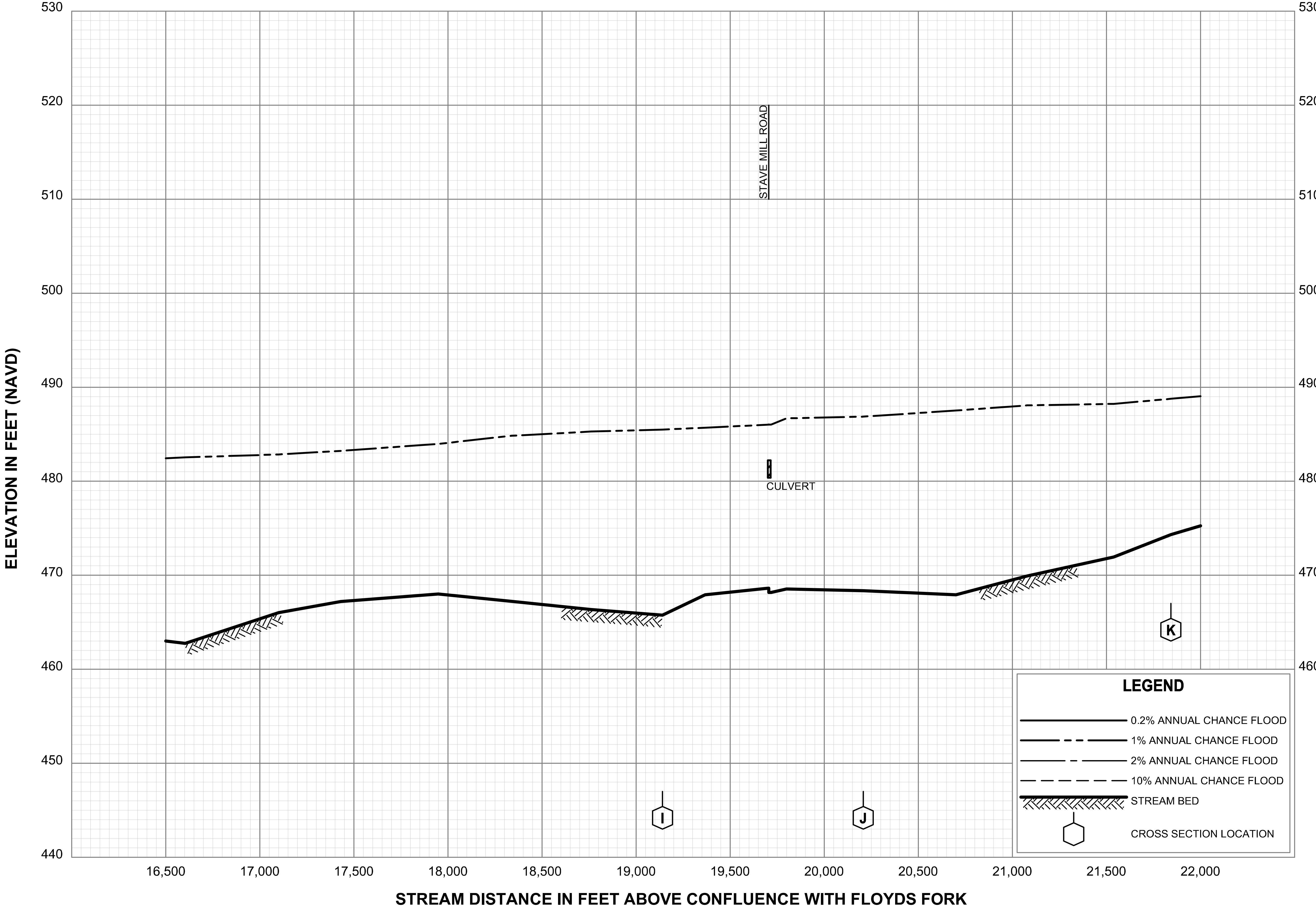
FLOOD PROFILES

CEDAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



FLOOD PROFILES

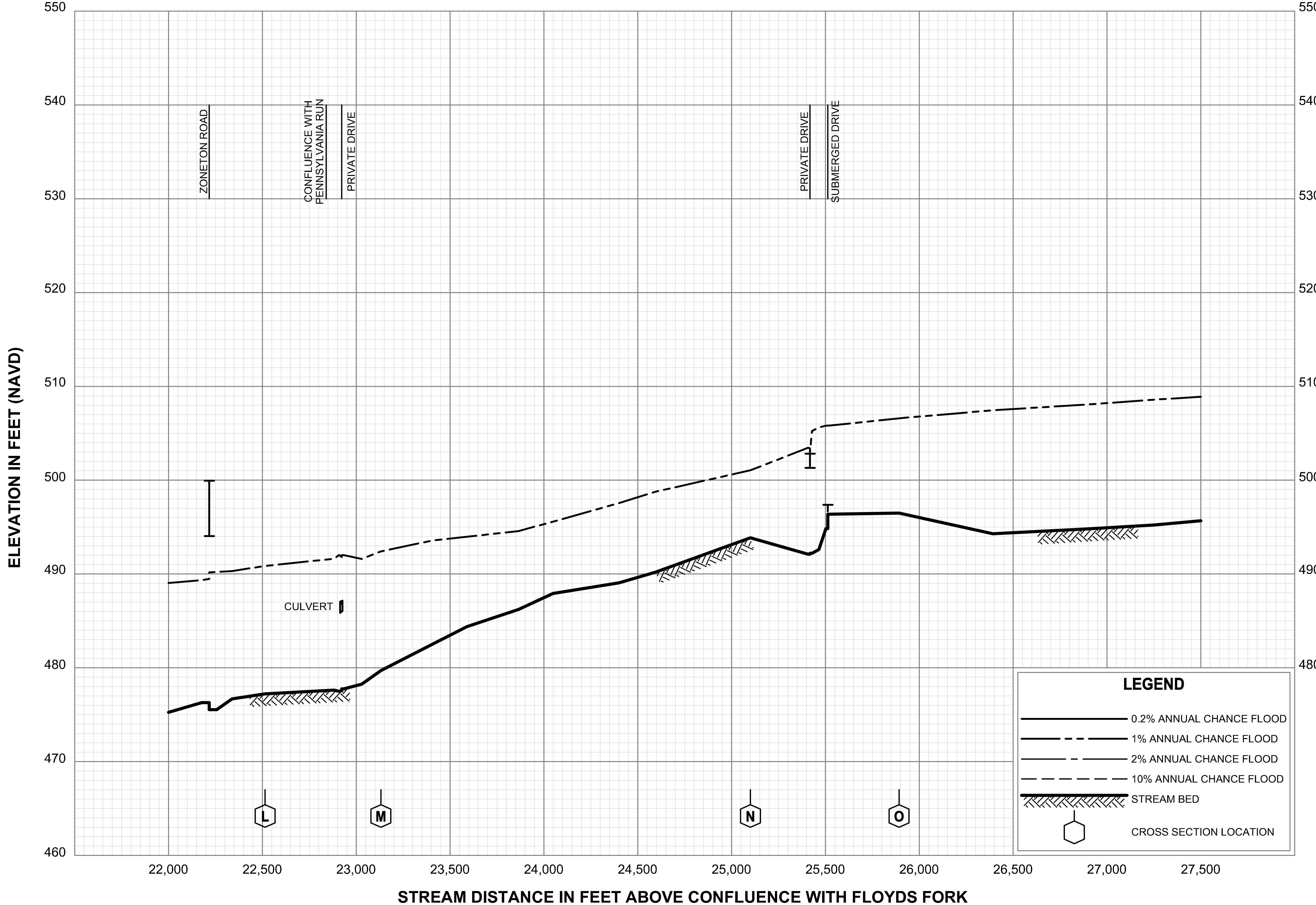
CEDAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

17P



FLOOD PROFILES

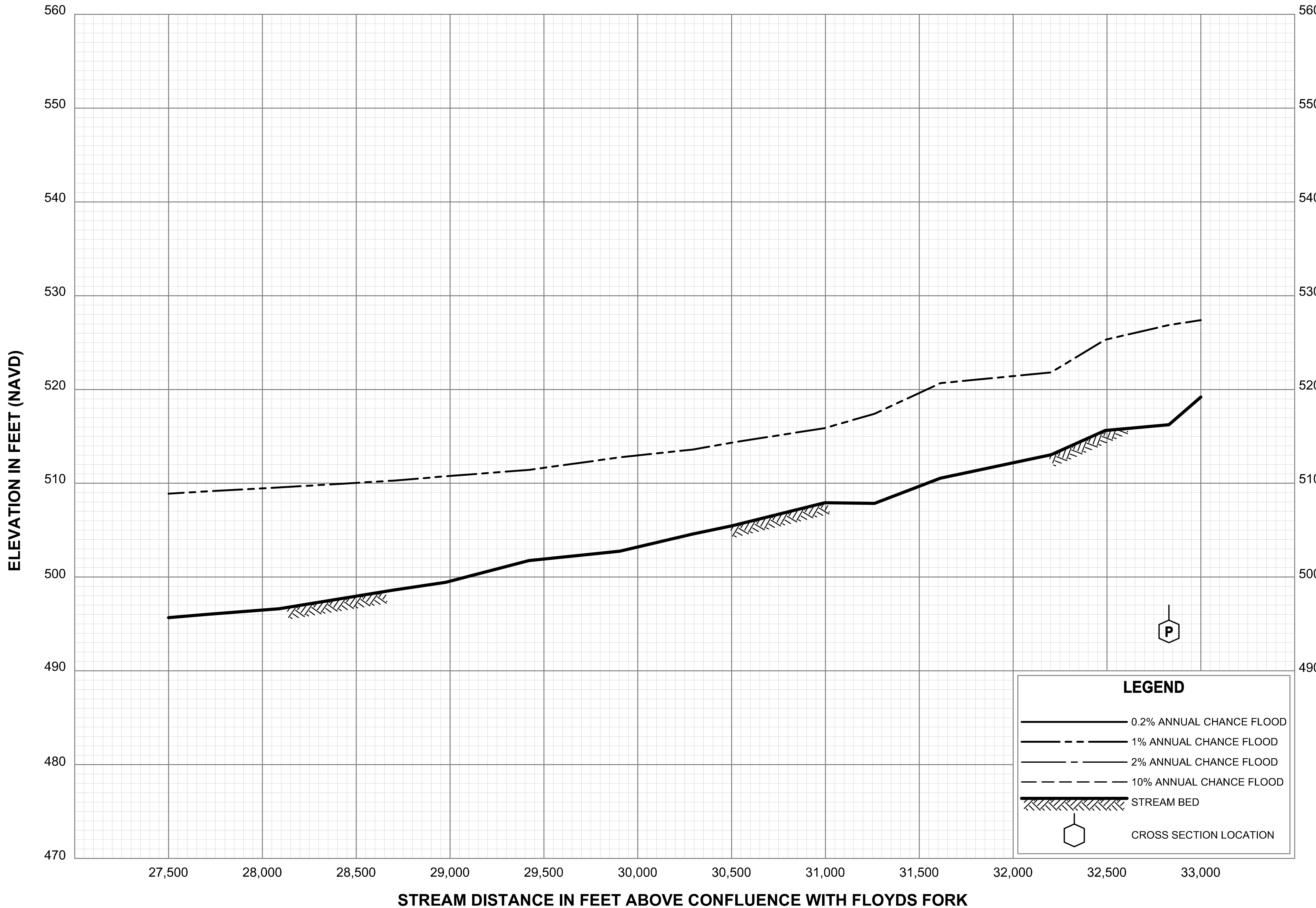
CEDAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

18P



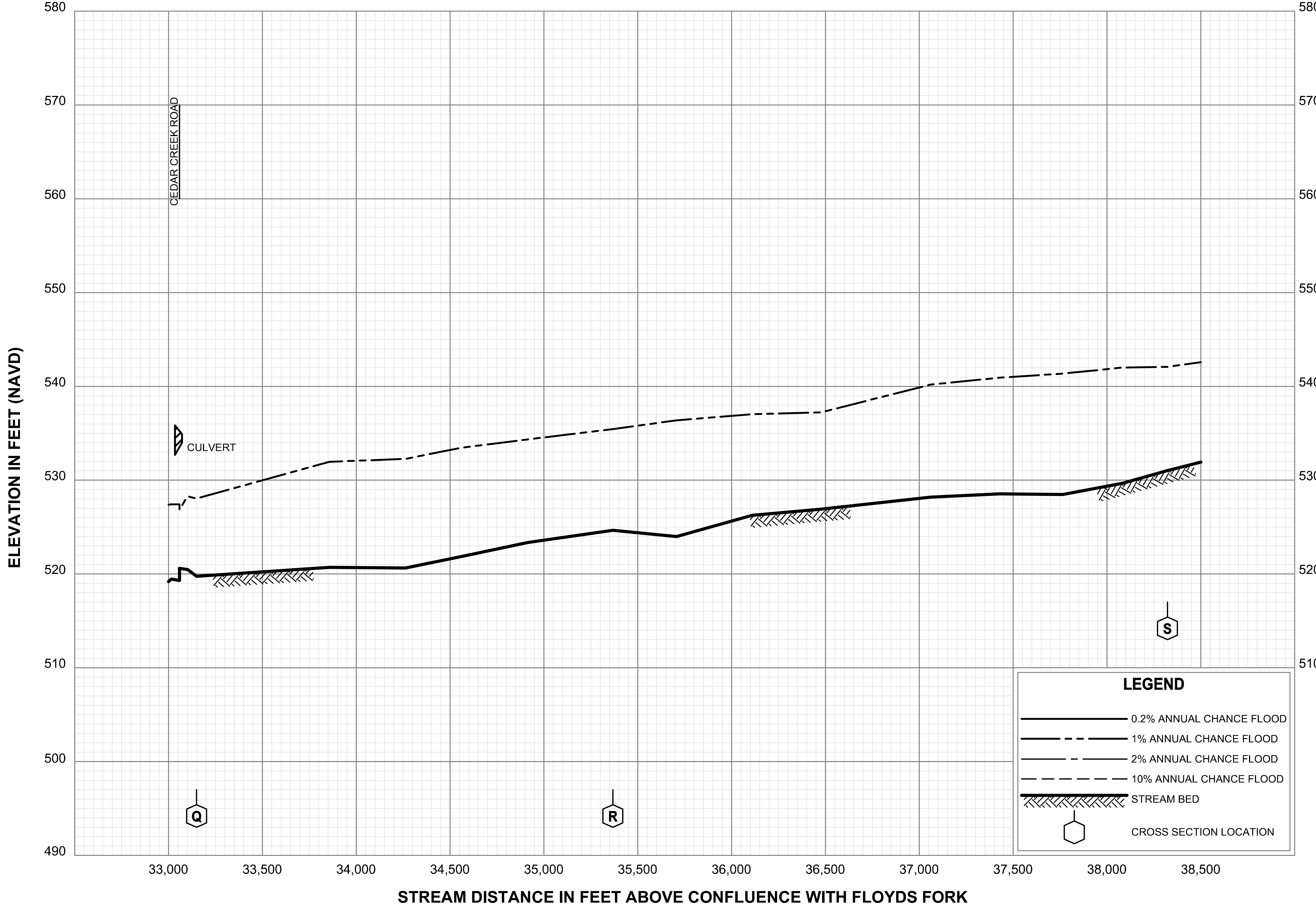
FLOOD PROFILES

CEDAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



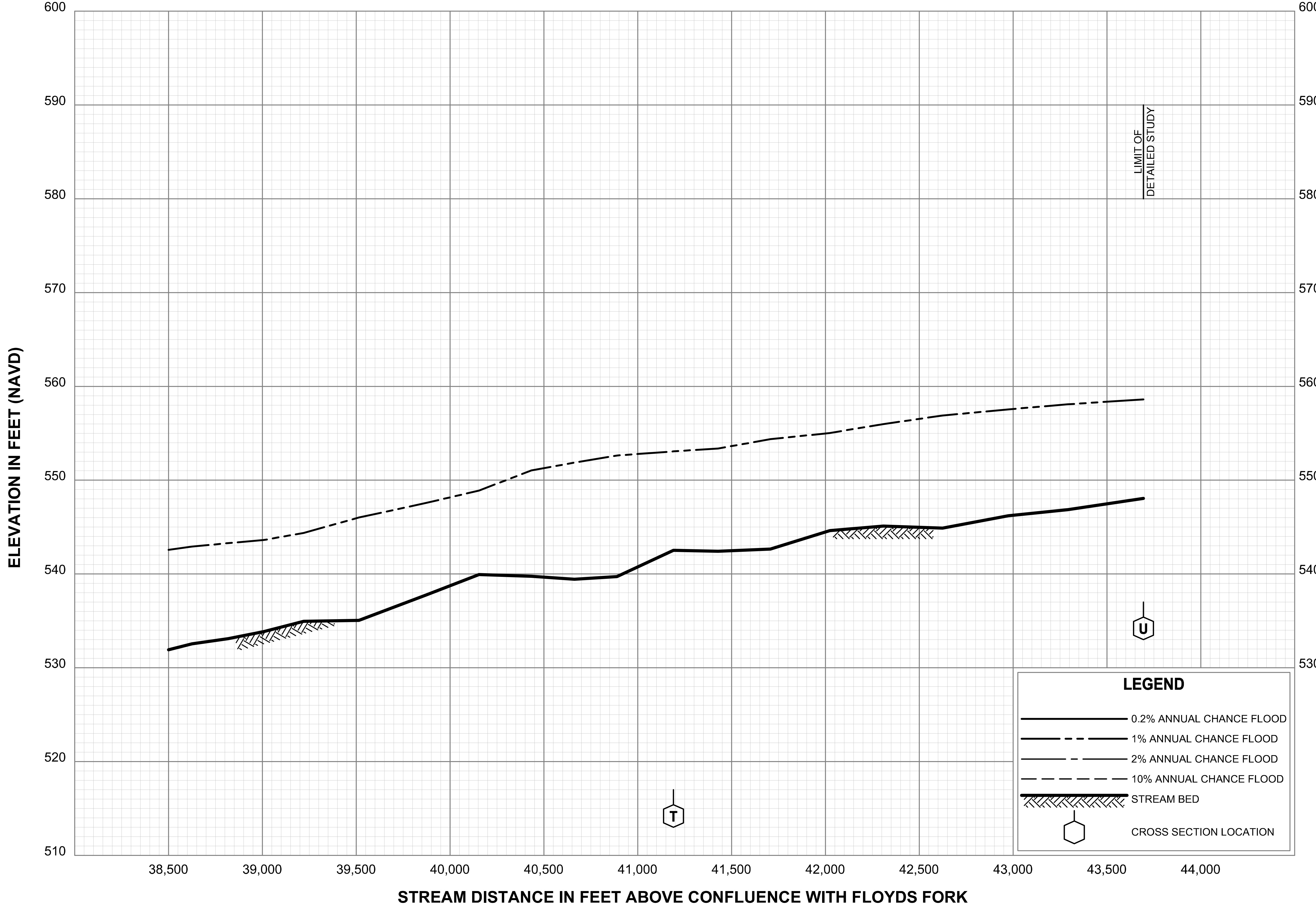
FLOOD PROFILES

CEDAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



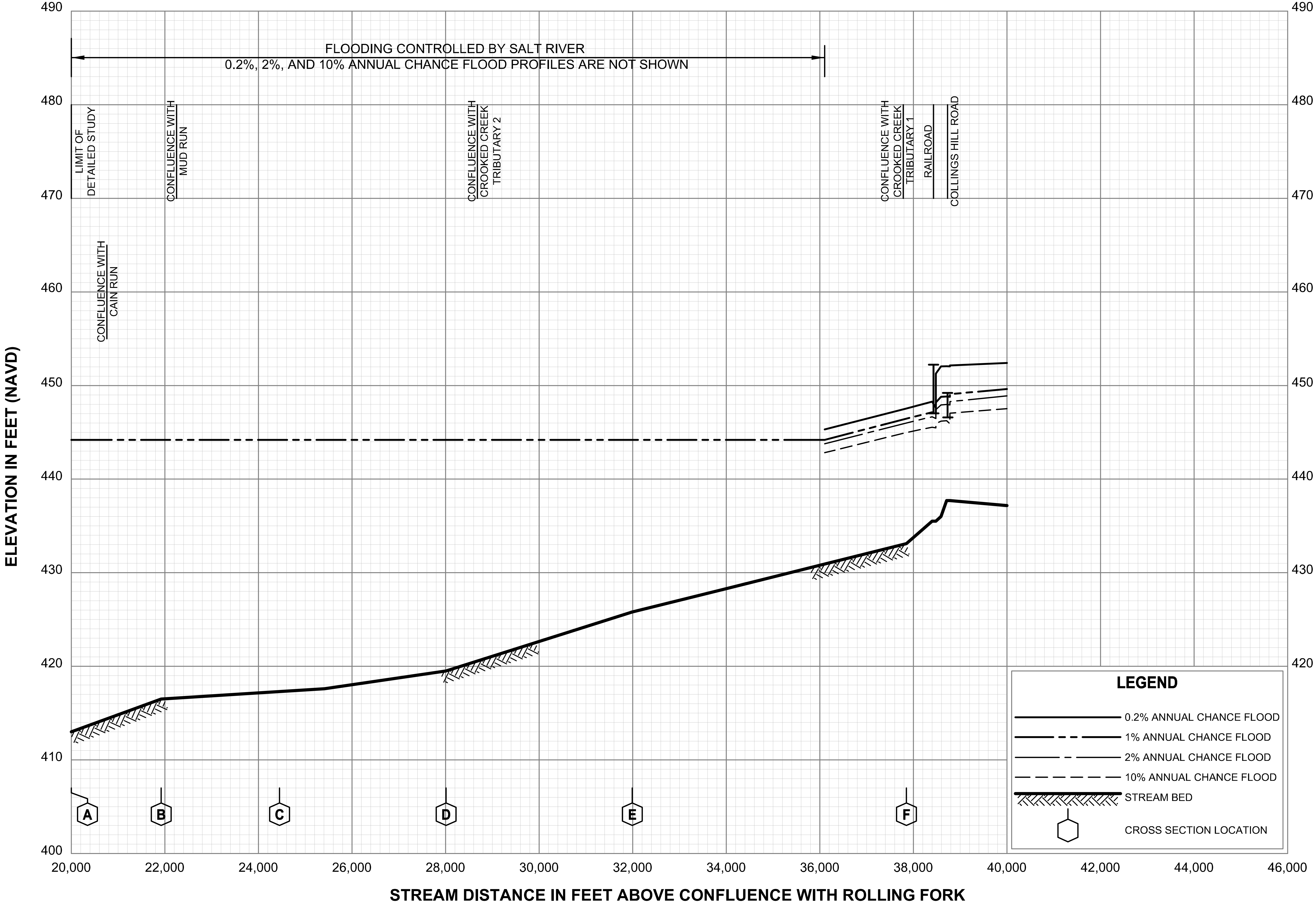
FLOOD PROFILES

CEDAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



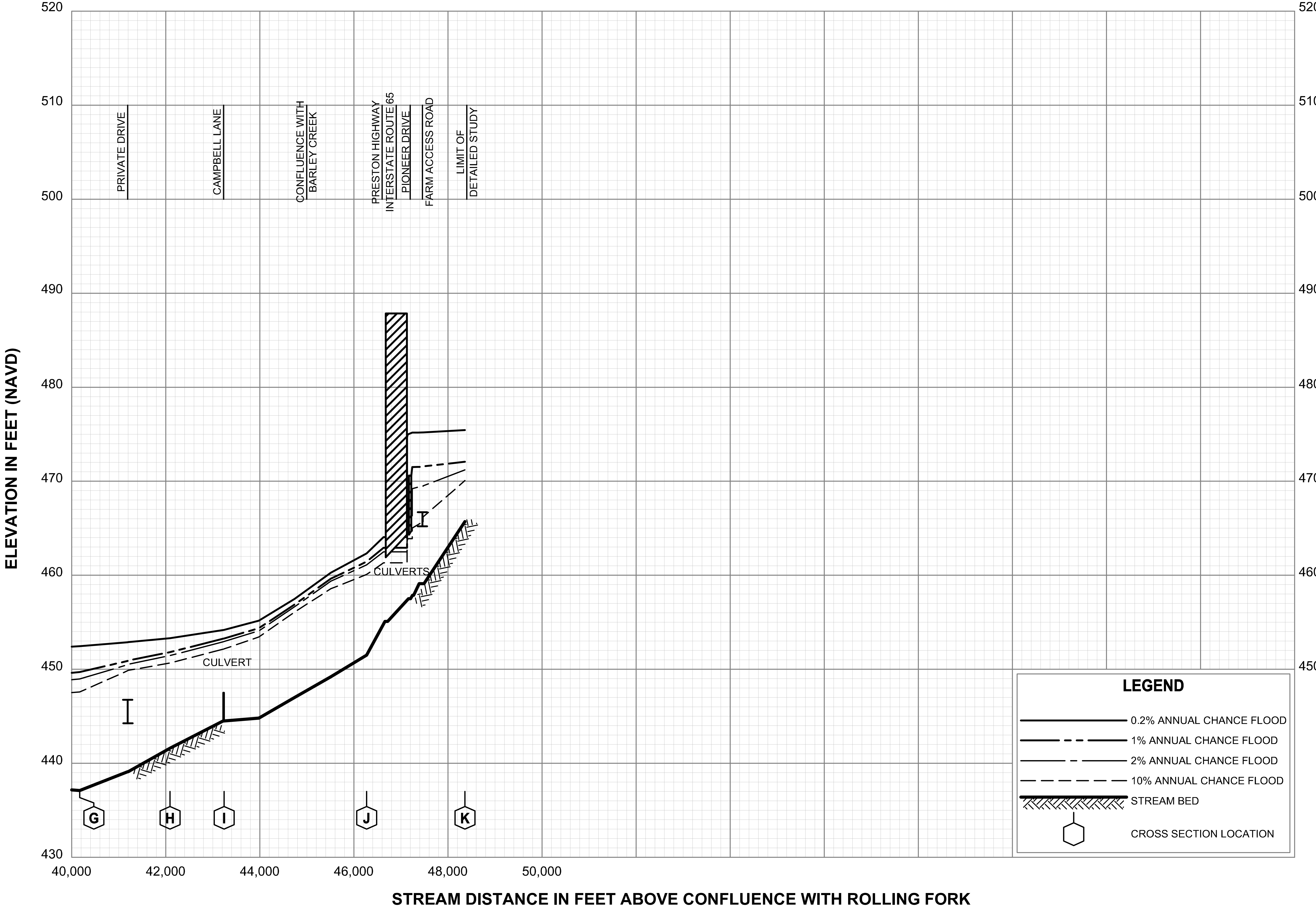
FLOOD PROFILES

CROOKED CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



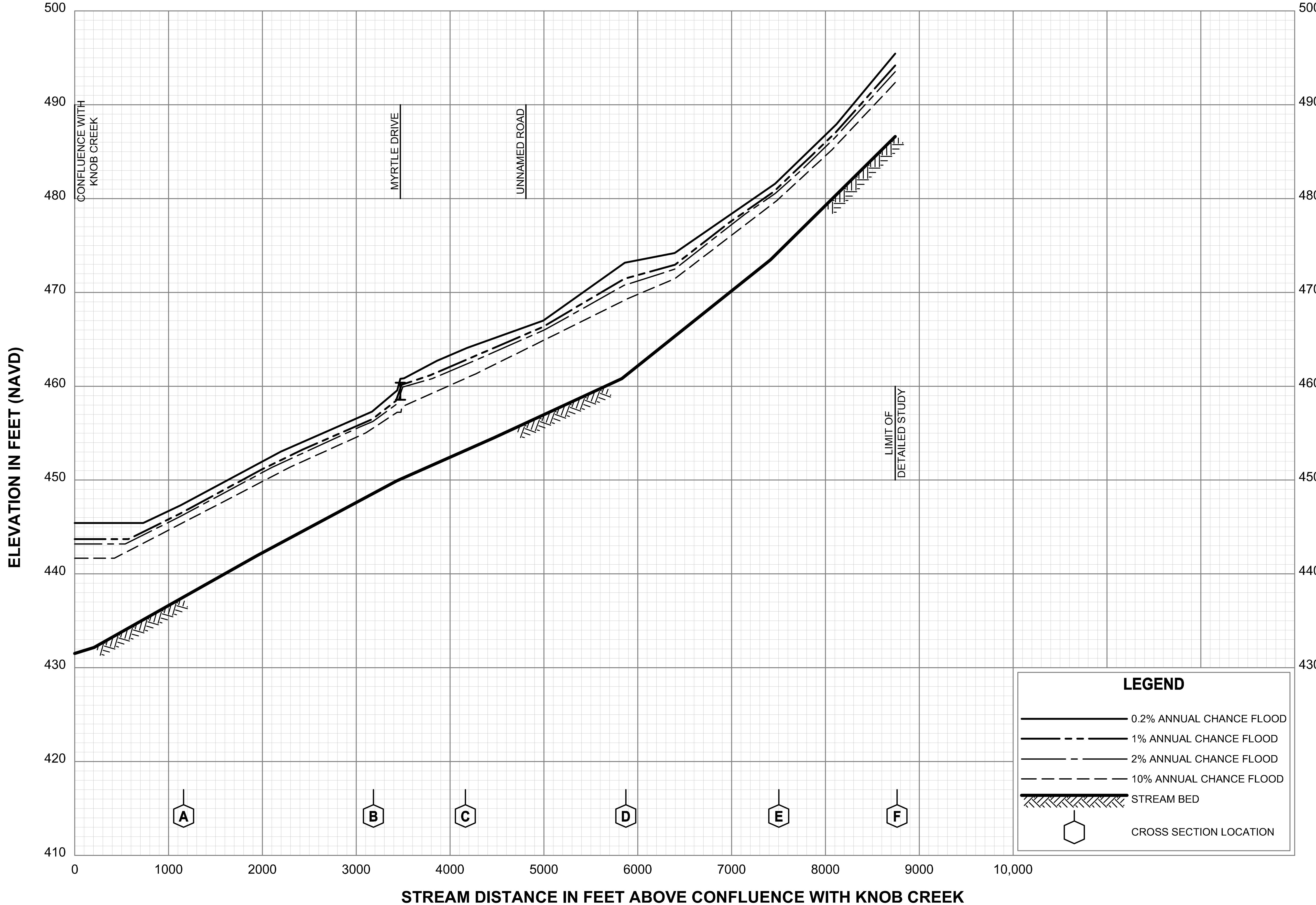
FLOOD PROFILES

CROOKED CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



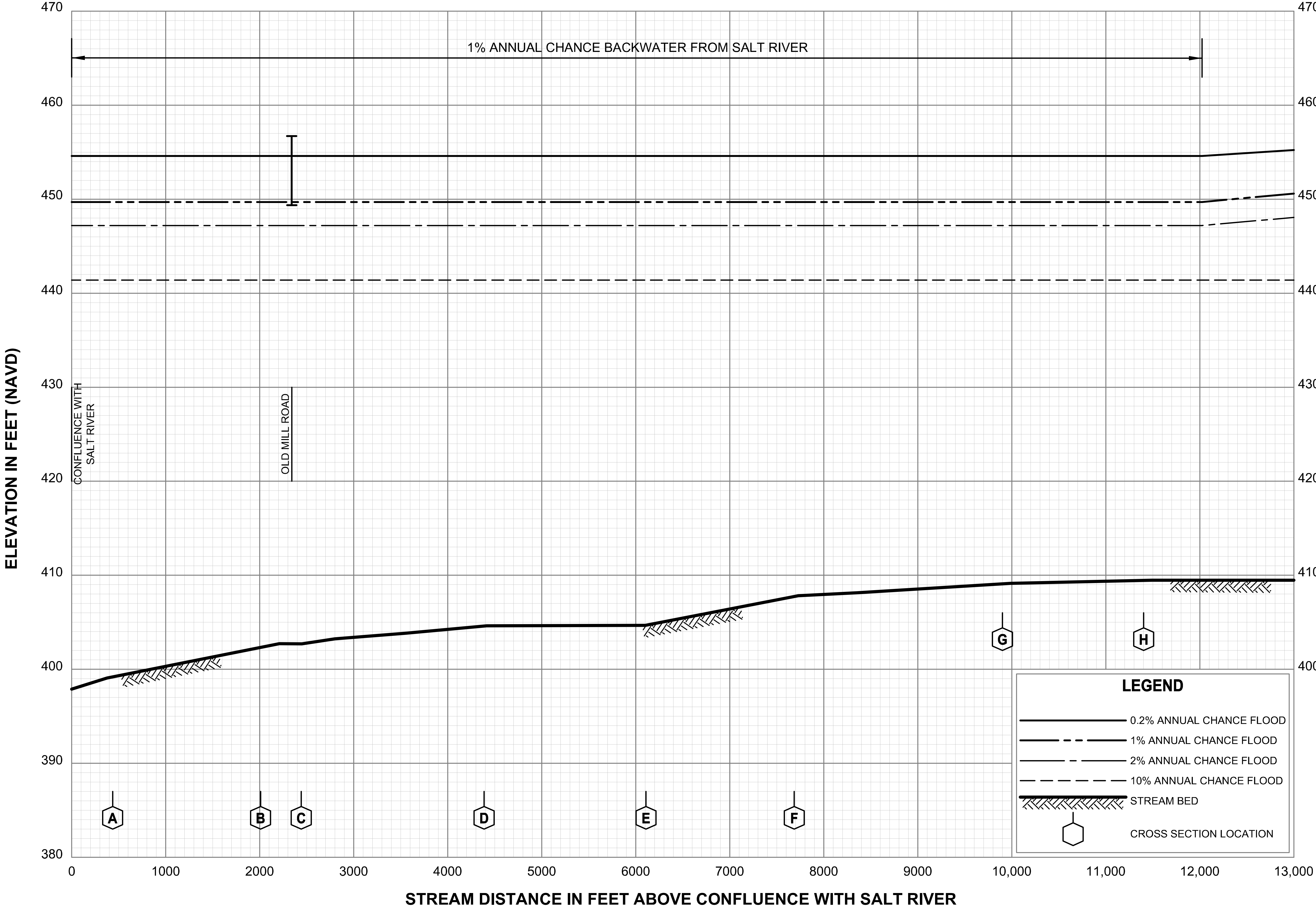
FLOOD PROFILES

CURRY BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



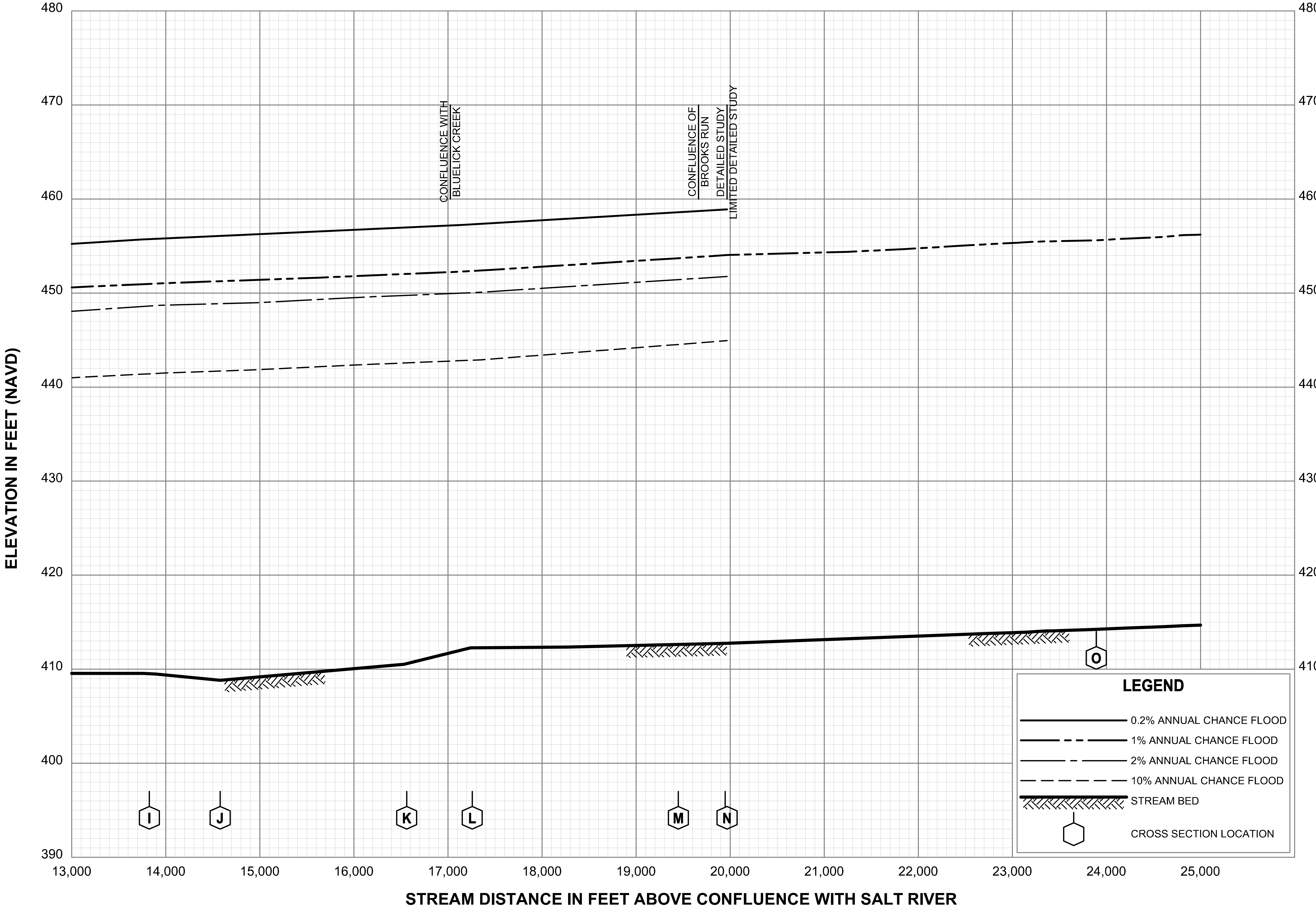
FLOOD PROFILES

FLOYDS FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



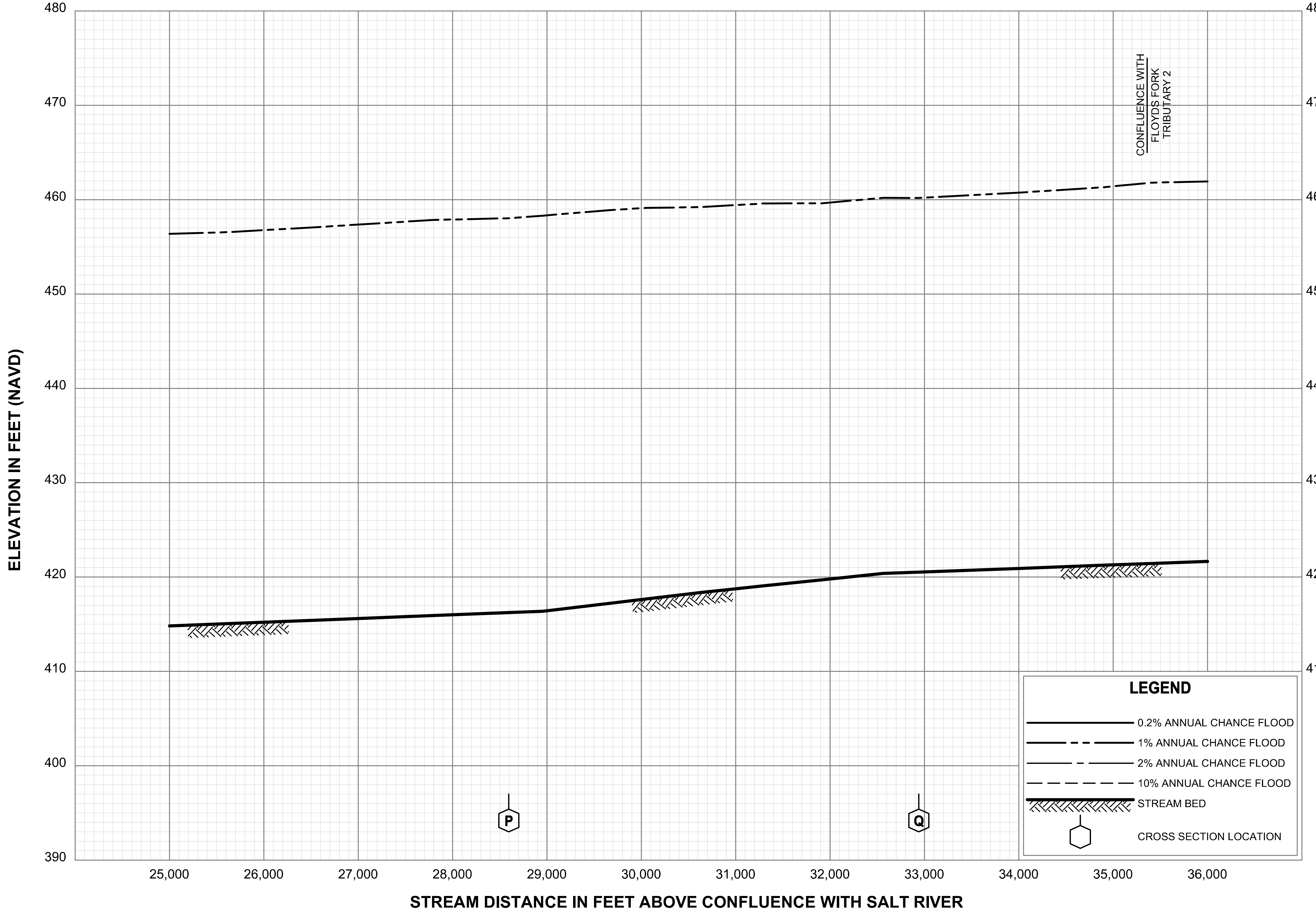
FLOOD PROFILES

FLOYDS FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



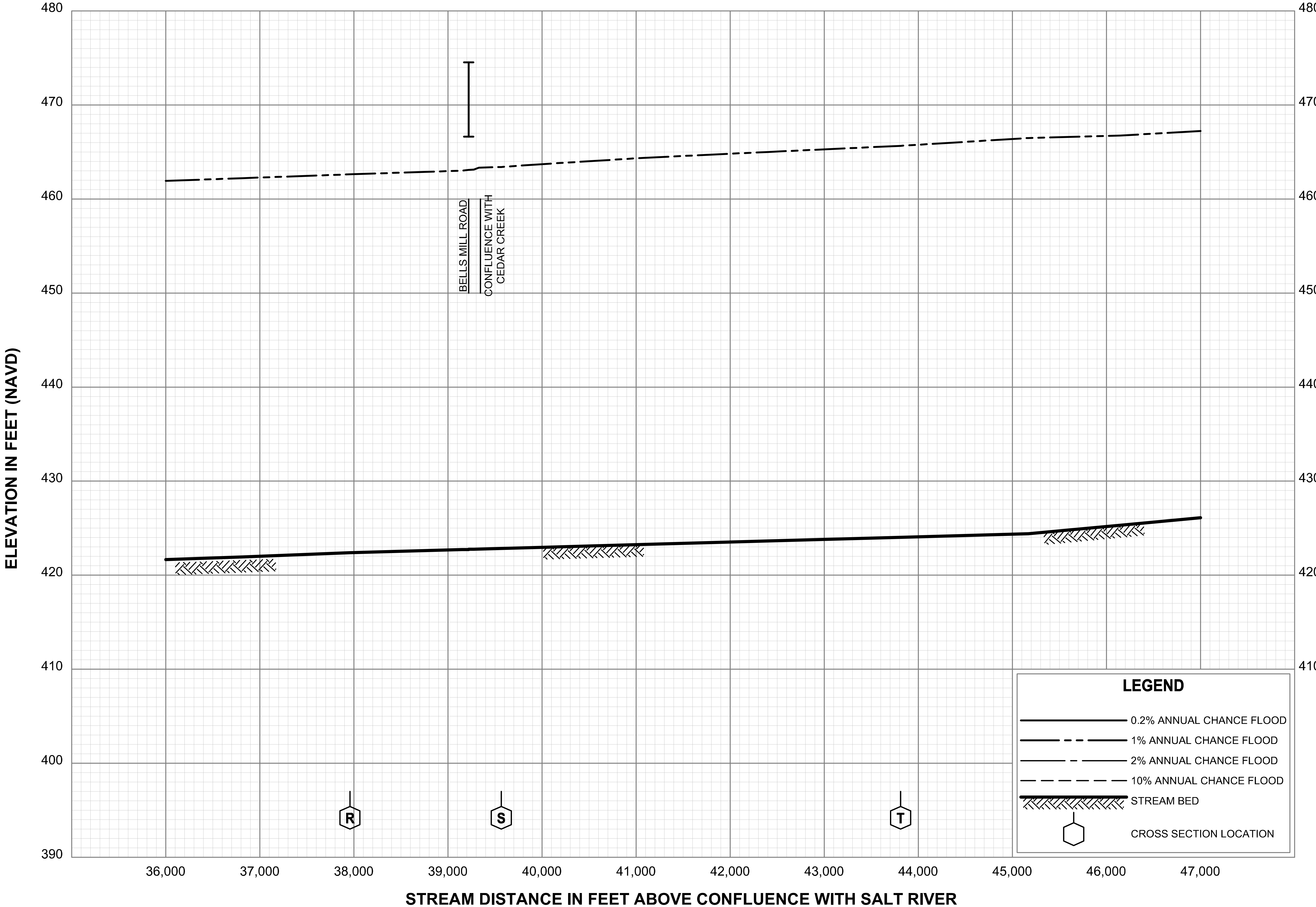
FLOOD PROFILES

FLOYDS FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



FLOOD PROFILES

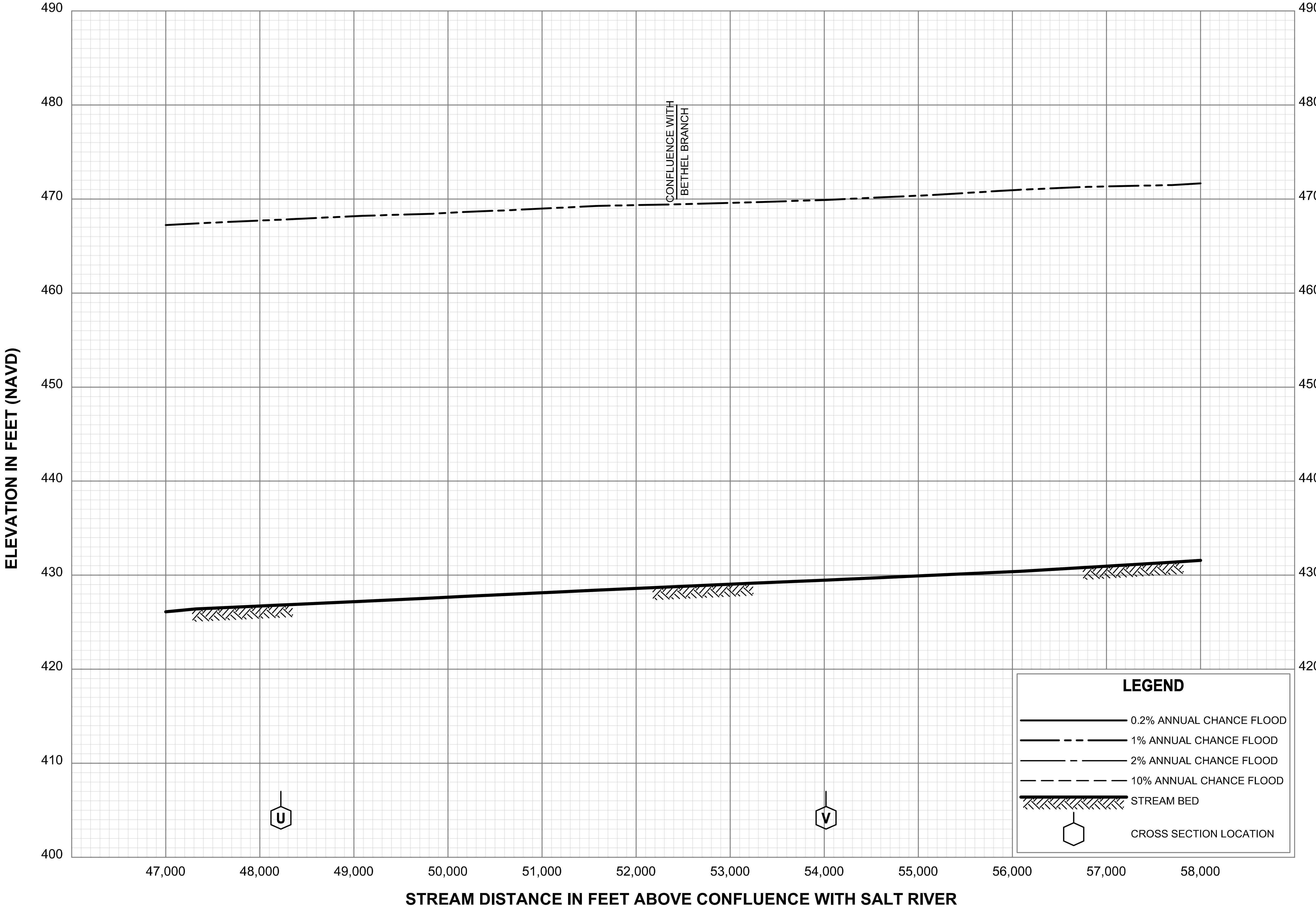
FLOYDS FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

28P



FLOOD PROFILES

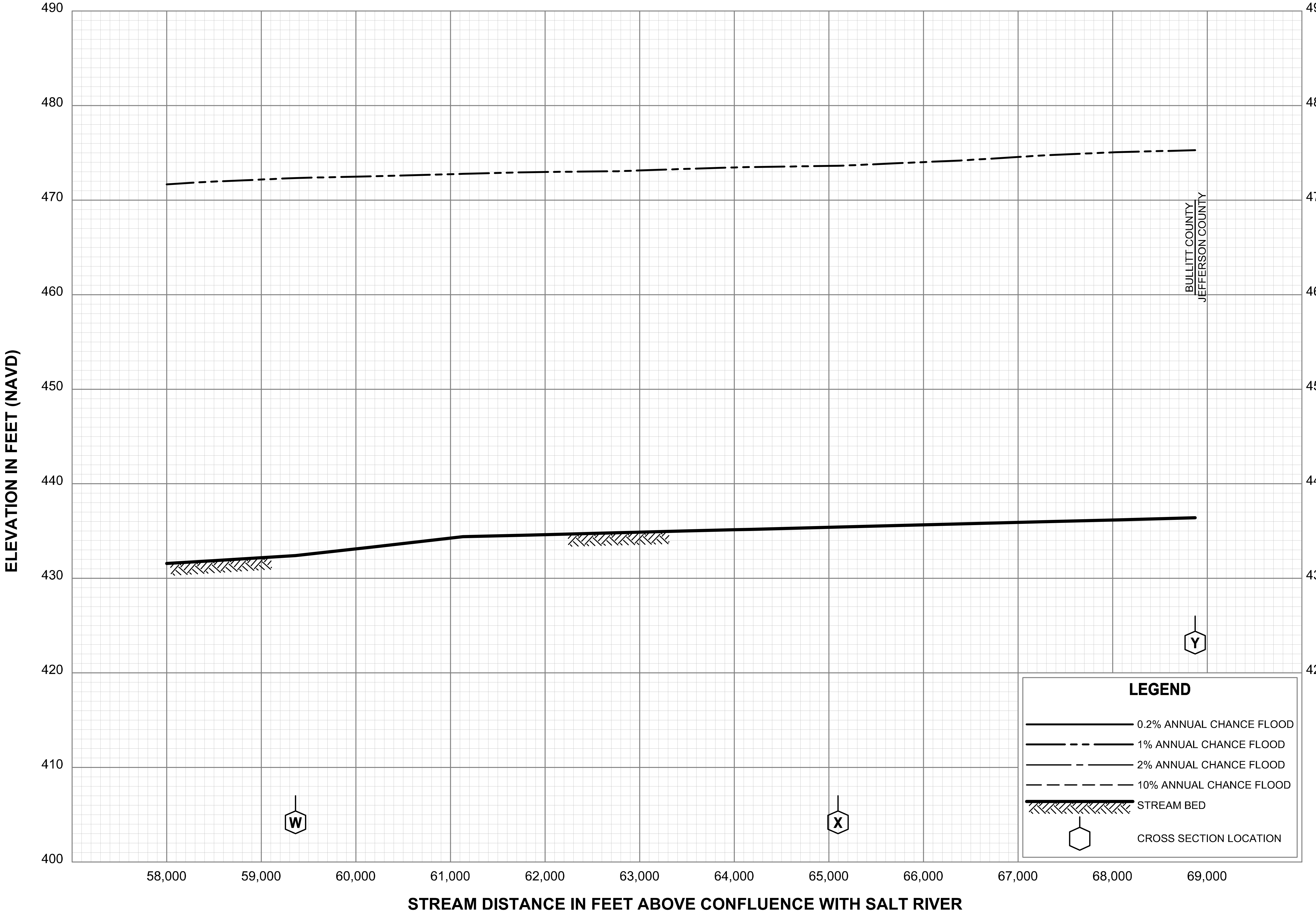
FLOYDS FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

29P



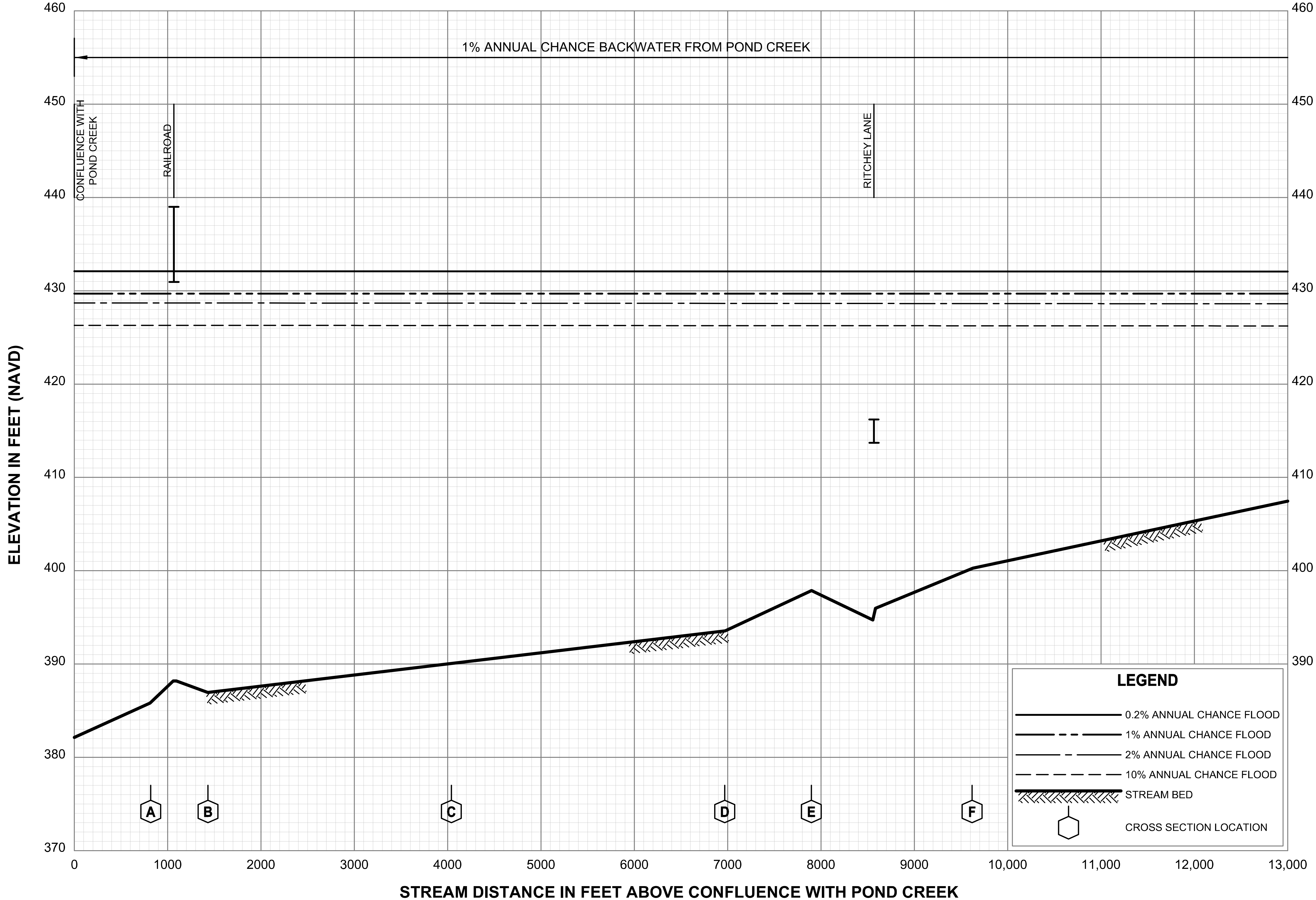
FLOOD PROFILES

FLOYDS FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



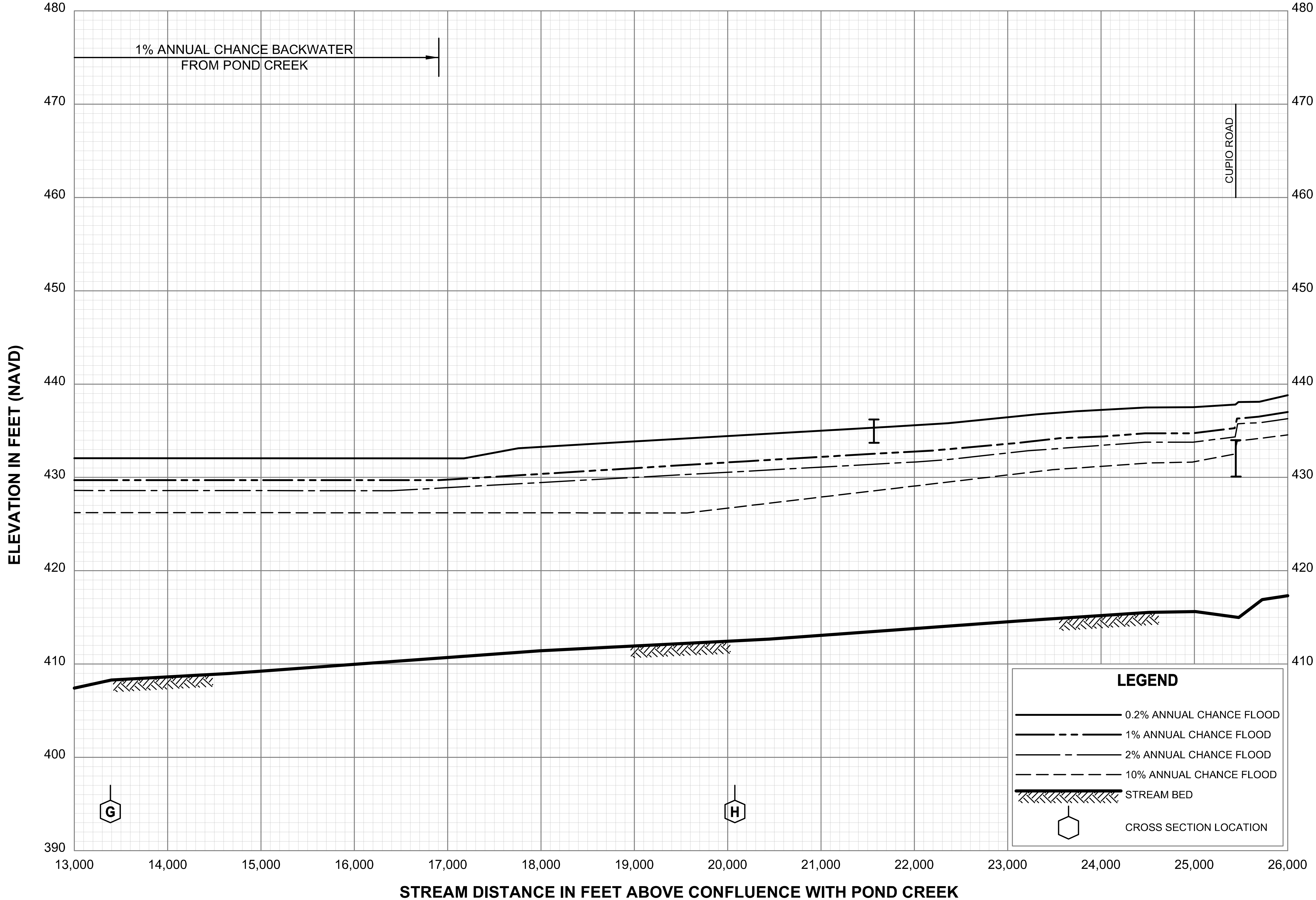
FLOOD PROFILES

KNOB CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



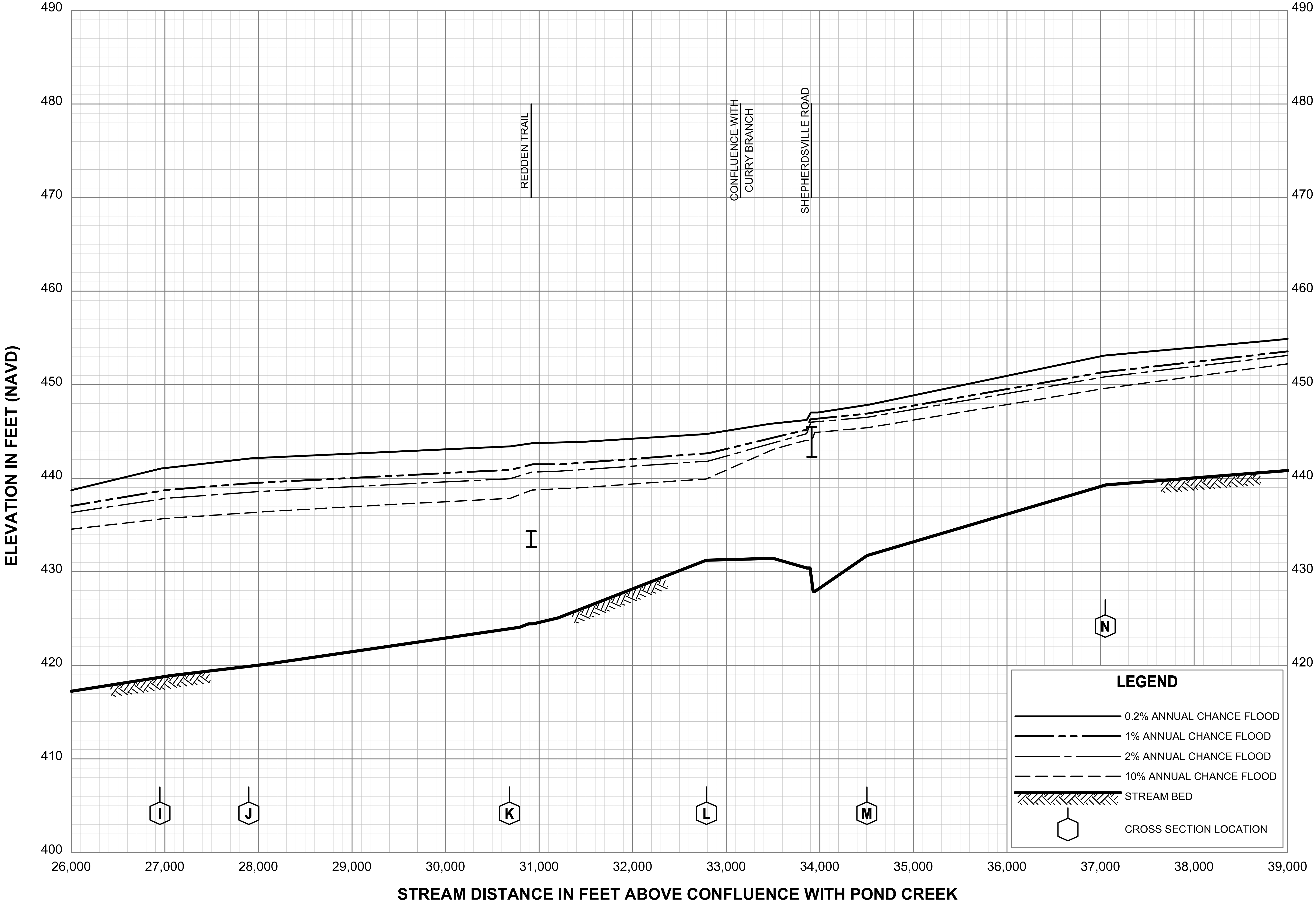
FLOOD PROFILES

KNOB CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



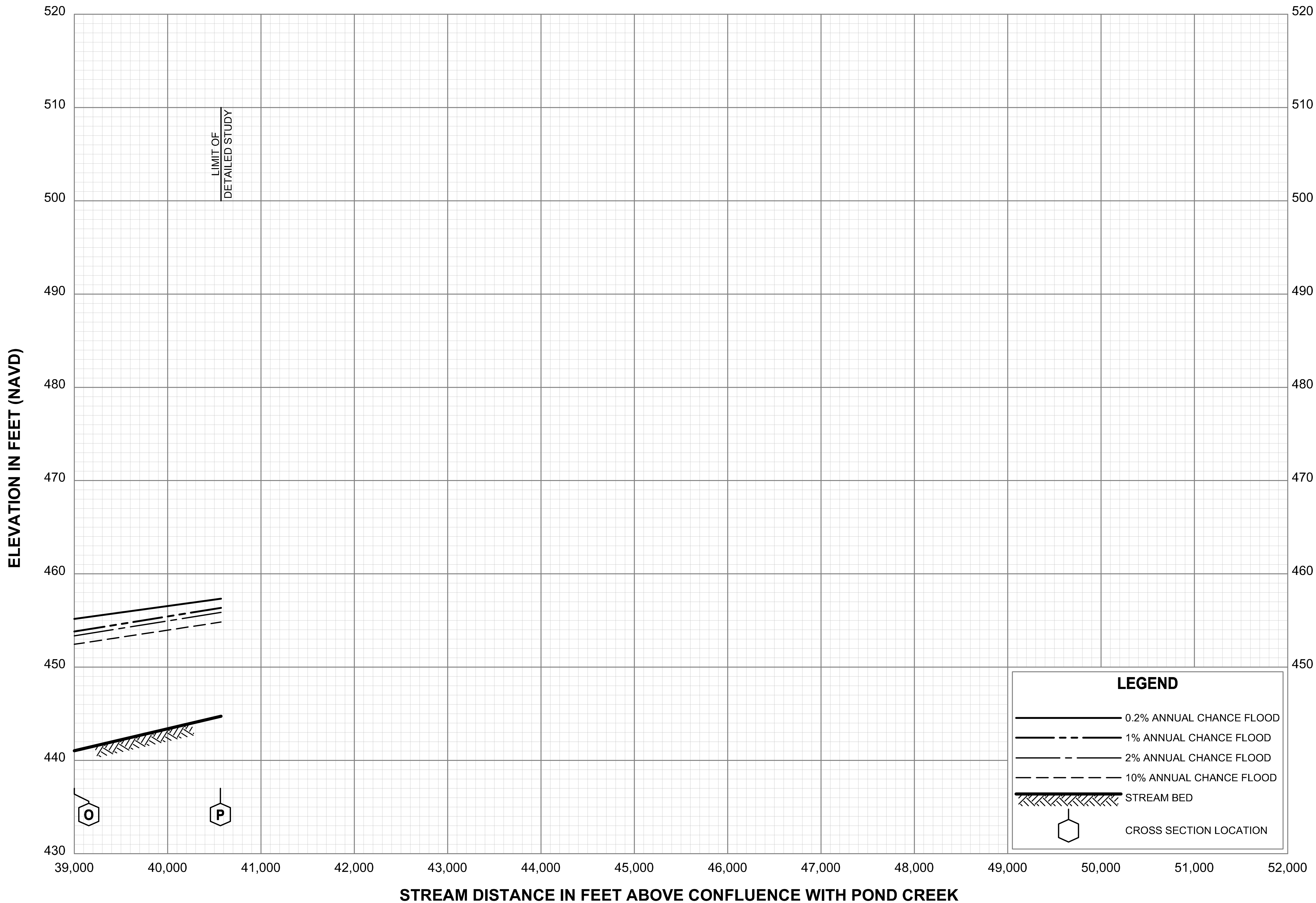
FLOOD PROFILES

KNOB CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



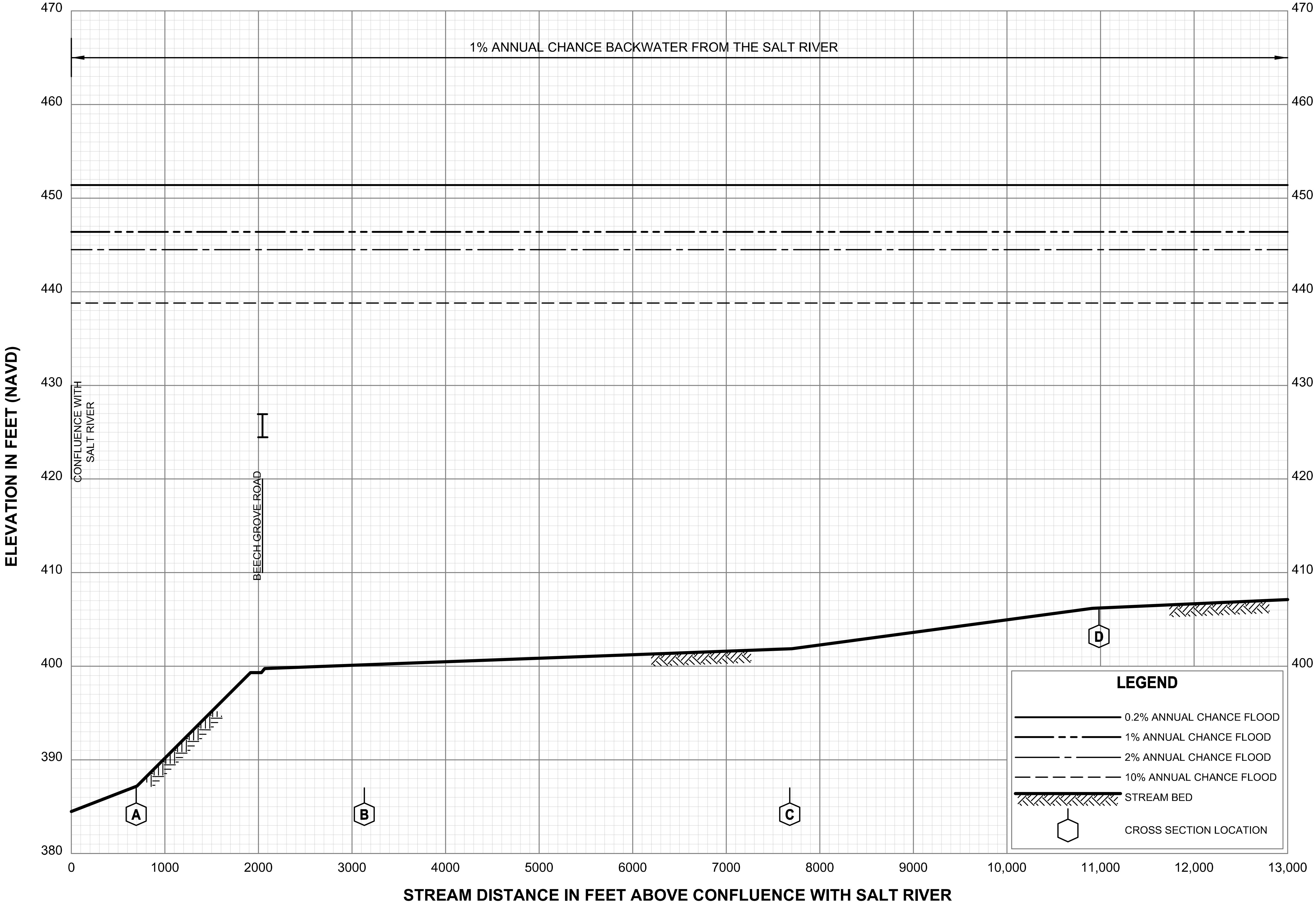
FLOOD PROFILES

KNOB CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



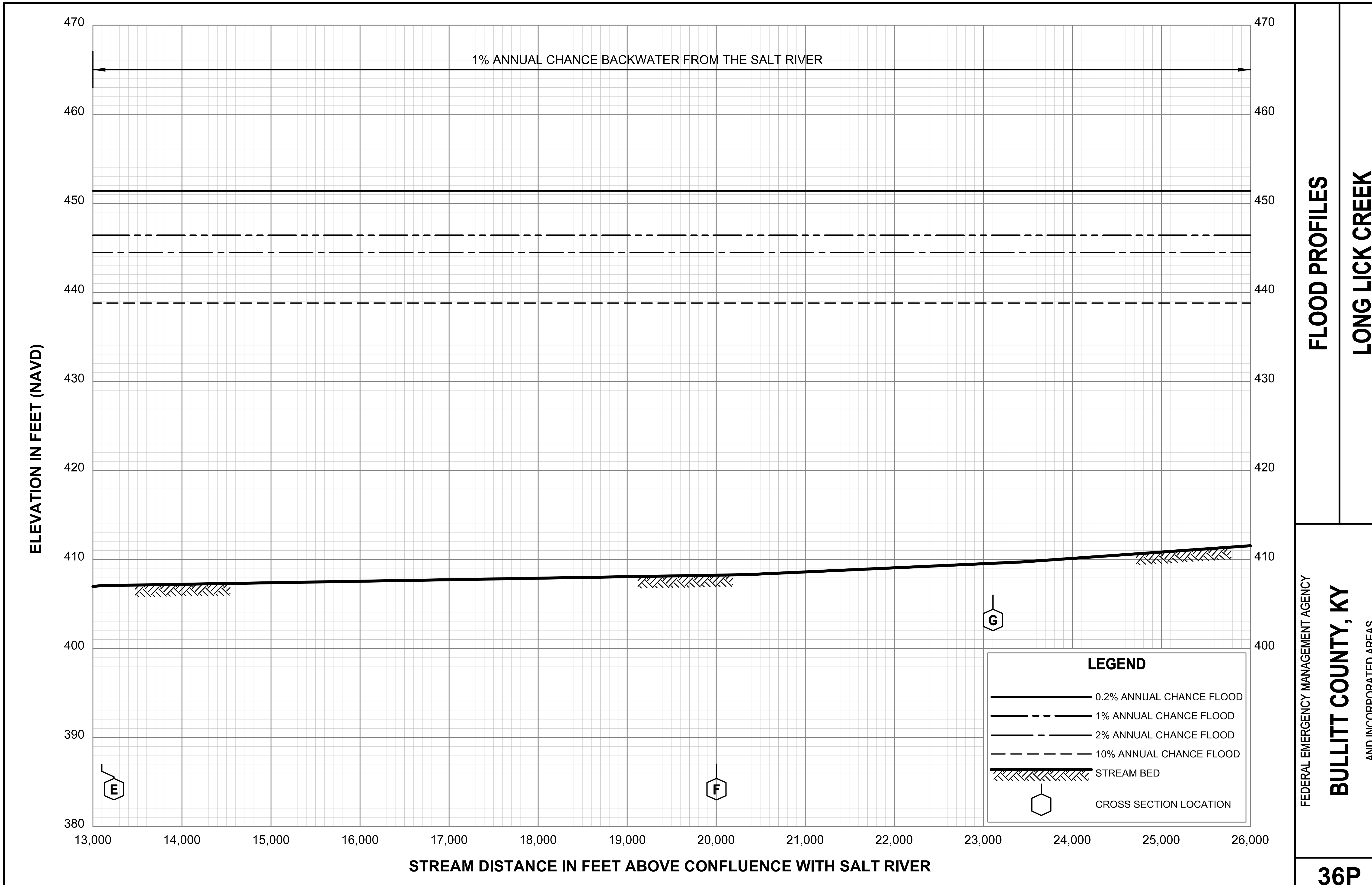
FLOOD PROFILES

LONG LICK CREEK

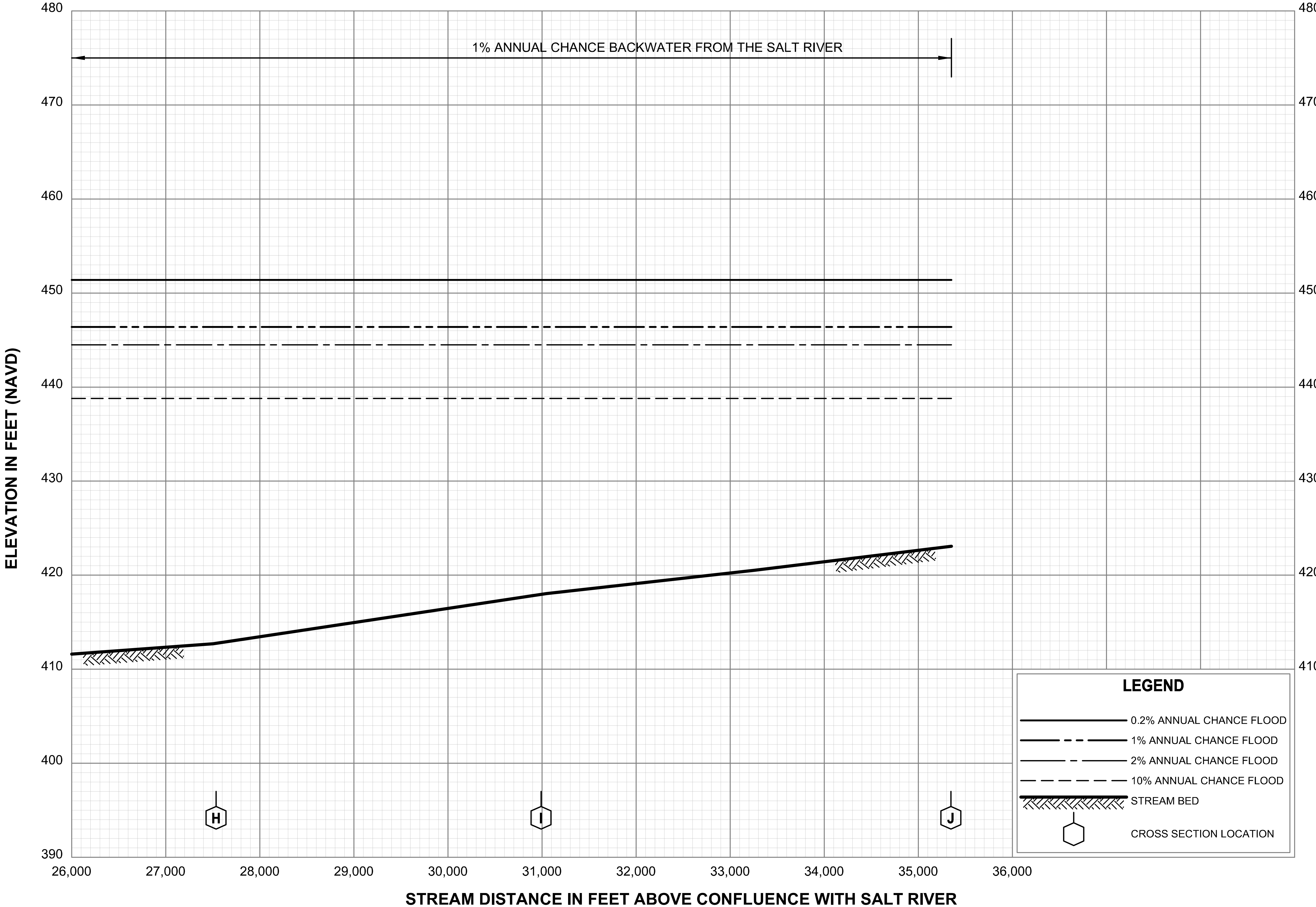
FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



1% ANNUAL CHANCE BACKWATER FROM THE SALT RIVER
ELEVATION IN FEET (NAVD)
470
460
450
440
430
420
410
400
390
380
13,000
14,000
15,000
16,000
17,000
18,000
19,000
20,000
21,000
22,000
23,000
24,000
25,000
26,000
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH SALT RIVER
E
F
G
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
LONG LICK CREEK
FEDERAL EMERGENCY MANAGEMENT AGENCY
BULLITT COUNTY, KY
AND INCORPORATED AREAS
36P



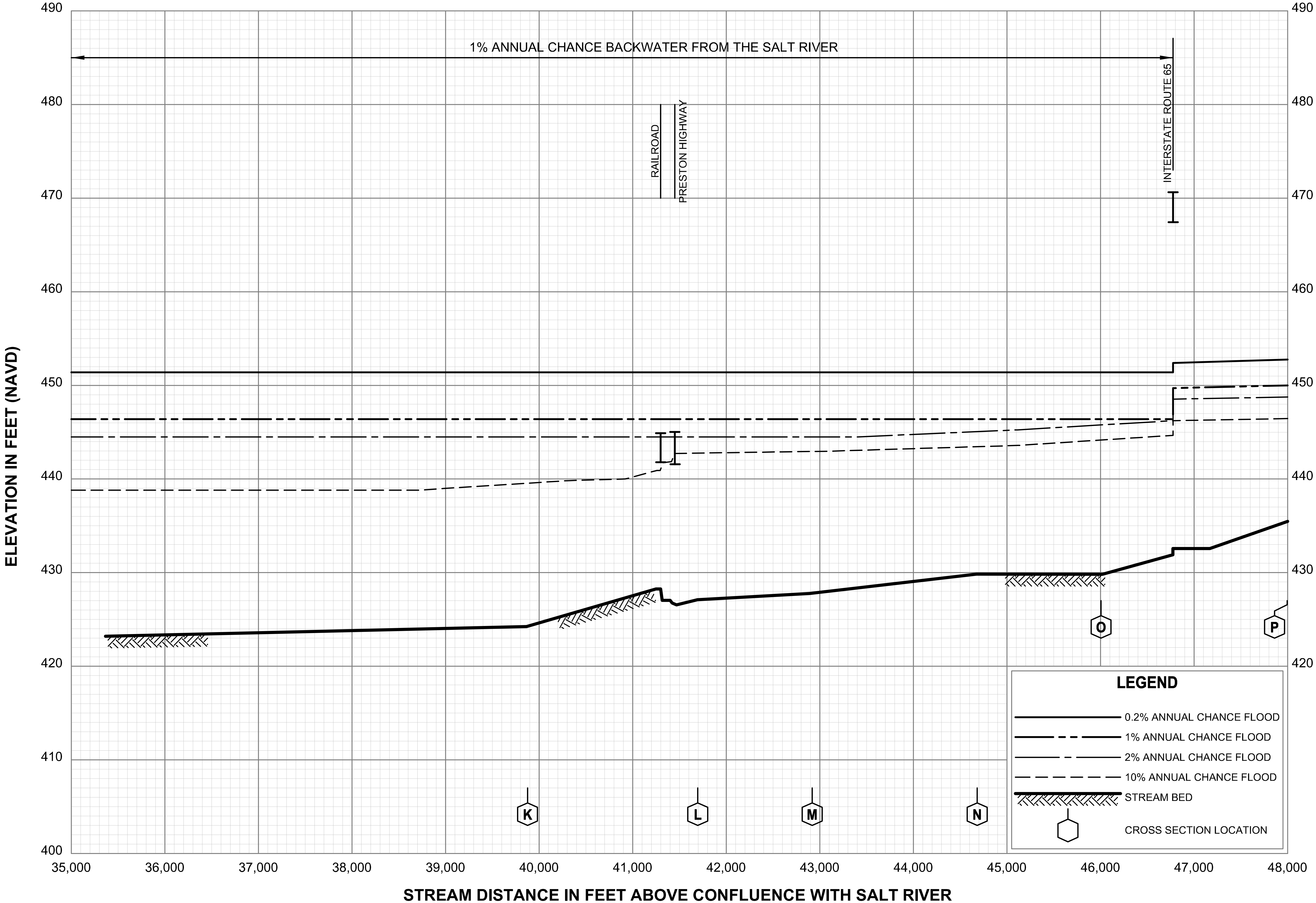
FLOOD PROFILES

LONG LICK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



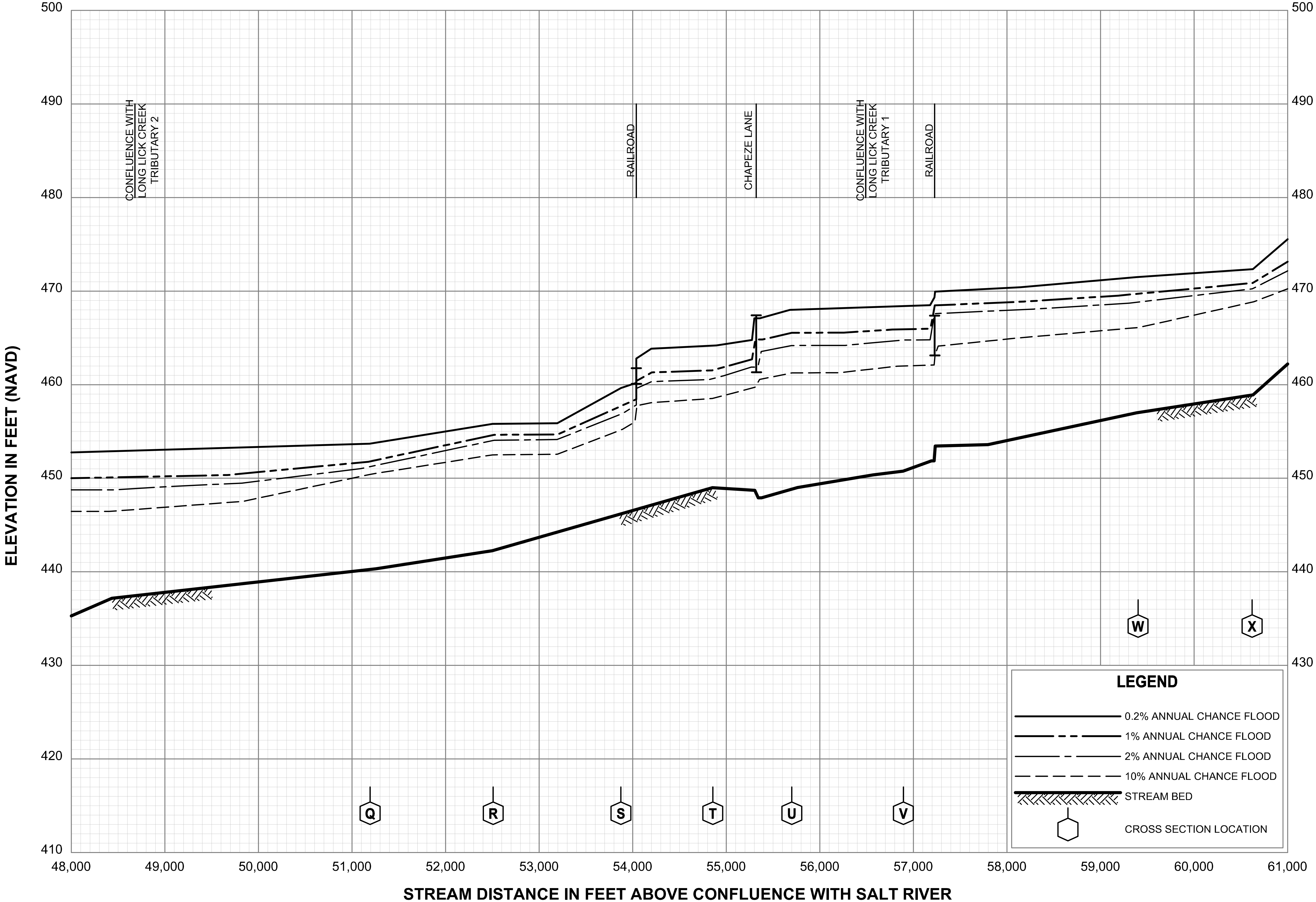
FLOOD PROFILES

LONG LICK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



FLOOD PROFILES

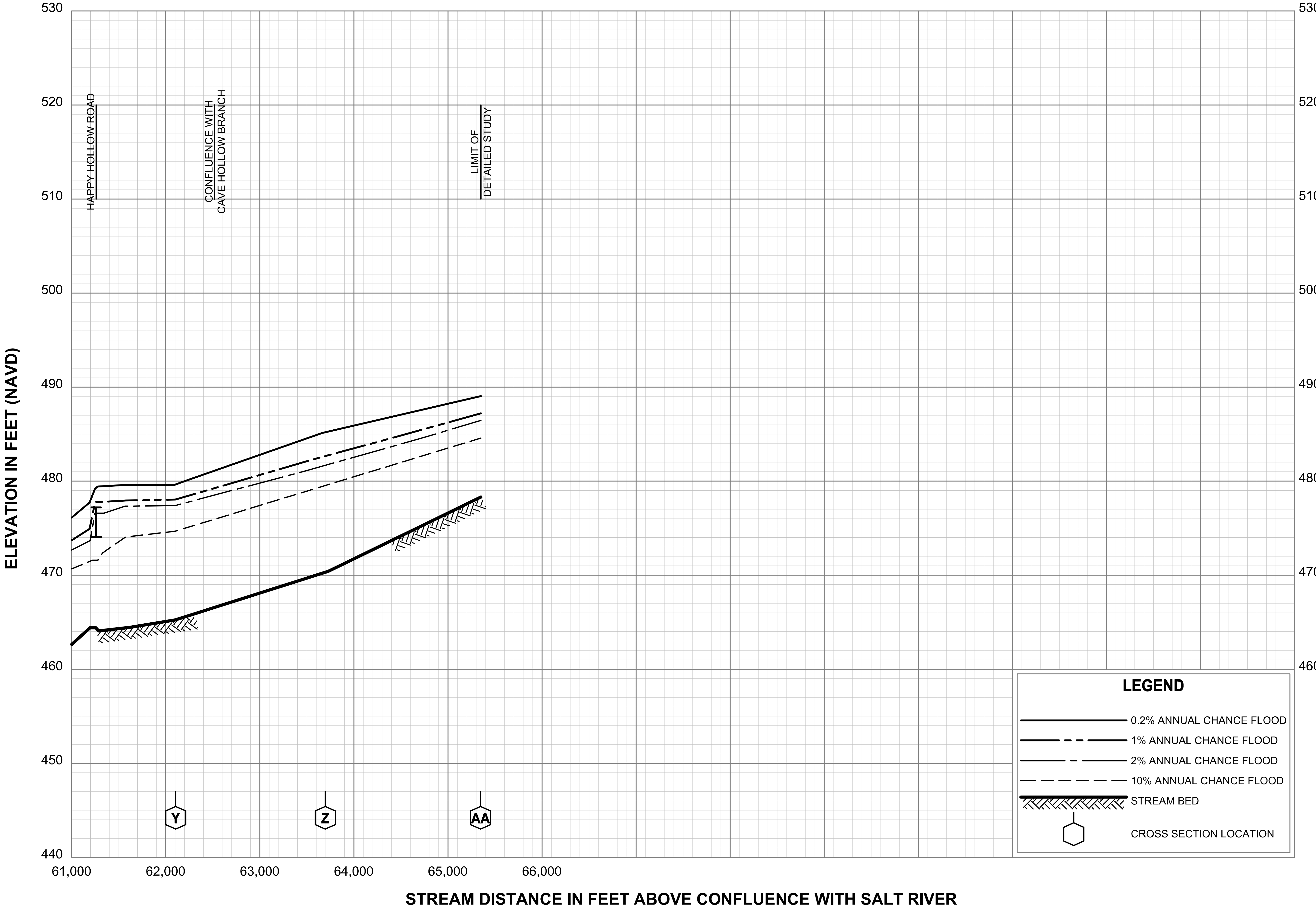
LONG LICK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

39P



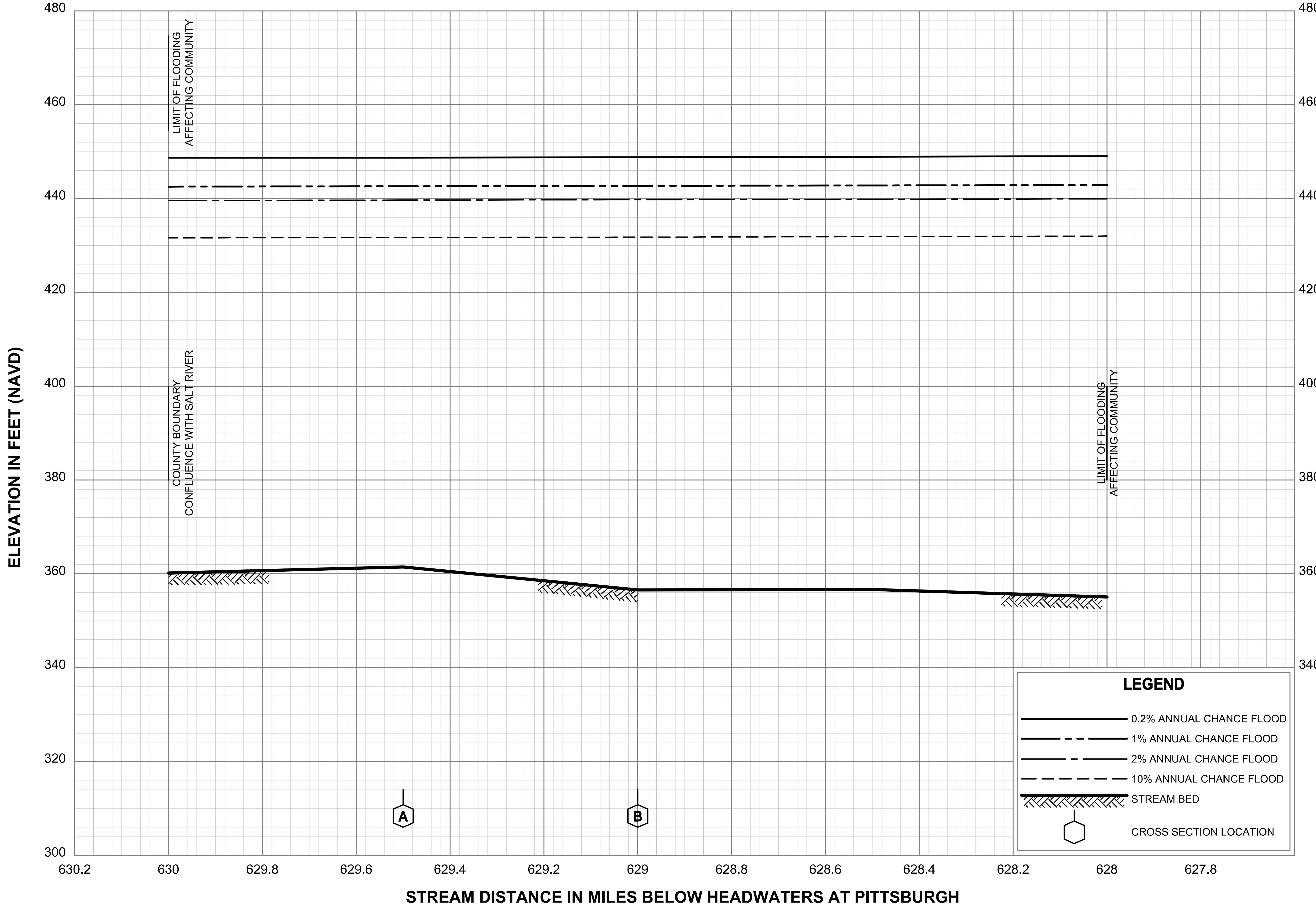
FLOOD PROFILES

LONG LICK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



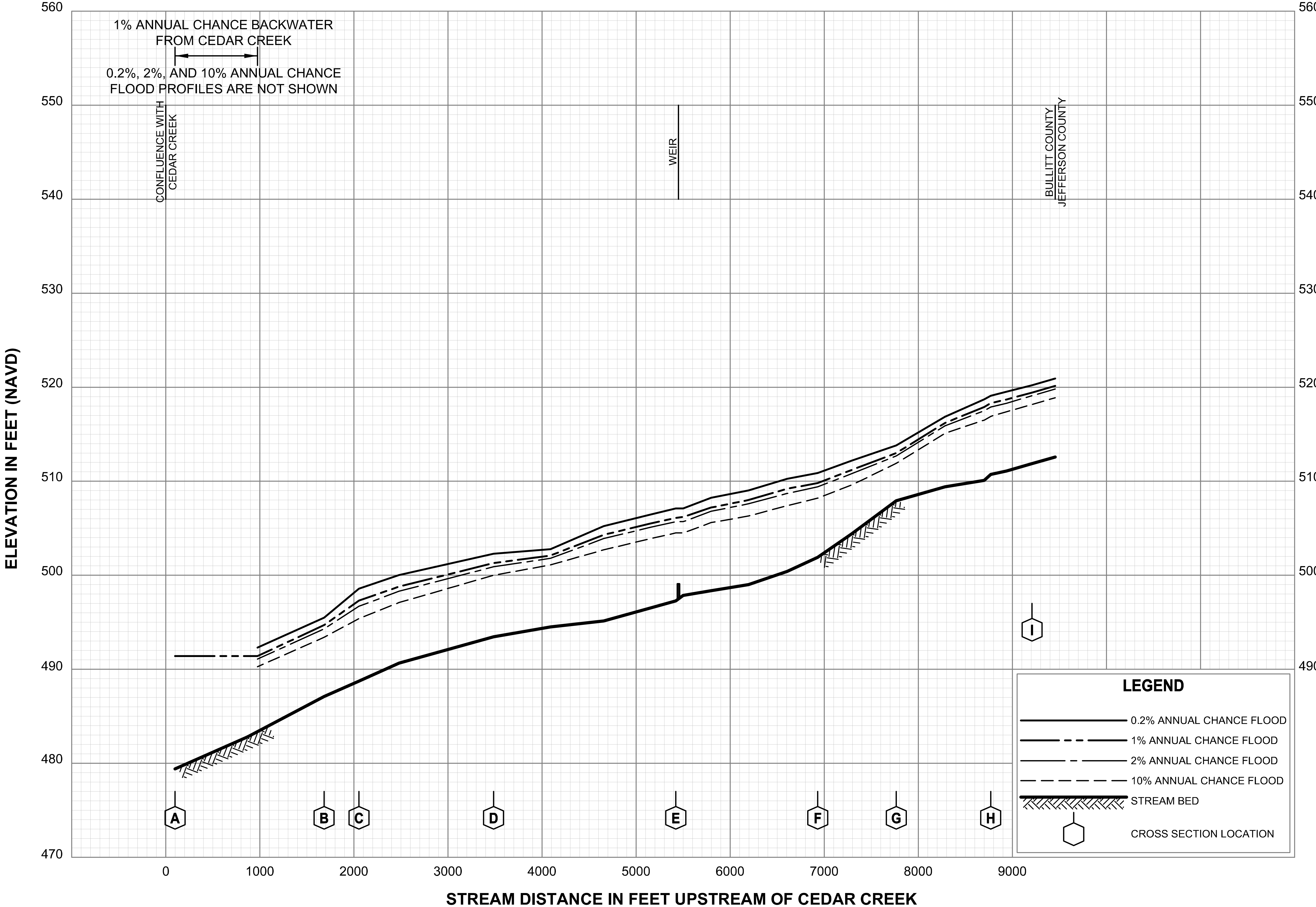
FLOOD PROFILES

OHIO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



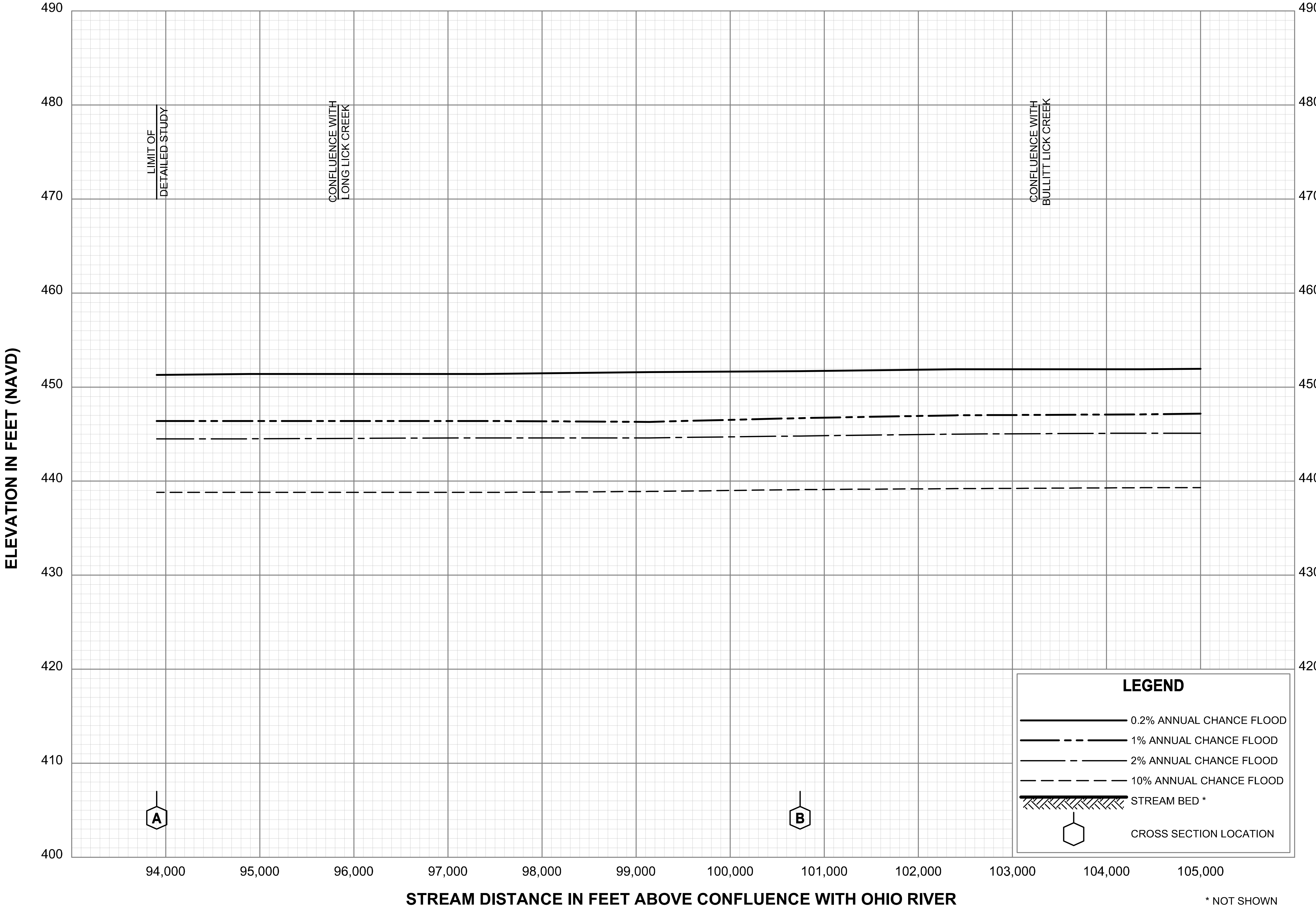
FLOOD PROFILES

PENNSYLVANIA RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



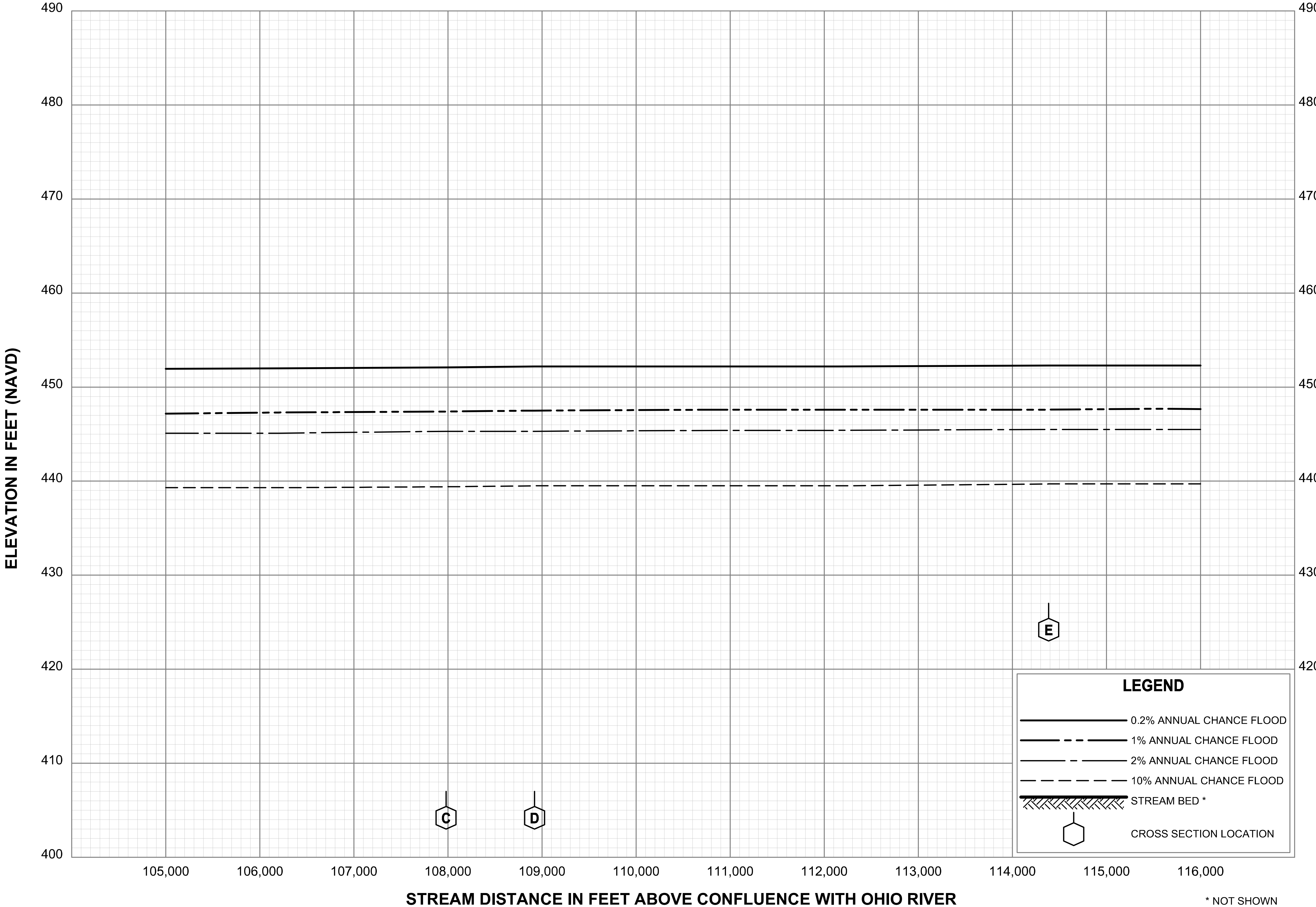
FLOOD PROFILES

SALT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



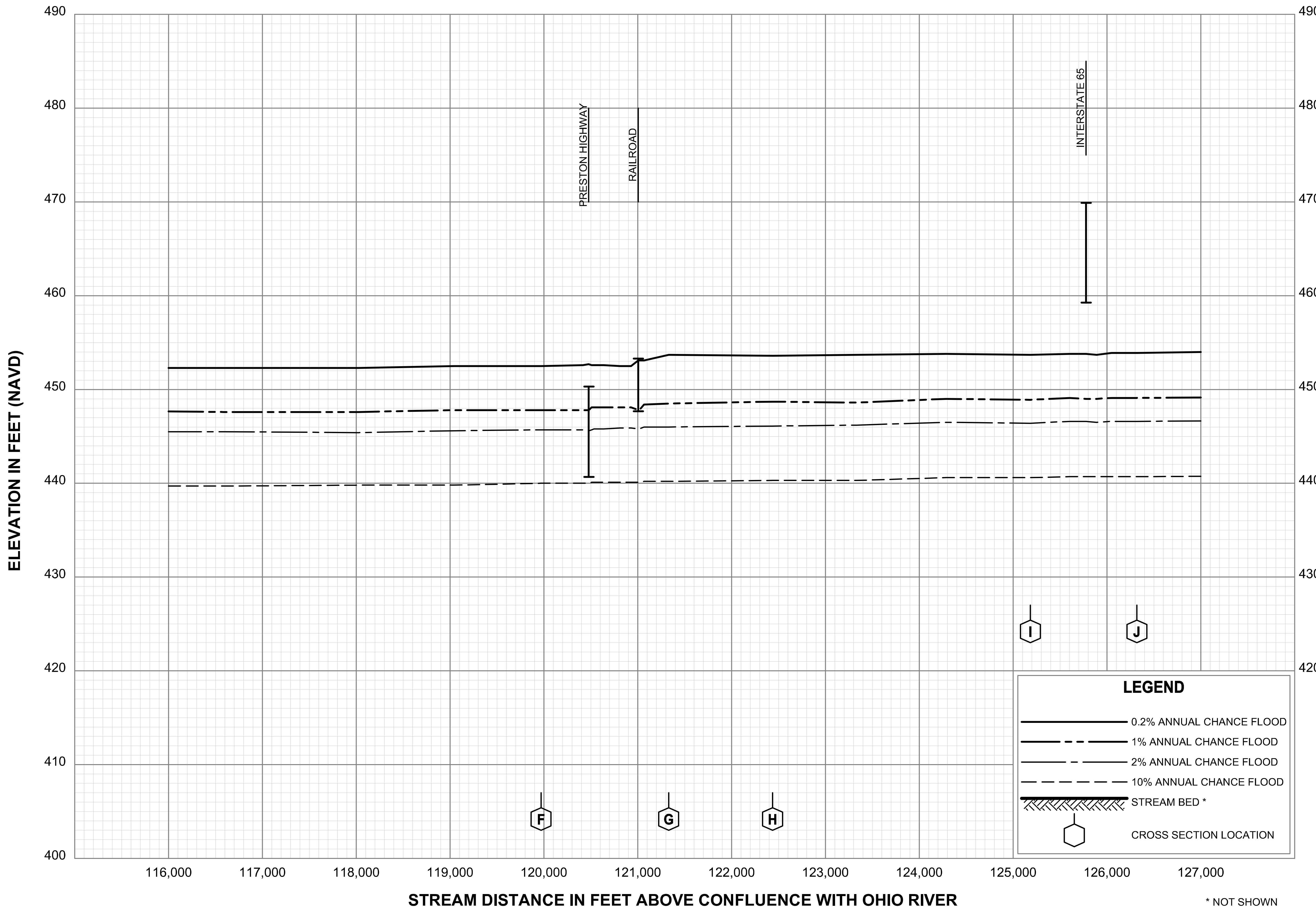
FLOOD PROFILES

SALT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



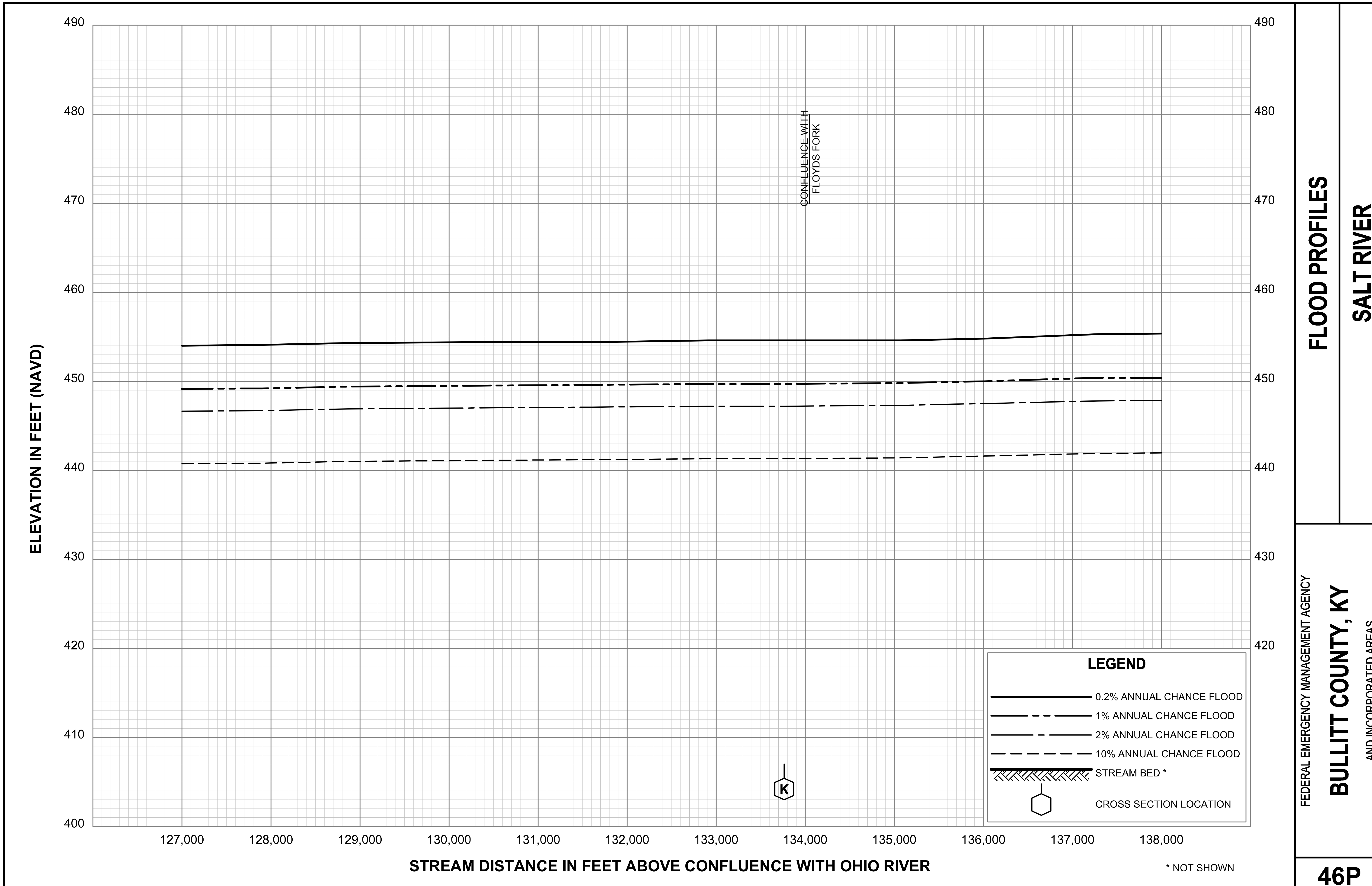
FLOOD PROFILES

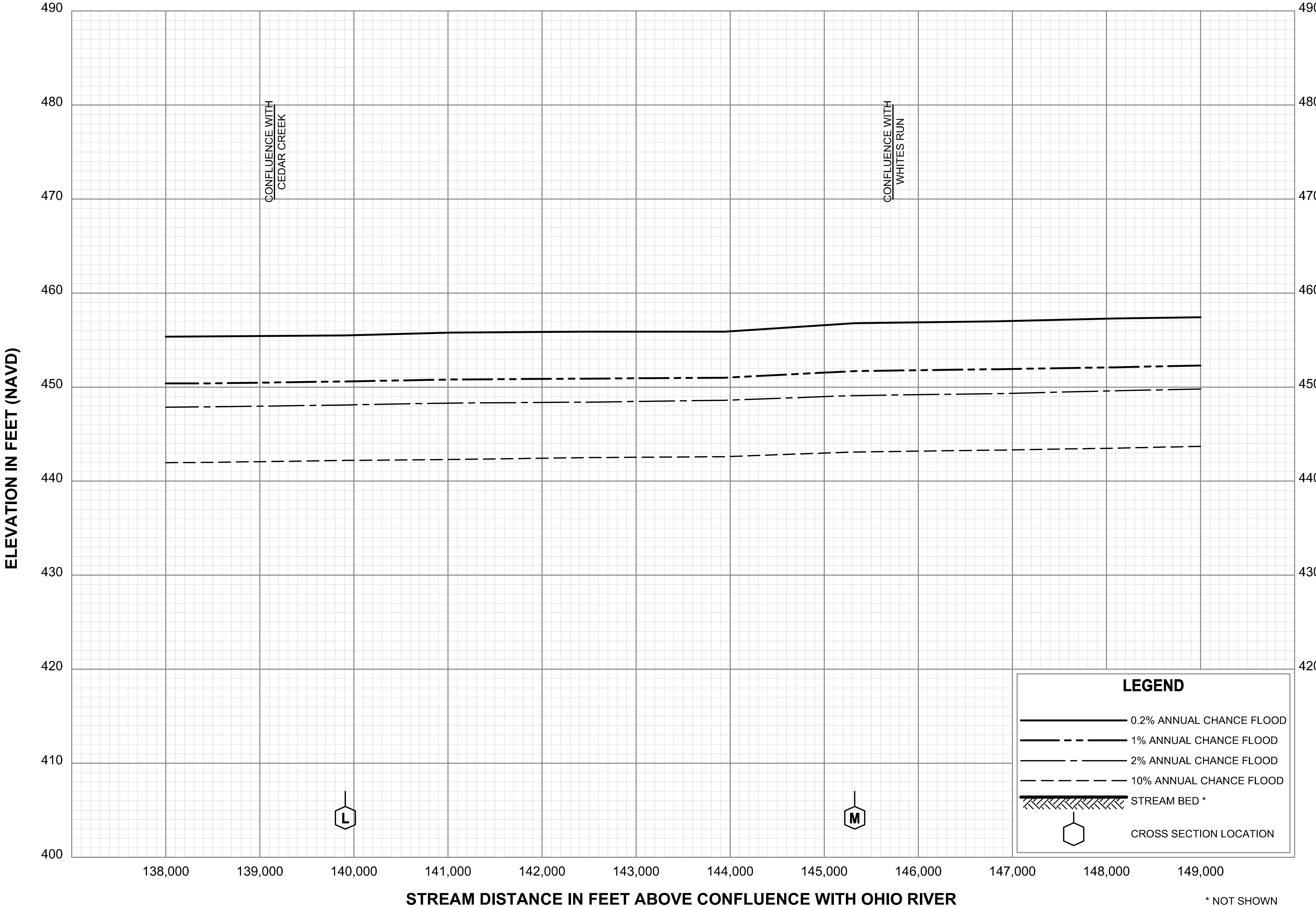
SALT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS


ELEVATION IN FEET (NAVD)
490
480
470
460
450
440
430
420
410
400
CONFLUENCE WITH FLOYDS FORK
K
127,000
128,000
129,000
130,000
131,000
132,000
133,000
134,000
135,000
136,000
137,000
138,000
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH OHIO RIVER
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED *
CROSS SECTION LOCATION
* NOT SHOWN
FLOOD PROFILES
SALT RIVER
FEDERAL EMERGENCY MANAGEMENT AGENCY
BULLITT COUNTY, KY
AND INCORPORATED AREAS
46P



FLOOD PROFILES

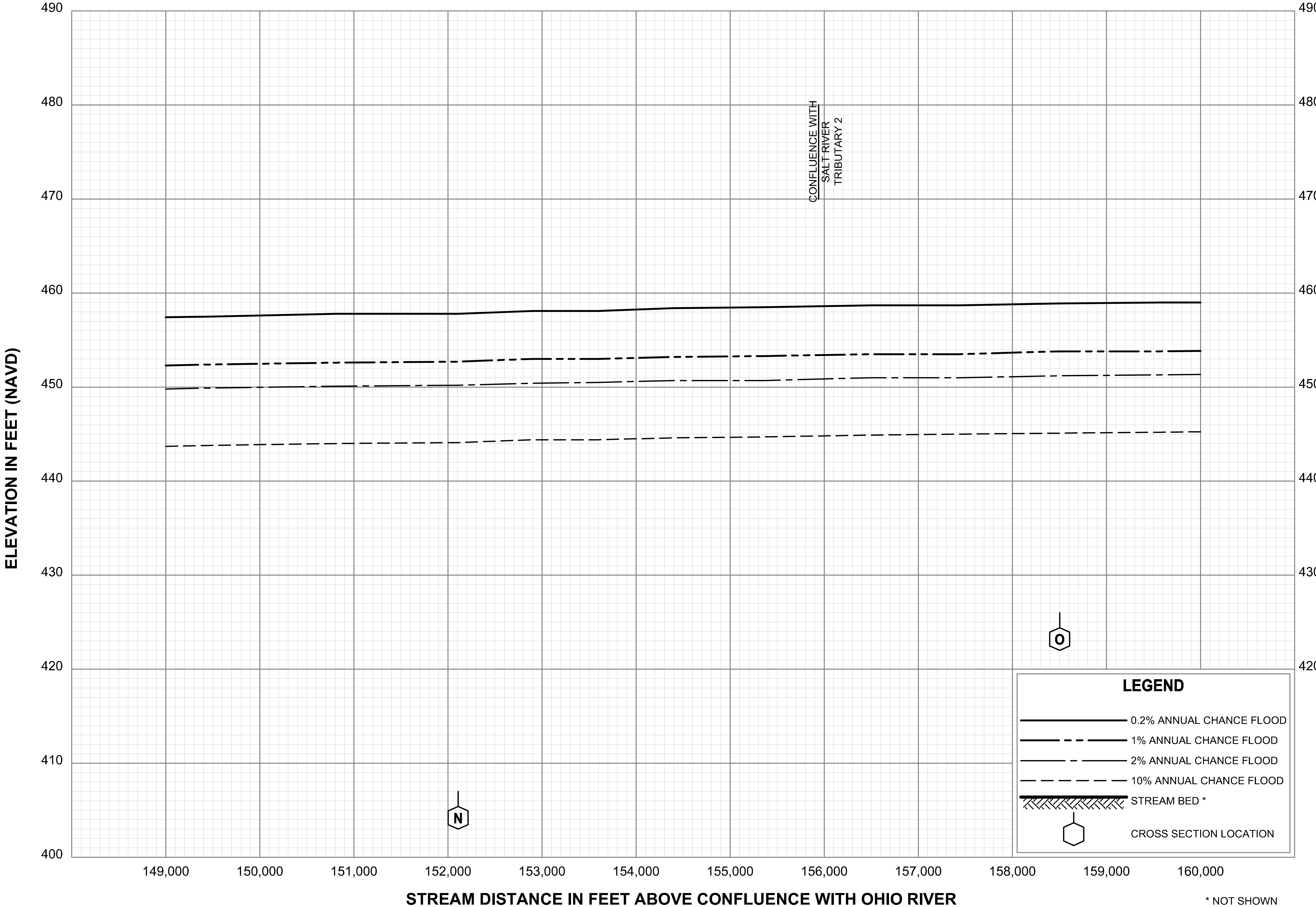
SALT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

47P



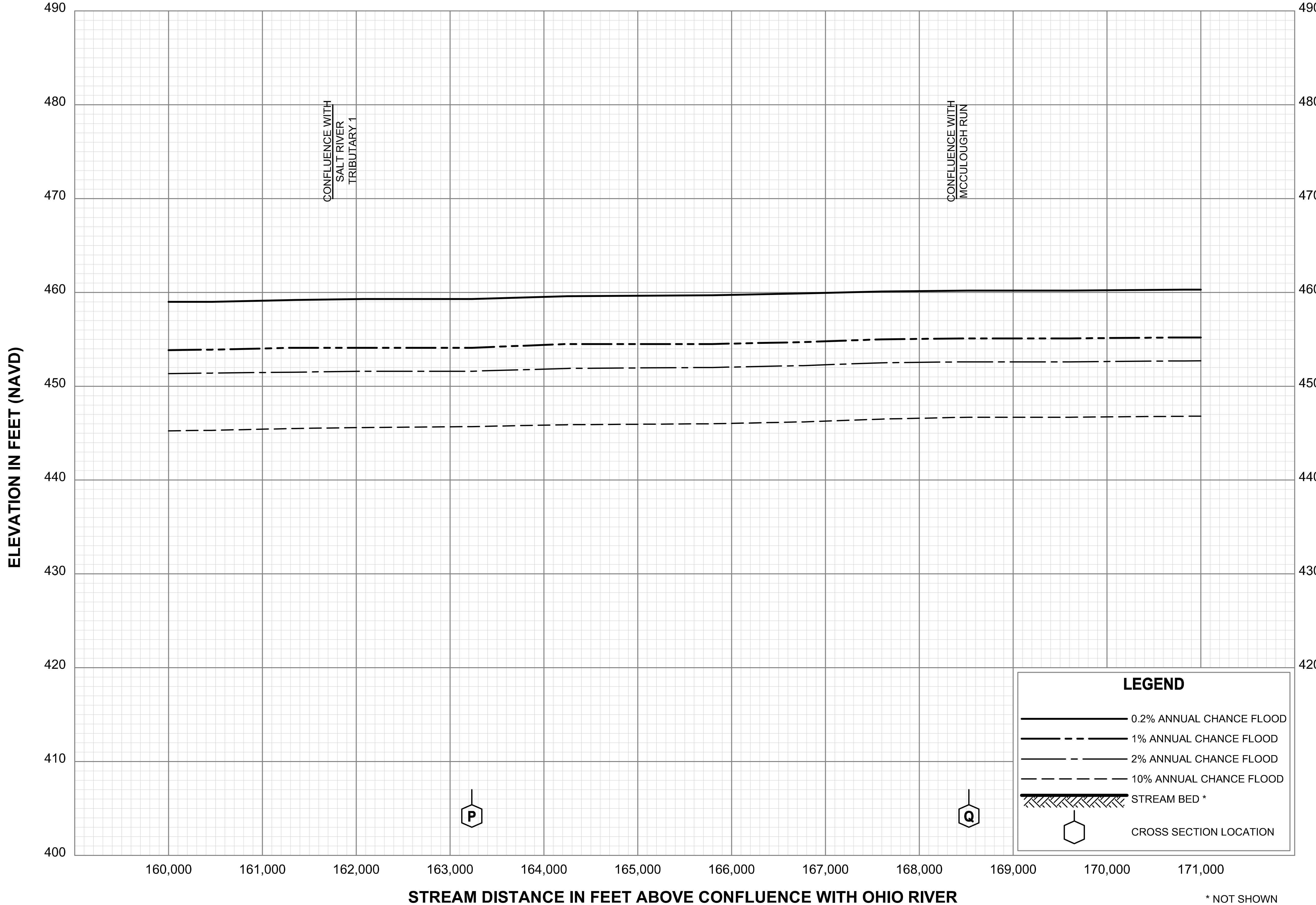
FLOOD PROFILES

SALT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



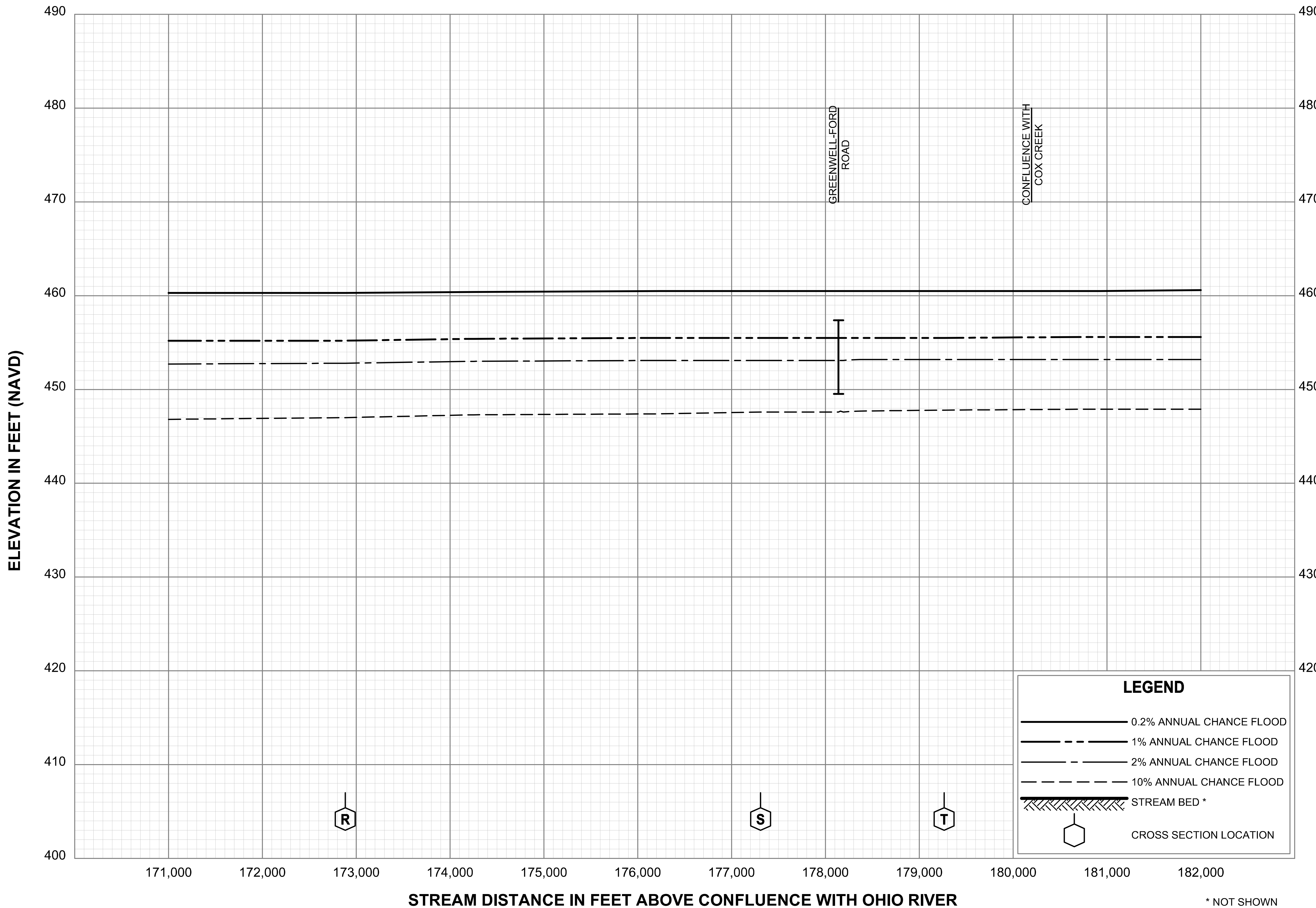
FLOOD PROFILES

SALT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



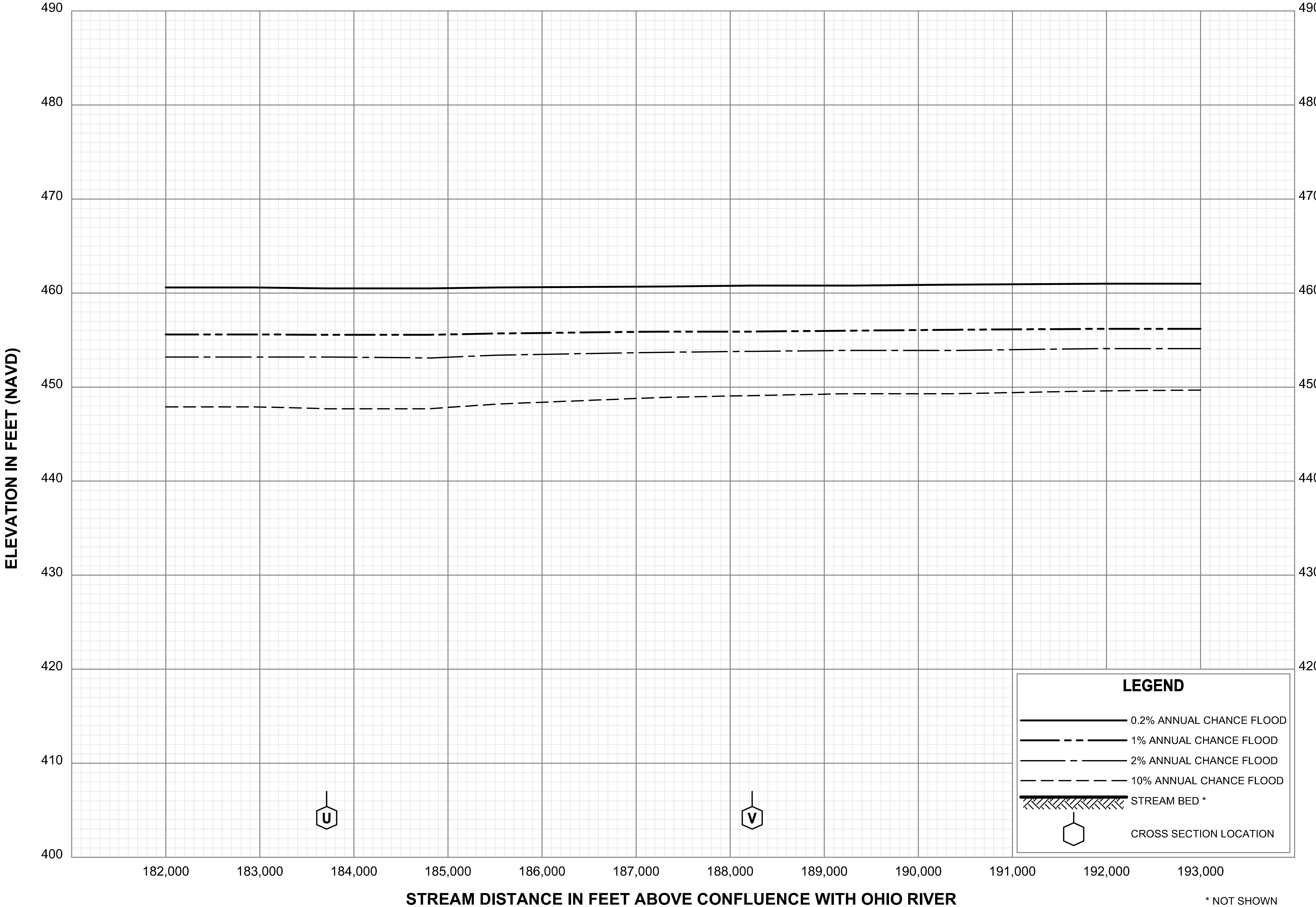
FLOOD PROFILES

SALT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



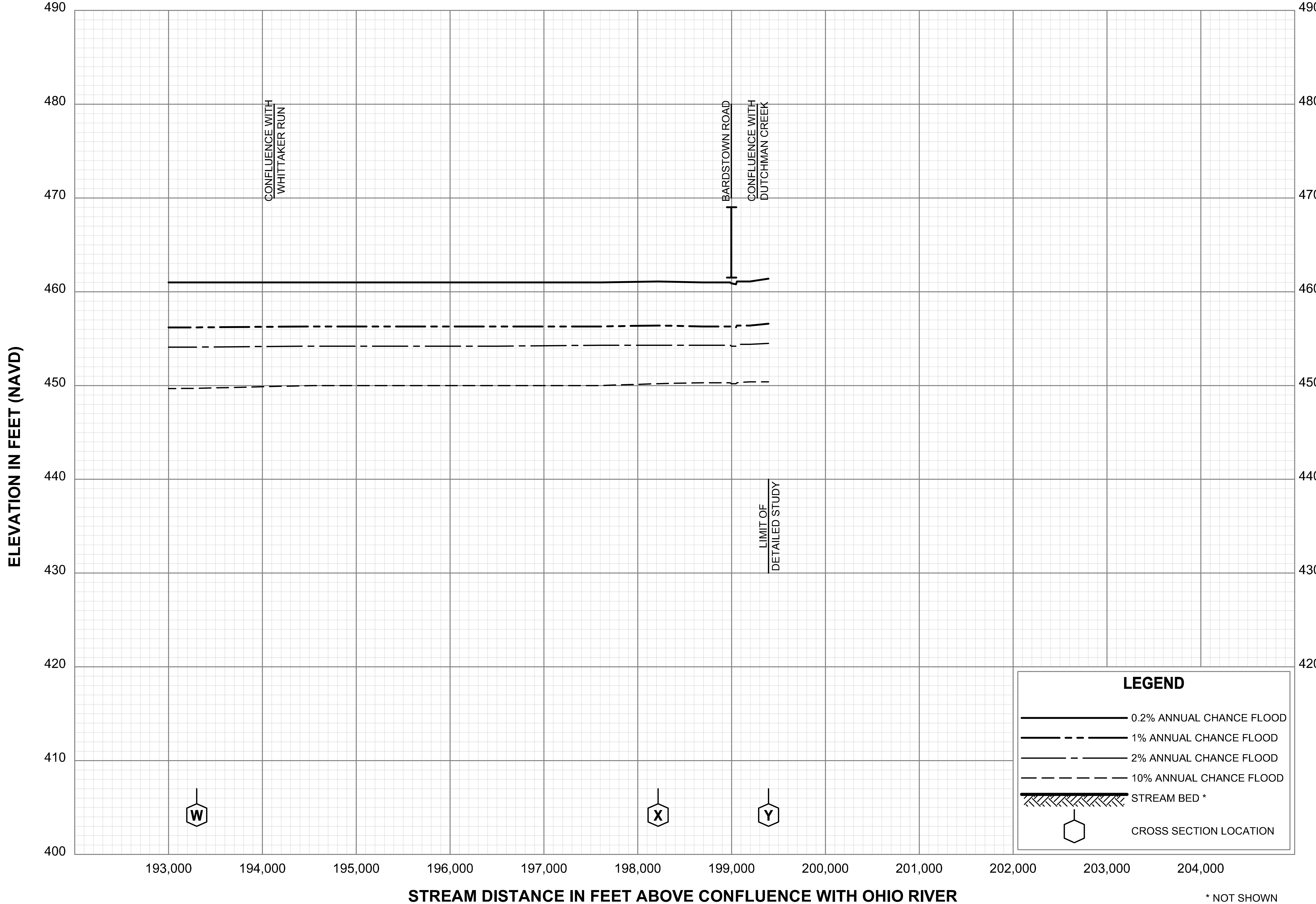
FLOOD PROFILES

SALT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



FLOOD PROFILES

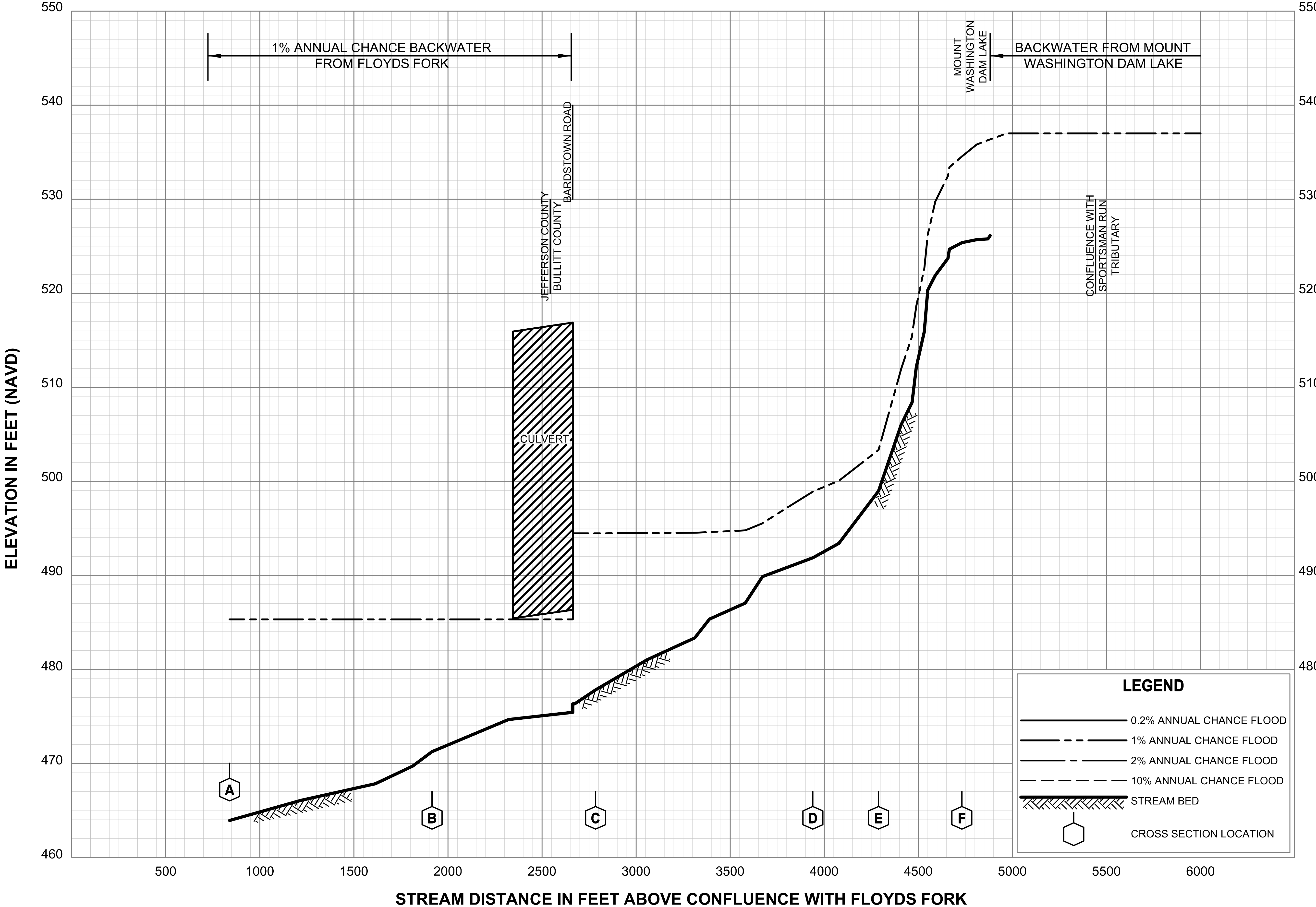
SALT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

52P



FLOOD PROFILES

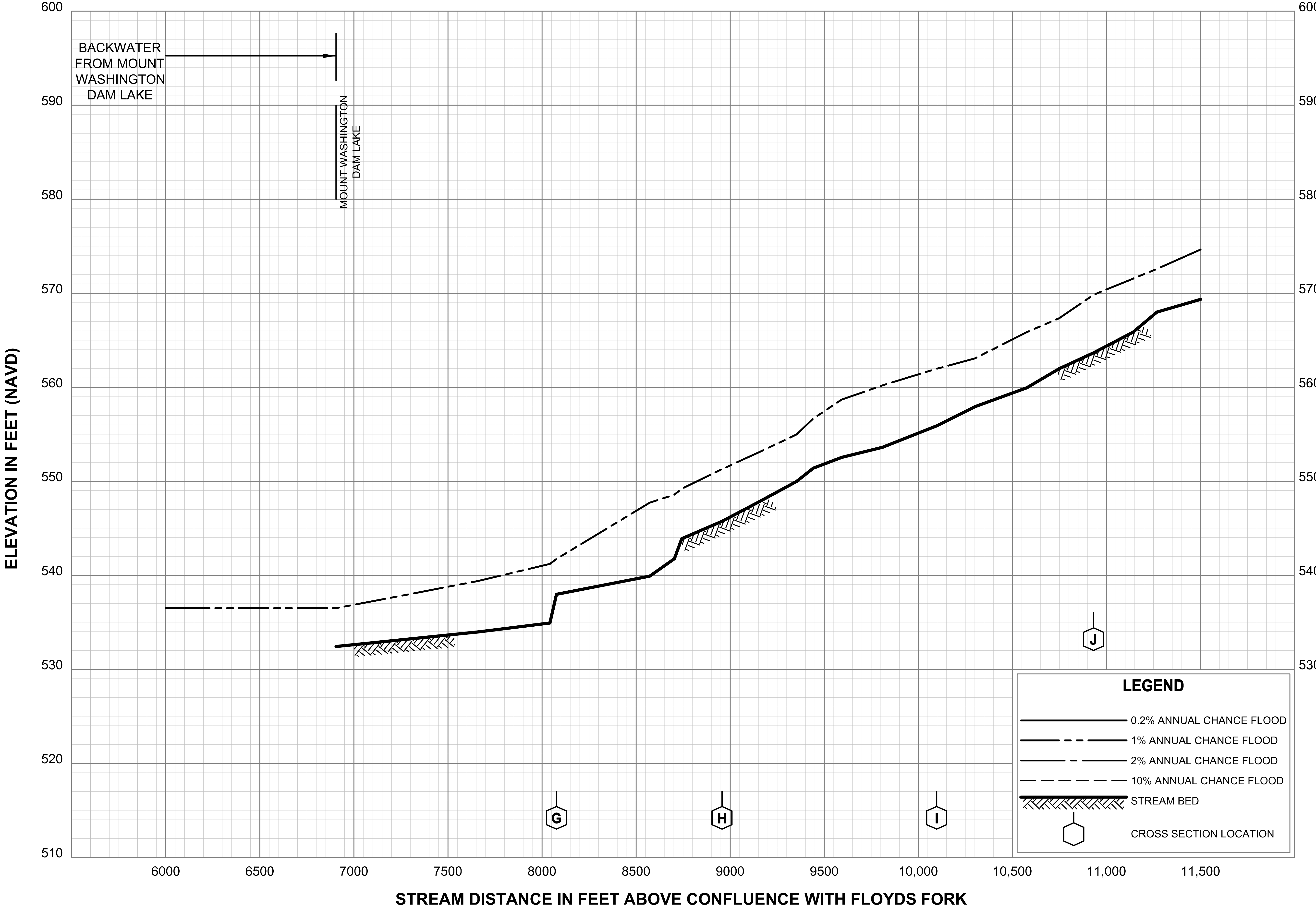
SPORTSMAN RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

53P



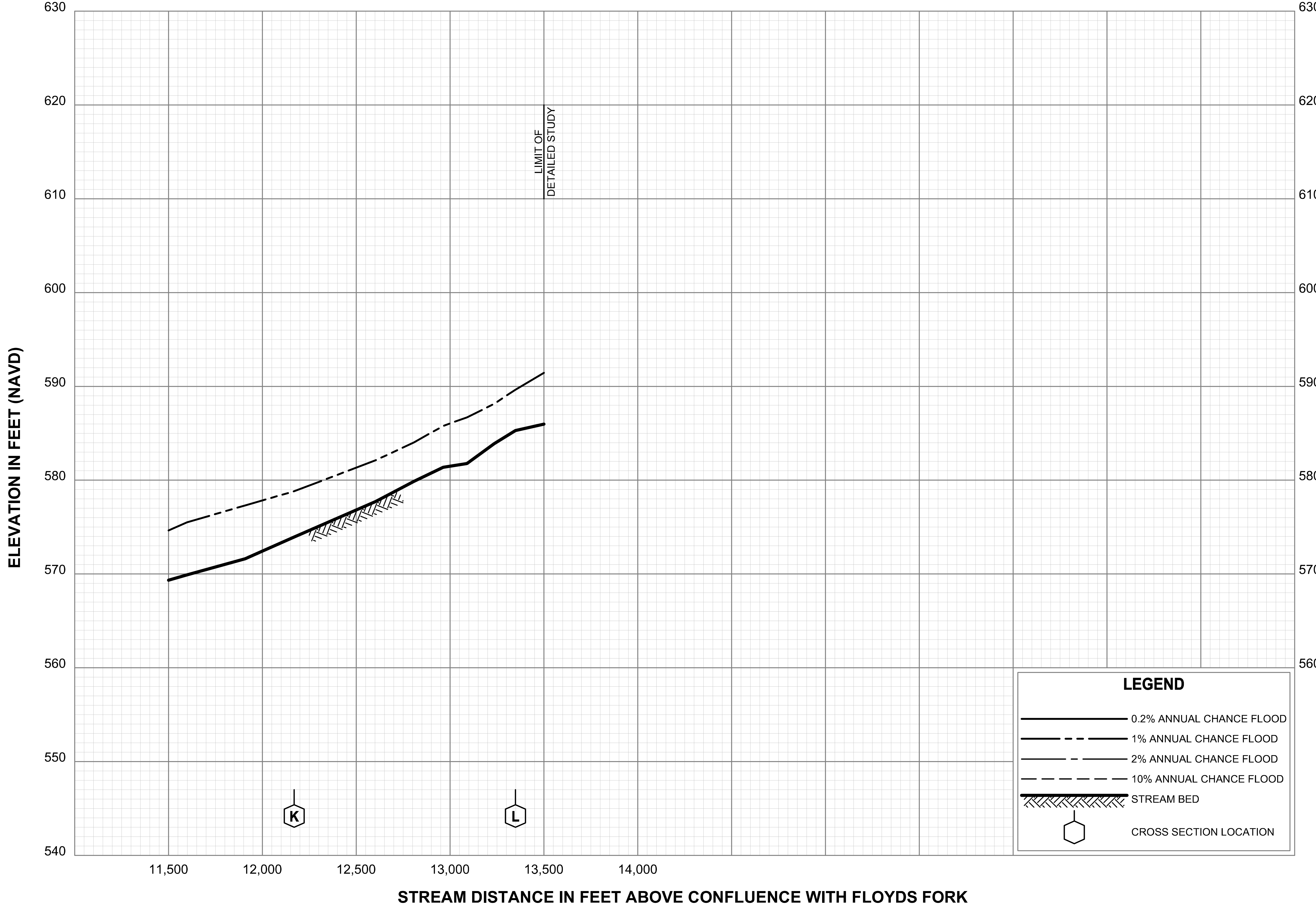
FLOOD PROFILES

SPORTSMAN RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



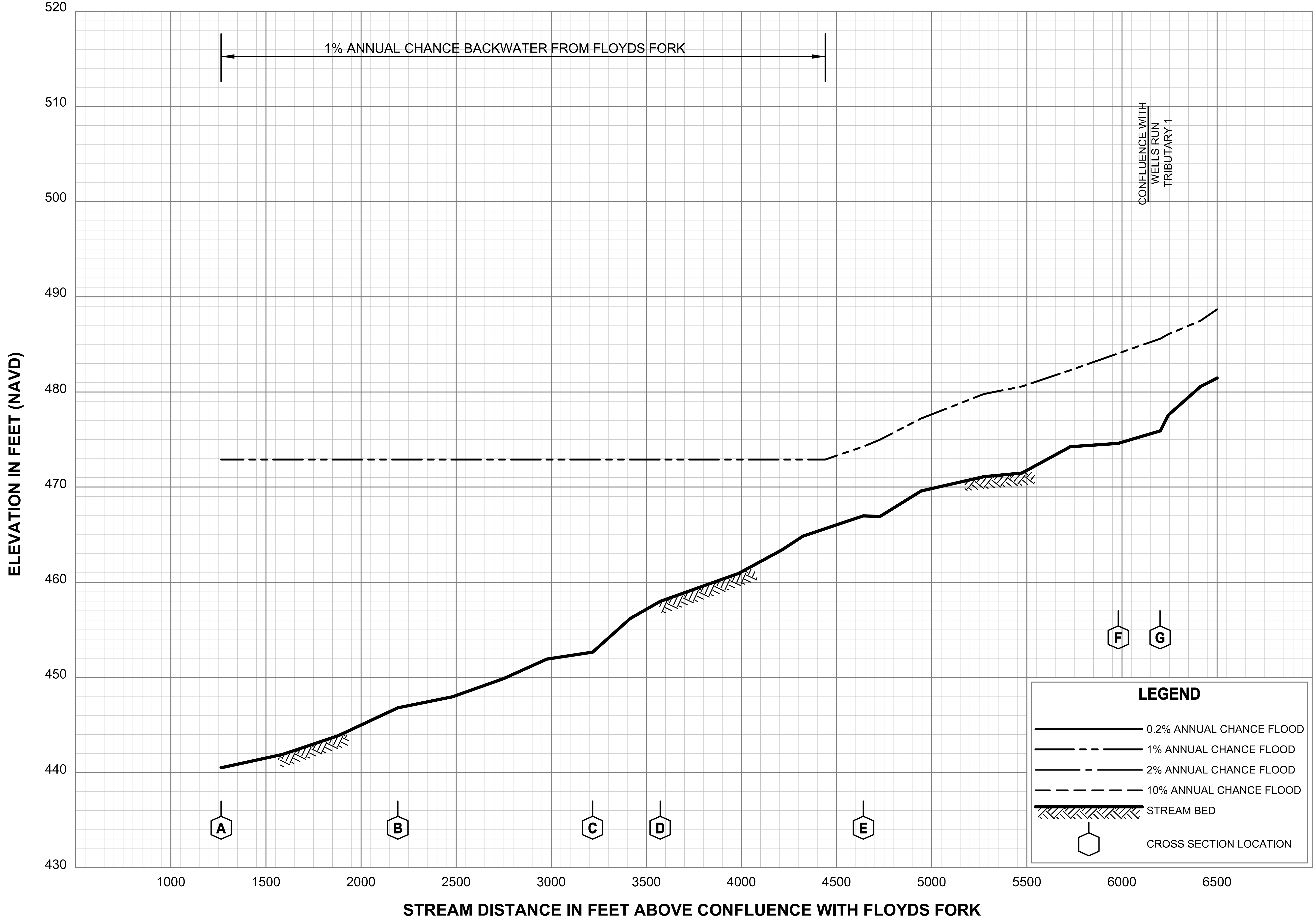
FLOOD PROFILES

SPORTSMAN RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



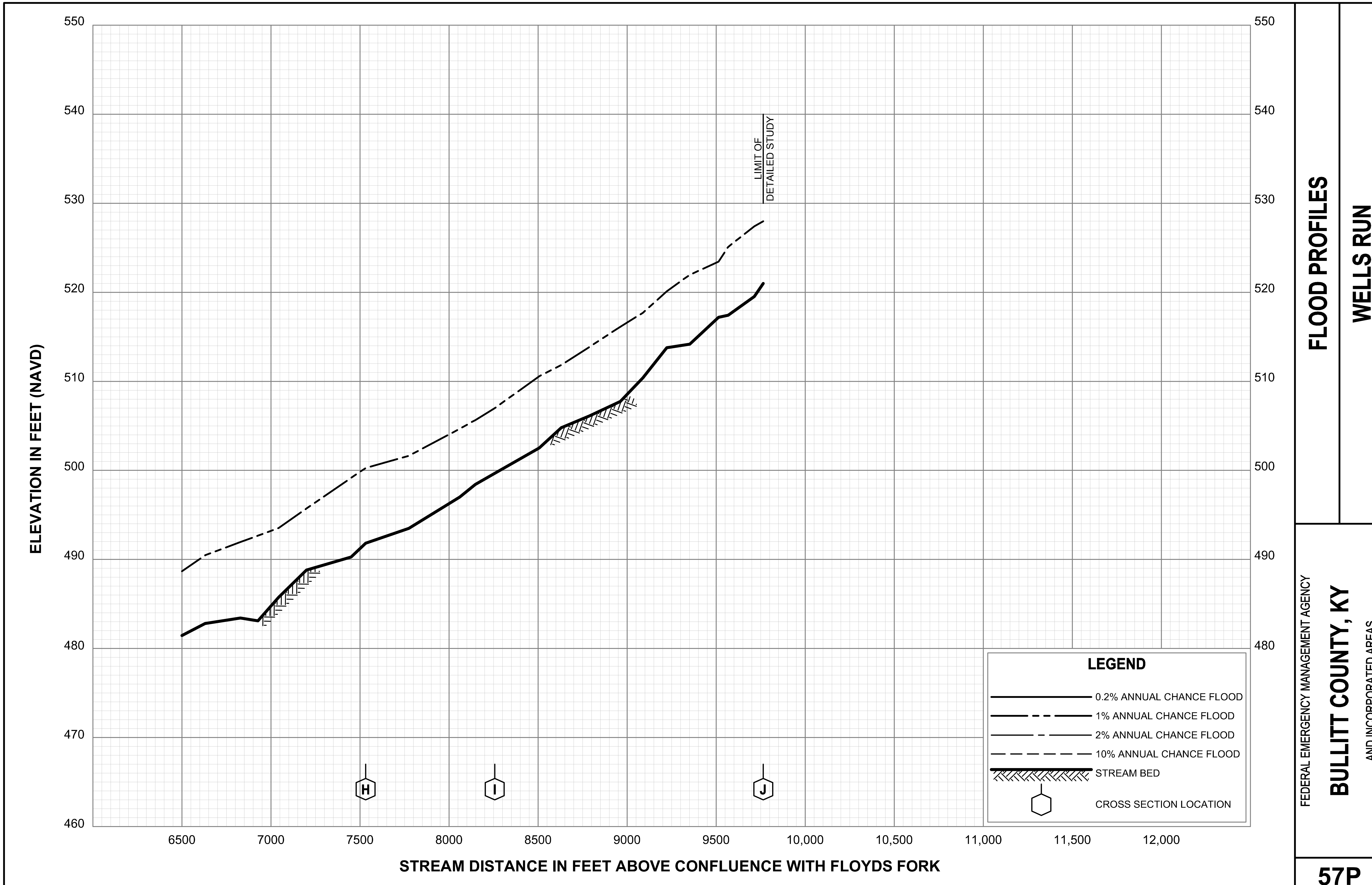
FLOOD PROFILES

WELLS RUN

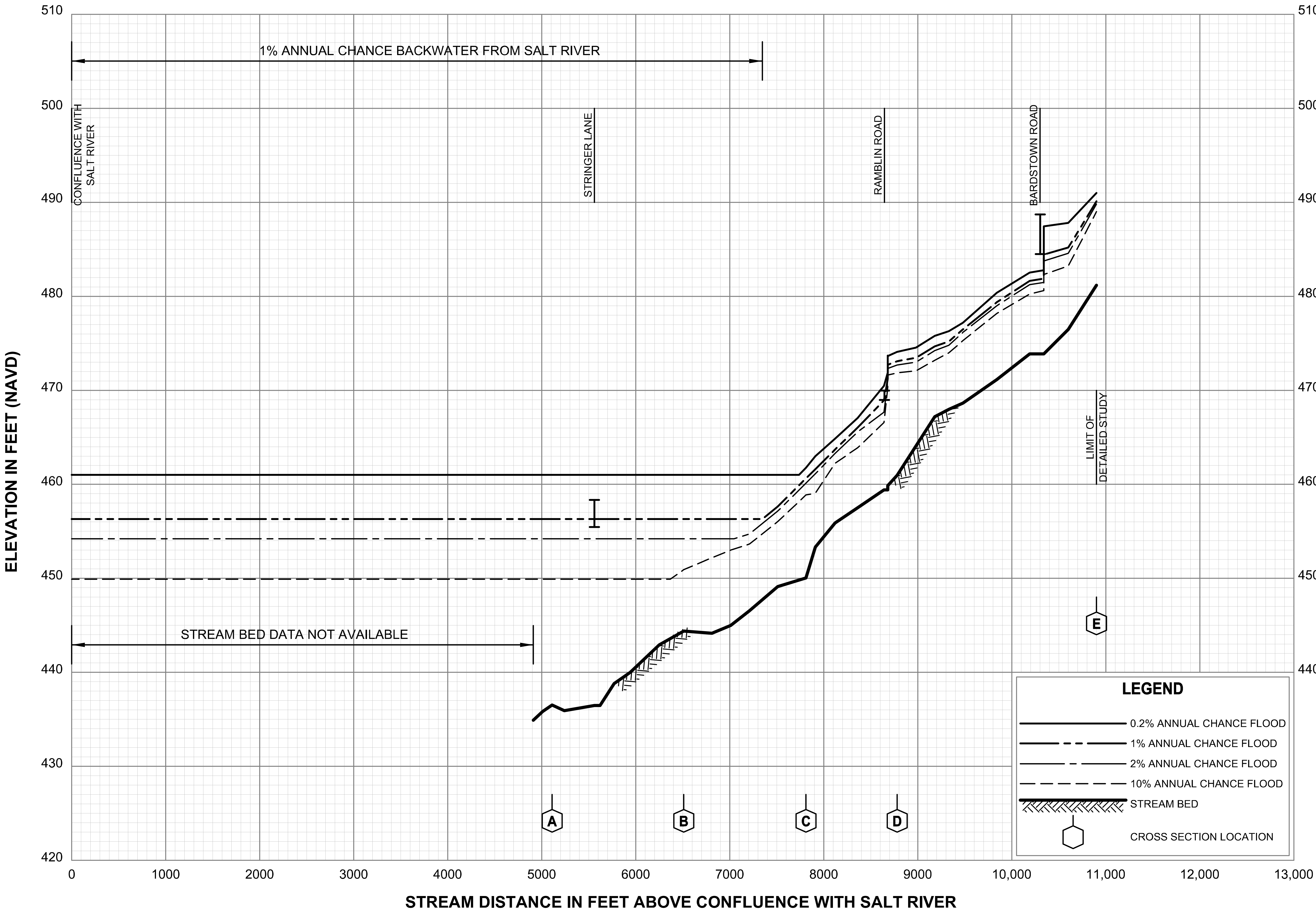
FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS



550
540
530
520
510
500
490
480
470
460
ELEVATION IN FEET (NAVD)
LIMIT OF DETAILED STUDY
H
I
J
6500
7000
7500
8000
8500
9000
9500
10,000
10,500
11,000
11,500
12,000
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH FLOYDS FORK
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
WELLS RUN
FEDERAL EMERGENCY MANAGEMENT AGENCY
BULLITT COUNTY, KY
AND INCORPORATED AREAS
57P



FLOOD PROFILES

WHITTAKER RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BULLITT COUNTY, KY

AND INCORPORATED AREAS

Appendix

Limited Detailed Flood Hazard Data

CROSS SECTION[1]	STREAM STATION[2]	FLOOD DISCHARGE *(cfs)*	1% ANNUAL CHANCE WATER SURFACE ELEVATION *(feet NAVD88)*	NON-ENCROACHMENT WIDTH[3] *(feet)*
BETHEL BRANCH				
A	1513	2340	469.6[4]	14 / 21
	1848	2340	469.6[4]	49 / 89
	1924	2340	469.6[4]	45 / 84
	2105	2340	469.6[4]	15 / 121
	2202	2250	469.6[4]	28 / 103
B	2449	2250	469.6[4]	124 / 13
	2723	2250	469.6[4]	90 / 12
	2899	2250	469.6[4]	72 / 15
	3051	2250	469.6[4]	79 / 14
C	3226	2200	469.6[4]	65 / 12
	3261	2200	469.6[4]	62 / 12
	3425	2200	469.6[4]	42 / 19
	3569	2200	469.6[4]	15 / 79
	3704	2200	469.6[4]	17 / 86
	3738	2200	469.6[4]	17 / 82
D	3905	1840	471.8	40 / 21
	3975	1840	472.9	39 / 47
	4074	1840	476.2	11 / 99
	4143	1690	477.4	9 / 95
	4424	1520	481.2	22 / 57
	4521	1520	482.6	9 / 41
E	4662	1520	485.0	19 / 11
	4731	1520	487.1	13 / 23
	4825	1520	488.8	16 / 16
F	4857	1520	509.9	17 / 17
	4970	1520	514.4	16 / 16
	5119	1520	518.0	23 / 11
	5220	1520	521.2	14 / 14
G	5293	1520	523.8	16 / 16
	5305	1520	524.9	13 / 16
	5397	1520	529.2	12 / 13
	5459	1520	537.0	11 / 16
	5516	1520	539.8	18 / 12
	5593	1520	542.3	15 / 15
	5620	1520	547.8	22 / 12

CROSS SECTION[1]	STREAM STATION[2]	FLOOD DISCHARGE *(cfs)*	1% ANNUAL CHANCE WATER SURFACE ELEVATION *(feet NAVD88)*	NON-ENCROACHMENT WIDTH[3] *(feet)*
	5682	1520	550.9	16 / 16
	5710	1520	552.9	10 / 19
	5733	1520	554.3	16 / 22
	5783	1520	555.8	27 / 17
H	5828	1520	557.1	23 / 31
	5919	1520	559.4	23 / 70
	5940	1520	560.3	*
I	5991	1120	561.2	13 / 87
	6040	1120	561.4	12 / 115
	6062	1120	561.5	*
J	6118	1120	561.6	19 / 105
	6170	1120	561.7	20 / 71
	6188	1120	562.8	*
K	6218	1120	563.0	52 / 54
	6379	1120	563.8	41 / 41
	6625	1120	565.7	27 / 12
	6804	1120	568.5	12 / 62
	6984	1120	570.0	31 / 14
	7240	1120	571.9	15 / 43
	7515	1120	573.6	13 / 15
	7680	1120	575.6	22 / 30
L	7846	990	576.2	16 / 37
	7982	990	577.2	21 / 50
	8064	990	582.0	*
M	8098	990	582.1	41 / 41
	8347	990	582.2	44 / 54
	8527	990	582.3	63 / 41
	8686	990	582.4	52 / 37
	8726	990	583.7	52 / 37
	8779	990	583.9	46 / 52
	8931	990	584.0	37 / 36
	9277	990	584.6	31 / 12
	9512	990	586.3	27 / 31
	9721	990	587.7	12 / 53
N	10108	920	589.9	41 / 14
BRIER CREEK				
A	1142	3490	430.1[4]	45 / 45
	1309	3490	430.1[4]	25 / 49

CROSS SECTION[1]	STREAM STATION[2]	FLOOD DISCHARGE *(cfs)*	1% ANNUAL CHANCE WATER SURFACE ELEVATION *(feet NAVD88)*	NON-ENCROACHMENT WIDTH[3] *(feet)*
	1628	3490	430.1[4]	22 / 145
	1775	3490	430.1[4]	25 / 101
	1919	3490	430.1[4]	18 / 93
	2209	3490	430.1[4]	30 / 69
	2534	3490	430.1[4]	42 / 102
	2743	3490	430.1[4]	34 / 77
	2898	3490	430.1	23 / 37
	3145	3490	431.1	27 / 96
	3294	3490	431.2	48 / 65
B	3356	3490	431.3	16 / 109
	3384	3490	431.7	18 / 134
C	3413	3490	431.8	30 / 176
	3754	3490	432.3	23 / 196
	4086[5]	3490	432.6	22 / 209
	4317[5]	3490	432.8	26 / 228
	4376[5]	3490	432.8	31 / 188
D	4437[5]	3490	432.9	21 / 178
E	4453[5]	3490	433.7	21 / 178
	4485[5]	3490	433.8	47 / 122
	4850[5]	3490	434.9	20 / 148
	5117[5]	3490	435.3	32 / 142
	5251[5]	3490	435.5	161 / 27
	5370[5]	3490	435.7	160 / 36
F	5708[5]	3490	436.4	74 / 123
	5815[5]	3490	436.8	35 / 132
	6317[5]	3490	439.1	37 / 125
	6567[5]	3490	439.7	28 / 128
	6822[5]	3530	440.2	22 / 129
	7056[5]	3530	440.9	22 / 194
	7180[5]	3530	441.0	22 / 221
G	7236[5]	3530	441.1	22 / 233
	7252[5]	3530	441.1	22 / 233
	7279[5]	3530	441.2	20 / 245
	7383	3530	441.2	54 / 217
	7444	3530	441.2	42 / 209
H	7460	3530	441.3	42 / 209
	7496	3530	441.4	37 / 198
I	7790	3530	441.6	24 / 150

CROSS SECTION[1]	STREAM STATION[2]	FLOOD DISCHARGE *(cfs)*	1% ANNUAL CHANCE WATER SURFACE ELEVATION *(feet NAVD88)*	NON-ENCROACHMENT WIDTH[3] *(feet)*
	7980	3530	442.3	55 / 121
J	8024	3530	442.4	51 / 125
	8044	3530	443.3	37 / 139
K	8069	3530	443.9	22 / 165
	8186	3530	444.0	29 / 127
	8472[5]	3530	444.7	19 / 207
	8607	3530	445.0	76 / 223
	8657	3530	445.0	68 / 241
L	8677	3530	445.0	68 / 241
	8702	3530	445.1	51 / 257
	8808	3530	445.2	33 / 257
	9099	3530	445.7	23 / 266
	9207	3530	445.8	26 / 270
M	9260	3530	445.9	26 / 260
	9282	3530	446.1	21 / 235
N	9312	3530	446.5	26 / 212
O	10219	3440	447.6	183 / 48
	10838	3440	449.2	248 / 30
	11326	3440	451.1	172 / 124
	12065	3440	453.4	272 / 32
	12470	3440	454.9	137 / 36
P	12493	3440	454.8	141 / 24
Q	12515	3440	455.4	145 / 20
	12525	3440	455.5	134 / 21
	12771	3220	456.9	80 / 43
	12883	3220	457.5	48 / 79
R	13304	3220	460.5	139 / 20
	13633	3220	461.7	181 / 27
	13732	3220	462.3	175 / 20
	14159	3220	464.8	165 / 22
	14266	3220	465.4	159 / 27
	14500	3220	466.5	93 / 55
	14734	3220	468.3	88 / 22
S	14767	3220	468.4	96 / 29
	14819	3220	469.5	*
T	14836	3220	469.7	94 / 61
	15087	3220	470.2	31 / 126
	15400	3220	471.0	81 / 57

CROSS SECTION[1]	STREAM STATION[2]	FLOOD DISCHARGE *(cfs)*	1% ANNUAL CHANCE WATER SURFACE ELEVATION *(feet NAVD88)*	NON-ENCROACHMENT WIDTH[3] *(feet)*
U	15647	3220	472.1	27 / 67
V	15815	3220	474.0	24 / 67
	15843	3220	474.4	29 / 78
	15867	3220	475.6	31 / 78
W	15898	3220	475.7	21 / 61
	15937	3220	475.7	21 / 60
	16216	3220	477.5	42 / 61
X	16501	2470	478.9	47 / 49
Y	16816	2470	479.5	37 / 37
	17158	2470	482.1	24 / 63
	17328	2470	483.1	24 / 62
Z	17467	2470	484.7	22 / 66
	17493	2470	485.3	48 / 64
	17516	2470	487.0	71 / 72
AA	17544	2470	487.3	43 / 69
	17668	2470	487.7	51 / 56
	18090	2470	489.2	64 / 42
	18497	2470	490.9	86 / 22
	18807	2470	492.2	58 / 49
	19174	2470	494.0	50 / 50
	19490	2470	496.2	44 / 44
	19647	2470	497.6	26 / 26
AB	19705	2470	498.3	34 / 22
	19731	2470	499.0	33 / 18
	19749	2470	500.7	39 / 20
AC	19762	2470	501.1	42 / 22
	19850	2470	501.3	50 / 26
	19935	2470	501.3	49 / 49
	20253	2470	501.3	36 / 36
	20347	2470	501.5	24 / 24
AD	20375	2470	501.6	19 / 19
	20396	2470	505.1	27 / 27
AE	20410	2470	505.7	45 / 60
	20455	2470	505.9	50 / 89
	20648	2470	506.0	43 / 109
AF	20825	2470	506.2	34 / 88
	20972	2470	507.1	56 / 59
AG	21142	2470	508.8	72 / 21

CROSS SECTION[1]	STREAM STATION[2]	FLOOD DISCHARGE *(cfs)*	1% ANNUAL CHANCE WATER SURFACE ELEVATION *(feet NAVD88)*	NON-ENCROACHMENT WIDTH[3] *(feet)*
	21166	2470	508.9	61 / 24
	21176	2470	509.5	62 / 24
AH	21188	2470	509.6	62 / 29
	21266	2470	510.0	42 / 49
AI	21463	2470	511.3	73 / 32
	21483	2470	511.3	73 / 37
	21500	2470	512.5	*
AJ	21510	2470	512.8	83 / 32
	21595	2470	513.0	93 / 36
AK	21841	2470	514.1	57 / 81
	21861	2470	514.1	57 / 83
	21881	2470	515.1	*
AL	21892	2470	515.5	63 / 78
	21948	2470	515.8	75 / 57
	22113	2470	516.5	138 / 39
	22208	2470	517.3	165 / 21
AM	22275	2470	517.7	167 / 22
AN	22291	2470	518.4	161 / 28
	22326	2470	518.5	105 / 47
AO	22478	2470	519.5	130 / 23
	22610	2470	520.1	106 / 22
	22731	2470	521.2	78 / 20
	22866	2470	522.6	29 / 29
	23003	2470	524.2	37 / 57
	23142	1690	524.7	20 / 81
	23164	1690	524.7	20 / 83
	23186	1690	524.8	28 / 78
AP	23198	1690	524.9	41 / 65
AQ	23288	1690	525.1	51 / 18
	23515	1690	526.3	48 / 20
	23607	1690	526.9	41 / 29
	23692	1690	527.7	52 / 32
AR	23821	1690	528.5	62 / 17
	23952	1690	529.9	26 / 56
	24157	1690	532.3	22 / 22
	24260	1690	533.2	29 / 29
AS	24342	1690	533.3	24 / 24
	24357	1690	534.6	60 / 30

CROSS SECTION[1]	STREAM STATION[2]	FLOOD DISCHARGE *(cfs)*	1% ANNUAL CHANCE WATER SURFACE ELEVATION *(feet NAVD88)*	NON-ENCROACHMENT WIDTH[3] *(feet)*
	24373	1690	535.4	50 / 20
AT	24381	1690	535.8	47 / 20
	24448	1690	535.9	53 / 17
	24521	1690	535.9	55 / 17
	24604	1690	536.0	25 / 44
AU	24757	1690	538.1	32 / 65
CEDAR CREEK				
A	224	8110	463.3[4]	22 / 26
	354	8110	463.3[4]	27 / 27
	406	8110	463.3[4]	30 / 25
	914	8110	463.3[4]	25 / 28
	1032	8110	463.3[4]	25 / 31
	1349	8110	463.3[4]	51 / 30
	1971	8110	463.3[4]	33 / 43
	2442	8110	463.3[4]	58 / 28
	2812	8110	463.3[4]	40 / 36
B	3388	8110	463.3[4]	29 / 74
	3746	8110	463.3[4]	47 / 33
	3766	8110	463.3[4]	47 / 33
	3857	8110	463.3[4]	44 / 39
C	4149	8110	463.3[4]	30 / 72
	4690	8110	463.3[4]	55 / 87
	4912	8110	463.3[4]	41 / 101
	5163	8110	463.3[4]	32 / 62
	5471	8110	463.3[4]	57 / 59
	5497	8110	463.3[4]	*
	5571	8110	463.3[4]	113 / 38
D	6234	8110	463.3[4]	85 / 54
	6579	8000	463.3[4]	173 / 51
	7053	8000	463.3[4]	42 / 233
	7535	8000	463.3[4]	115 / 35
	7966	8000	463.3[4]	87 / 29
E	8427	8000	463.3[4]	67 / 27
	9029	8000	465.9	87 / 74
	9218	8000	466.4	57 / 75
	9855	8000	468.3	39 / 56
F	10459	8000	469.9	95 / 38
	10986	8000	471.4	105 / 39

CROSS SECTION[1]	STREAM STATION[2]	FLOOD DISCHARGE *(cfs)*	1% ANNUAL CHANCE WATER SURFACE ELEVATION *(feet NAVD88)*	NON-ENCROACHMENT WIDTH[3] *(feet)*
	11239	8000	472.4	54 / 80
	11530	8000	472.5	28 / 100
	11864	8000	474.3	81 / 35
	12401	8000	476.5	94 / 42
	12925	8000	478.0	42 / 100
	13488	7830	478.9	129 / 32
G	13852	7830	479.9	166 / 35
	14112	7830	480.0	100 / 69
	14598	7830	480.6	119 / 47
	15296	7830	481.3	104 / 53
	15706	7830	481.7	55 / 118
H	16125	7830	482.1	37 / 117
	16603	6880	482.5	53 / 114
	17100	6880	482.9	44 / 92
	17430	6880	483.2	51 / 67
	17948	6880	484.0	35 / 76
	18339	6880	484.8	100 / 40
	18760	6880	485.3	103 / 45
I	19140	6880	485.5	97 / 36
	19366	6880	485.7	94 / 29
	19693	6880	486.0	57 / 97
	19717	6880	486.0	*
	19799	6880	486.7	29 / 126
J	20207	6880	486.9	50 / 145
	20700	6880	487.5	78 / 38
	21078	6880	488.1	35 / 126
	21538	6880	488.2	33 / 92
K	21842	6880	488.8	25 / 101
	22176	6880	489.3	81 / 31
	22256	6880	490.2	81 / 31
	22338	6880	490.3	125 / 25
L	22514	6550	490.9	146 / 25
	22882	6550	491.6	237 / 48
	22908	6550	492.0	218 / 44
	22934	6550	492.0	*
	23029	6550	491.6	193 / 18
M	23131	6550	492.4	174 / 20
	23406	4240	493.6	177 / 25

CROSS SECTION[1]	STREAM STATION[2]	FLOOD DISCHARGE *(cfs)*	1% ANNUAL CHANCE WATER SURFACE ELEVATION *(feet NAVD88)*	NON-ENCROACHMENT WIDTH[3] *(feet)*
	23590	4240	494.0	107 / 88
	23865	4240	494.6	23 / 115
	24048	4240	495.6	20 / 146
	24400	4240	497.6	23 / 219
	24594	4240	498.8	28 / 89
N	25100	4240	501.1	20 / 81
	25407	4240	503.5	22 / 22
	25428	4240	505.2	22 / 22
	25465	4240	505.6	26 / 89
	25502	4240	505.8	32 / 100
	25522	4240	505.8	*
O	25892	4240	506.6	91 / 37
	26391	4240	507.5	117 / 22
	26897	4240	508.1	139 / 24
	27251	4240	508.6	21 / 129
	27695	4110	509.1	142 / 24
	28090	4110	509.6	87 / 86
	28696	4110	510.3	27 / 132
	28976	4110	510.7	20 / 229
	29420	4110	511.4	24 / 174
	29904	4110	512.8	17 / 124
	30293	4110	513.6	26 / 172
	30504	4110	514.3	34 / 102
	30996	4110	515.9	35 / 27
	31261	4110	517.4	38 / 20
	31612	4110	520.7	54 / 50
	32202	4110	521.8	18 / 26
	32490	4110	525.3	31 / 28
P	32830	4110	526.9	28 / 60
	33015	4110	527.4	34 / 36
	33101	4110	528.3	*
Q	33149	4110	528.0	36 / 104
	33857	4110	532.0	41 / 40
	34262	4110	532.3	51 / 27
	34559	4110	533.5	77 / 26
	34914	3730	534.4	30 / 33
R	35367	3730	535.5	28 / 39
	35706	3730	536.4	62 / 44

CROSS SECTION[1]	STREAM STATION[2]	FLOOD DISCHARGE *(cfs)*	1% ANNUAL CHANCE WATER SURFACE ELEVATION *(feet NAVD88)*	NON-ENCROACHMENT WIDTH[3] *(feet)*
	36110	3730	537.0	34 / 53
	36475	3730	537.2	51 / 39
	37060	3730	540.2	41 / 73
	37426	3730	540.9	23 / 98
	37764	3730	541.4	27 / 86
	38080	3730	542.0	66 / 59
S	38322	3690	542.1	41 / 36
	38625	3690	542.9	27 / 110
	38817	3690	543.3	98 / 82
	39006	3690	543.6	96 / 28
	39220	3690	544.4	49 / 22
	39514	3690	546.0	55 / 27
	39871	3690	547.6	75 / 17
	40154	3690	548.9	79 / 14
	40433	3690	551.0	76 / 28
	40662	3690	551.9	59 / 64
	40889	3690	552.6	34 / 77
T	41190	3690	553.1	24 / 83
	41428	3690	553.4	20 / 48
	41706	3690	554.4	21 / 62
	42023	3690	555.0	63 / 27
	42308	3690	556.0	35 / 35
	42624	3690	556.9	31 / 54
	42974	3690	557.6	28 / 70
	43291	3690	558.1	68 / 58
U	43694	3500	558.6	95 / 25
FLOYDS FORK				
N	19966	41330	454.2	80 / 659
	21245	41330	454.5	178 / 287
	21863	41330	454.8	143 / 292
	22665	41330	455.3	133 / 360
	23050	41330	455.5	159 / 291
	23149	41330	455.6	155 / 290
	23276	41330	455.6	176 / 271
	23365	41330	455.7	177 / 271
	23414	41330	455.7	182 / 265
O	23891	41330	455.8	248 / 169
	24116	41330	455.9	250 / 186

CROSS SECTION[1]	STREAM STATION[2]	FLOOD DISCHARGE *(cfs)*	1% ANNUAL CHANCE WATER SURFACE ELEVATION *(feet NAVD88)*	NON-ENCROACHMENT WIDTH[3] *(feet)*
	24238	41330	456.0	255 / 192
	24607	41330	456.1	234 / 109
	24813	41330	456.3	196 / 144
	24958	41330	456.4	145 / 200
	25632	41330	456.6	83 / 251
	26584	41330	457.1	66 / 389
	27786	41330	457.8	81 / 499
P	28595	41330	458.0	193 / 114
	28953	41330	458.3	291 / 62
	29654	41330	458.9	487 / 181
	30045	41330	459.1	210 / 598
	30636	41330	459.2	86 / 429
	31309	41330	459.6	231 / 143
	31915	41330	459.6	242 / 121
	32565	41330	460.2	301 / 152
Q	32940	41330	460.2	213 / 143
	34032	41330	460.8	169 / 169
	34883	41330	461.3	78 / 355
	35408	41330	461.8	288 / 394
	35987	41330	461.9	289 / 107
	36819	41330	462.2	259 / 131
R	37957	41330	462.6	382 / 64
	39148	41660	463.0	165 / 157
	39275	41660	463.1	165 / 157
	39328	41660	463.3	161 / 130
S	39566	41660	463.4	178 / 127
	39994	41660	463.7	275 / 116
	41097	41660	464.4	196 / 183
	42404	41660	465.0	143 / 218
T	43811	41660	465.7	103 / 195
	45169	41660	466.5	97 / 244
	46145	41660	466.7	107 / 250
	47314	41660	467.4	67 / 393
U	48223	41660	467.8	395 / 91
	49093	41660	468.2	300 / 272
	49837	41660	468.4	107 / 379
	50128	41660	468.6	91 / 388
	50667	41660	468.8	72 / 428

CROSS SECTION[1]	STREAM STATION[2]	FLOOD DISCHARGE (cfs)	1% ANNUAL CHANCE WATER SURFACE ELEVATION (feet NAVD88)	NON-ENCROACHMENT WIDTH[3] (feet)
	51580	40760	469.3	145 / 508
	52367	40760	469.4	291 / 199
	53260	40760	469.7	463 / 94
V	54018	40760	469.9	285 / 118
	55109	40760	470.4	233 / 164
	56076	40760	471.0	341 / 78
	56808	40760	471.3	246 / 317
	57694	40760	471.5	85 / 361
	58422	40760	471.9	491 / 97
W	59361	40760	472.3	646 / 176
	60186	40760	472.5	50 / 672
	61131	41600	472.8	451 / 339
	61833	41600	473.0	916 / 65
	62776	41600	473.1	573 / 143
	63457	41600	473.3	377 / 369
	64161	41600	473.5	254 / 487
X	65096	41600	473.6	121 / 427
	66385	41600	474.2	97 / 325
	67280	41600	474.7	157 / 413
	68030	41600	475.1	591 / 98
Y	68871	41600	475.3	426 / 59
SPORTSMAN RUN				
A	839	3090	485.3[4,5]	117 / 18
	1217	3090	485.3[4,5]	201 / 14
	1613	3090	485.3[4,5]	19 / 54
	1812	3090	485.3[4,5]	28 / 90
B	1915	3090	485.3[4,5]	39 / 99
	2321	3090	485.3[4]	27 / 27
	2673	3090	494.1	*
C	2784	3090	494.5	108 / 102
	3057	3090	494.6	43 / 160
	3311	3090	494.6	15 / 129
	3390	2910	494.7	21 / 131
	3580	2910	494.8	20 / 103
	3671	2910	495.5	17 / 98
D	3939	2910	498.9	16 / 161
	4077	2910	500.1	15 / 205
E	4288	2910	503.3	19 / 115

CROSS SECTION[1]	STREAM STATION[2]	FLOOD DISCHARGE *(cfs)*	1% ANNUAL CHANCE WATER SURFACE ELEVATION *(feet NAVD88)*	NON-ENCROACHMENT WIDTH[3] *(feet)*
	4409	2870	512.0	23 / 84
	4466	2870	515.4	*
	4489	2870	518.7	*
	4531	2870	522.6	*
	4550	2870	526.2	23 / 85
	4590	2870	529.7	*
	4657	2870	532.5	*
	4665	2870	533.4	*
F	4731	2870	534.6	*
	4810	2870	535.8	*
	4870	2870	536.3	*
	4881	2870	536.4	*
	6905	2140	536.5	15 / 258
	7660	2140	539.4	86 / 51
	8041	2140	541.2	27 / 65
G	8076	2140	541.7	32 / 98
	8572	2140	547.7	23 / 77
	8703	1860	548.6	15 / 84
	8742	1860	549.2	17 / 91
H	8956	1860	551.3	15 / 101
	9146	1860	553.0	17 / 118
	9352	1860	555.0	18 / 51
	9441	1860	556.7	22 / 48
	9593	1860	558.7	12 / 81
	9809	1860	560.2	13 / 80
I	10097	1570	562.0	63 / 54
	10302	1570	563.1	17 / 45
	10576	1570	565.9	12 / 73
	10749	1570	567.3	14 / 37
J	10931	1570	569.8	14 / 64
	11141	1570	571.6	91 / 54
	11268	1570	572.6	130 / 8
	11598	1480	575.5	51 / 43
	11908	1480	577.3	12 / 131
K	12169	1480	578.8	53 / 55
	12603	1480	582.1	12 / 104
	12807	1480	584.0	26 / 77
	12963	1480	585.8	9 / 138

CROSS SECTION[1]	STREAM STATION[2]	FLOOD DISCHARGE *(cfs)*	1% ANNUAL CHANCE WATER SURFACE ELEVATION *(feet NAVD88)*	NON-ENCROACHMENT WIDTH[3] *(feet)*
	13090	1480	586.7	10 / 104
	13235	790	588.1	15 / 15
L	13348	790	589.7	13 / 15
	13500	790	591.5	10 / 43
WELLS RUN				
A	1264	3450	472.9[4]	17 / 130
	1587	3450	472.9[4]	21 / 157
	1880	3450	472.9[4]	12 / 180
B	2193	3450	472.9[4]	15 / 151
	2479	3450	472.9[4]	12 / 111
	2749	3450	472.9[4]	11 / 56
	2976	3450	472.9[4]	70 / 65
C	3217	3450	472.9[4]	90 / 36
	3415	3430	472.9[4]	73 / 21
D	3572	3430	472.9[4]	34 / 54
	3984	3430	472.9[4]	76 / 26
	4213	3430	472.9[4]	102 / 37
	4322	3430	472.9[4]	113 / 60
E	4640	3430	474.3	142 / 18
	4727	3430	475.0	128 / 14
	4944	3430	477.2	56 / 57
	5273	3430	479.8	121 / 18
	5474	3430	480.6	133 / 17
	5728	3430	482.3	126 / 19
F	5980	3240	484.1	73 / 34
G	6201	3240	485.6	52 / 40
	6244	3240	486.1	74 / 47
	6412	3240	487.5	111 / 15
	6630	3240	490.5	17 / 95
	6828	3240	492.0	28 / 79
	6926	3240	492.7	29 / 68
	7042	3240	493.5	23 / 74
	7199	3240	495.7	95 / 31
	7450	3240	499.2	20 / 56
H	7531	2010	500.3	12 / 82
	7774	2010	501.6	38 / 43
	8060	2010	504.7	66 / 23
	8147	2010	505.7	82 / 15

CROSS SECTION[1]	STREAM STATION[2]	FLOOD DISCHARGE *(cfs)*	1% ANNUAL CHANCE WATER SURFACE ELEVATION *(feet NAVD88)*	NON-ENCROACHMENT WIDTH[3] *(feet)*
I	8256	2010	507.0	15 / 34
	8506	2010	510.6	49 / 27
	8630	2010	511.8	46 / 46
	8789	1710	513.9	19 / 55
	8961	1710	516.1	13 / 68
	9088	1710	517.7	14 / 34
	9222	1710	520.1	16 / 41
	9351	1710	522.0	98 / 23
	9513	1710	523.4	37 / 11
	9567	1710	525.1	38 / 12
	9714	1470	527.4	21 / 31
J	9764	1470	528.0	21 / 29

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

[2] Feet above mouth.

[3] Left/right distance from the mapped center of stream to encroachment boundary based on a 1.0 foot or less surcharge.

[4] Elevation includes backwater effects.

[5] Located outside of county boundary.

* Encroachment widths same as floodplain width.