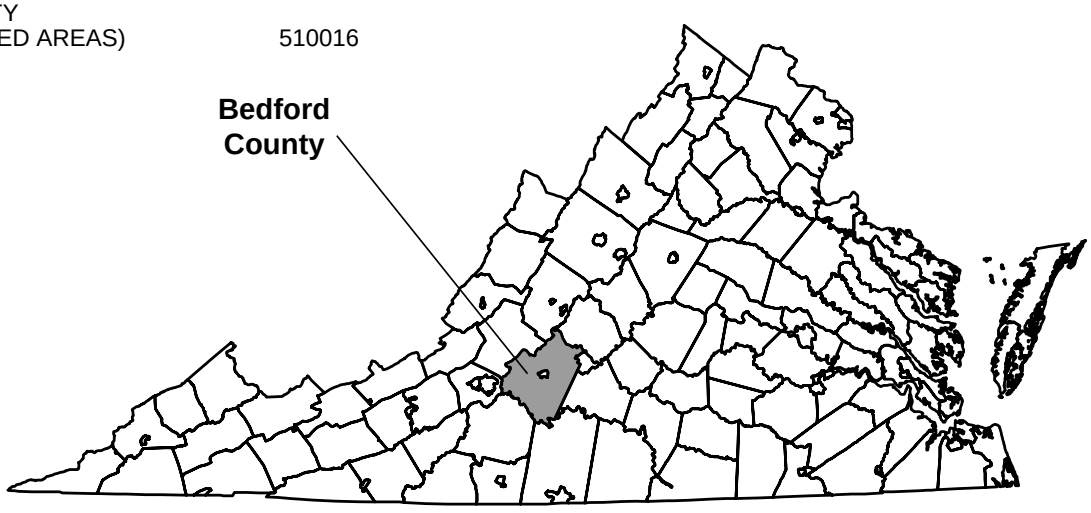
FLOOD INSURANCE STUDY

BEDFORD COUNTY, VIRGINIA AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
BEDFORD, CITY OF (INDEPENDENT CITY)	510015
BEDFORD COUNTY (UNINCORPORATED AREAS)	510016



September 29, 2010

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
51019CV000A

NOTICE TO
FLOOD INSURANCE STUDY USERS

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

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

Selected Flood Insurance Rate Map panels for this community contain new flood zone designations. The flood hazard zones have been changed as follows:

Old Zones	New Zones
A1 through A30	AE
B	X
C	X

Initial Countywide FIS Effective Date: September 29, 2010

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FLOOD INSURANCE STUDY
BEDFORD COUNTY, VIRGINIA AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Countywide Flood Insurance Study (FIS) investigates the existence and severity of flood hazards in, or revises and updates previous FIS's / Flood Insurance Rate Maps (FIRMs) in the geographic area of Bedford County, Virginia, including the independent City of Bedford and the unincorporated areas of Bedford County (referred to collectively herein as Bedford County) and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This FIS has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates. This information will also be used by Bedford County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and will also be used 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) shall be able to explain them.

1.2 Authority and Acknowledgments

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

This FIS was prepared to include the unincorporated areas of, and incorporated communities within, Bedford County in a countywide format FIS. Information on the authority and acknowledgments for each jurisdiction included in this countywide FIS, as compiled from their previously printed FIS reports, is shown below.

Bedford County (Unincorporated Areas):	The hydrologic and hydraulic analyses for the March 1978 study were performed by the U. S. Army Corps of Engineers, Wilmington District, for the Federal Insurance Administration under Inter-Agency Agreement No. IAA-H-16-75,

Project Order 21, and IAA-H-7-76, Project Order 1. Hydraulic analyses for tributary streams and preparation of the report were conducted by Wiley and Wilson, Inc., under subcontract to the U. S. Army Corps of Engineers, Wilmington District. This work, which was completed in October 1976, covered all significant flooding sources affecting Bedford County.

Bedford, City of (Independent City): The original hydrologic and hydraulic analyses for the February 1977 study were prepared by CH2M HILL for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. H-3833. This work was completed in February 1977. In this revision, the hydrologic and hydraulic analyses were performed by the Wilmington District of the U. S. Army Corps of Engineers (USACE) for FEMA, under Inter-Agency Agreement No. EMW-90-E-3286, Task Letter No. 90-2. The work for the April 2, 1992 revised study was completed in August 1990. Additional flood hazard information was taken from the Flood Insurance Study for the unincorporated areas of Bedford County.

For this countywide FIS, revised hydrologic and hydraulic analyses were prepared for the Bedford County by AMEC Earth & Environmental, Inc., and was funded in part by the Virginia Water Quality Improvement Fund at the Department of Conservation and Recreation (DCR) through grants #91934-2001-WQIA-04 and #91934-2001-WQIA-18. This work was completed in June 2004. The analyses and results are presented in Sections 2.0 and 3.0 of this report. Also as part of this revision, the 1% annual chance floodplain for Buffalo Creek was delineated based on data from the 2008 Flood Insurance Study for Campbell County, VA and newly available topographic data (March 2008) provided by the Virginia Geographic Information Network (VGIN). Detailed hydrologic and hydraulic analyses for a segment of Lick Run were incorporated from a flood hazard study conducted by Slusher Surveying & Associates. This work was completed in February 2005.

Base map files were obtained in digital format from the Commonwealth of Virginia and Bedford County. Road centerline files, stream centerlines, and political boundaries were provided by Bedford County. Adjustments were made to specific base map features to align them to 2002 digital orthopotographs that were

provided by the Virginia Geographic Network Division of its Department of Technology Planning (VGIN). Adjustments were made to specific base map features to align them to 1"=200' and 1"=400' scale VGIN orthophotos.

The coordinate system used for the production of this FIRM is Universal Transverse Mercator (UTM), Zone 17 North, North American Datum of 1983 (NAD 83), GRS 80 spheroid. Corner coordinates shown on the FIRM are in latitude and longitude referenced to the UTM projection, NAD 83. Differences in the datum and spheroid used in the production of FIRMs for adjacent counties may result in slight positional differences in map features at the county boundaries. These differences do not affect the accuracy of information shown on the FIRM.

The Digital Flood Insurance Rate Map (DFIRM) conversion for this study was performed by AMEC, Earth & Environmental, Inc. for FEMA, under Contract No. EMP-2001-CO-2411, Task Order 0027.

1.3 Coordination

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.

A search for basic data was made at all levels of government. The Virginia Water Control Board and local organizations were informed of the initiation of the study and requested to furnish pertinent information. Information was also requested from the Natural Resources Conservation Service (NRCS), the National Oceanic and Atmospheric Administration (NOAA), the U. S. Army Corps of Engineers (USACE) and the U. S. Geological Survey (USGS). However, other federal and state agencies were unable to provide flood data for this location.

For the City of Bedford, another meeting was held in October 1975 and was attended by personnel of the USACE and the study contractor. The purpose of this meeting was to discuss the coordination of Flood Insurance Studies being prepared by the study contractor with adjacent studies contracted to the USACE; the City of Bedford Flood Insurance Study was among the ones being discussed. The USACE was contacted throughout the study to discuss information developed for the Bedford County Flood Insurance Study.

On December 14, 1976, personnel of the study contractor attended the final Consultation and Coordination (CCO) meeting for the County of Bedford Flood Insurance Study to review results of the county study. This meeting was attended by county officials, City of Lynchburg officials, and personnel of the Virginia State Water Control Board and FEMA.

A final CCO meeting was held with representatives of FEMA, the Virginia Water Control Board, and community. At this meeting, the findings of the study were discussed with community officials.

The dates of the initial and final CCO meetings held for the incorporated communities within the boundaries of Bedford County are shown in the following tabulation:

TABLE 1 – INITIAL AND FINAL CCO MEETINGS

Community Name	Initial CCO Date	Final CCO Date
Bedford County (Unincorporated Areas)	January 15, 1975	December 14, 1976
Bedford, City of (Independent City)	March and October, 1975	April 12, 1977

For this revision, a final meeting was held on March 12, 2008 and was attended by representatives of Bedford County, the City of Bedford, the study contractor, and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Bedford County, Virginia, including the City of Bedford.

Areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction for the next five years, through October 1981.

In the original study (June 1, 1978) for the City of Bedford, Johns Creek and Little Otter River Tributary No. 1 (formerly called Unnamed Tributary to Little Otter River) were studied by detailed methods. In the April 2, 1992 revision, the following streams were studied by detailed methods: West Branch, from the confluence with Little Otter River Tributary No. 1 to U. S. Route 460; and Little Otter River Tributary No. 1, from approximately 800 feet downstream of Merchants Street to a point approximately 850 feet upstream of Crenshaw Street. In addition, flood hazard information for the Little Otter River, for its entire length affecting the community, and for the Little Otter River Tributary No. 1, from the

confluence with the Little Otter River to a point approximately 1 mile upstream, was taken from the Flood Insurance Study for the unincorporated areas of Bedford County (Reference 23). The April 2, 1992 revision also incorporates updated topographic information.

All or portions of the flooding sources listed in Table 2 "Flooding Sources Studied by Detailed Methods" were studied by detailed methods. Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRMs (Exhibit 2).

TABLE 2 – FLOODING SOURCES STUDIED BY DETAILED METHODS

Battery Creek	North Fork Goose Creek
Beaverdam Creek	North Otter Creek
Big Otter River	Roanoke River
Bore Auger Creek	Sandy Creek
East Fork Beaverdam Creek	South Fork Goose Creek
Falling Creek	Tributary No. To 1 Little Otter River
Goose Creek	Tributary No. 8 To Little Otter River
Hunting Creek	Tributary No. 8A To Little Otter River
Ivy Creek	Tributary No. 9 To Little Otter River
James River	Tributary No. 10 To Little Otter River
Johns Creek	Tributary No. 10 To Ivy Creek
Judith Creek	Tributary No. 11 To Ivy Creek
Lick Run	Tributary No. 14 To Ivy Creek
Little Otter River	Tributary No. 15 To Ivy Creek
Machine Creek	Wells Creek
Mill Creek	West Branch
Nat Branch	West Fork Beaverdam Creek

During the new revision, two segments of Little Otter River were studied by detailed methods. One major tributary of Little Otter River, Johns Creek, was studied in detail and four unnamed tributaries were studied in limited details. Ivy Creek was analyzed in detail from the City of Lynchburg corporate limits to upstream of Quail Ridge Drive. Four unnamed tributaries of Ivy Creek were studied in limited detail. Lick Run was revised to reflect more accurate information performed by U.S. Army Corps of Engineers Wilmington District (Table 3).

TABLE 3 – REVISED STREAM REACHES

Stream	Study Area Description	Study Type	Length (mi)
Little Otter River	Section 1 – From a point just downstream of Route 784 (Nicopolis Drive) to its confluence with Johns Creek	Detailed	Section 1 – 6.0
	Section 2 – From a point just downstream of Route 122 (Big Island Highway) to a point just downstream of Route 43		Section 2 – 2.8

TABLE 3 – REVISED STREAM REACHES (continued)

Stream	Study Area Description	Study Type	Length (mi)
Johns Creek	From the City of Bedford corporate limits to a point approximately 2,100 ft downstream of Gold Road	Detailed	1.0
Johns Creek	Section 1 – From its confluence with Little Otter River to the City of Bedford corporate limits Section 2 – From a point approximately 2,100 ft downstream of Gold Road to a point just upstream of East Main Street	Limited Detail	Section 1 – 2.0 Section 2 – 0.9
Lick Run	From a point approximately 1 mi downstream of US 460 to just downstream of US 460	Detailed	1.0
Tributary No. 8 To Little Otter River	From confluence with Little Otter River to a point approximately 500 ft downstream of Longwood Avenue	Limited Detail	1.3
Tributary No. 8A To Little Otter River	From confluence with Little Otter River Tributary No. 8 to a point approximately 0.5 mi upstream of confluence.	Limited Detail	0.5
Tributary No. 9 To Little Otter River	From confluence with Little Otter River to a point approximately 2,400 ft upstream of Whitfield Drive	Limited Detail	0.6
Tributary No. 10A To Little Otter River	From confluence with Little Otter River to a point just downstream of Lake Drive	Limited Detail	0.6
Ivy Creek	From the City of Lynchburg corporate limits to a point just downstream of Coffee Road	Detailed	9.6
Tributary No. 10 To Ivy Creek	From confluence with Ivy Creek to a point approximately 500 ft downstream of Forest Road	Limited Detail	2.4
Tributary No. 11 To Ivy Creek	From Confluence with Ivy Creek to a point approximately 500 ft downstream of Forest Road	Limited Detail	2.5
Tributary No. 14 To Ivy Creek	From confluence with Ivy Creek to a point approximately 1,500 ft upstream of McIntosh Drive	Limited Detail	2.1
Tributary No. 15 To Ivy Creek	From confluence with Ivy Creek to a point approximately 1 mi upstream of Hawkins Mill Road	Limited Detail	2.8

Numerous flooding sources in the county were studied by approximate methods. Approximate methods of analysis were used to study those areas having low development potential and/or minimal flood hazards as identified at the initiation of the study. The scope and methods of study were proposed to and agreed upon by FEMA.

2.2 Community Description

Bedford County is in the highest part of the Piedmont Plateau in the west-central region of Virginia. The county is bounded by the James River on the north, the Blue Ridge Mountains on the west, and the Roanoke River including Smith Mountain Lake and Leesville Lake on the south. Bedford County is bounded by Rockbridge County to the northwest, Amherst County to the north and northeast, Campbell County to the east, Pittsylvania County to the south, and Franklin, Roanoke, and Botetourt counties to the west.

Bedford County was formed from Lunenburg County in 1753, and parts of Albemarle and Lunenburg Counties were added later. The county was named for John Russell, Duke of Bedford. The county seat was first at New London near the Campbell County border, but in 1782 it was moved and renamed Liberty. In 1839 the Town of Liberty incorporated, and in 1890 its name was changed to Bedford City. In 1912, the name was changed to Bedford, where the county seat remains today.

The population of the county was 27,200 in 1972, an increase of 472 over the 1970 census (Reference 1). After a period of stable population levels from the beginning of the 1900s through 1960, followed by a slight decrease in population in 1970, the population trend has increased steadily in the past 35 years. The population for Bedford County as determined by the 2000 Census is 60,371, and the 2006 estimated population is 56,601, an increase of 10.3% (Reference 30).

The economy in the area is highly diversified, including farming and a variety of industries. Most of the residential and commercial developments in Bedford County are adjacent to the cities of Lynchburg and Bedford. Recently, residential developments in the communities of Stewartsville and Villamont have been built as the greater Roanoke Metropolitan Area expands. The remainder of the county remains rural and wooded with dispersed residences.

Flood plains are usually comprised of farmlands and woodlands. Principal concentrations of flood plain development lie along Hunting Creek in the Big Island community and along Mill Creek in the Moneta community. Other minor concentrations of commercial and residential structures within flood plains are scattered throughout the county.

The topography varies from rolling hills in the southeast to mountainous terrain in the northwest. Elevations within the county range from 600 feet to 4,200 feet on the highest mountain peak. Annual precipitation averages 43 inches with the highest monthly totals occurring from May through August. Temperatures vary from an average of 34°F in January to an average of 76°F in July (Reference 1). Soils along the major rivers are deep, mostly well-

drained (with inclusions of poorly drained to moderately well-drained) soils belonging to the Hiwassee, Turbeville, Congaree Association. Soils of the Cecil, Madison Association of deep, well-drained sands over red clay subsoils predominate in the uplands.

Goose Creek, Big Otter River, and Little Otter River and their tributaries drain most of the county and empty into the Roanoke River. The James River and its tributaries drain a small area in the northern portion of the county.

The City of Bedford is located in the center of Bedford County in southwestern Virginia. The city is situated midway between the City of Roanoke to the west and the City of Lynchburg to the east. The population of Bedford in 1974 was 6,000 persons. Population projections based on the static migration method estimate the population of the city to be approximately 6,200 persons in the early 1990's (Reference 24). The 2000 Census population was 6,299 (Reference 31).

In the past, Bedford has had a strong industrial employment base while commercial development has lagged because of the nearness of Lynchburg and Roanoke (Reference 24).

The topography of Bedford is suitable for both commercial and industrial development. Bedford has a general slope of less than 15 percent, although much of the city has a slope of less than 7 percent (Reference 24).

Bedford is situated in the highest part of the Piedmont Plateau and is in the Blue Ridge Physiographic Province. The city is located within the Marshall Formation consisting of coarse massive or thick-bedded granite gneiss. The soils of Bedford can be characterized as areas dominated by light-colored, sandy surface soils and yellowish areas dominated by reddish brown to dark brown loam surface soils and red or dark red clay subsoils. These characteristics can be found in the following three specific soil associations: 1) Cecil-Appling; 2) Davidson Lloyd and Dykes; and 3) Wilkes. These are usually deep, well drained soils except for the Wilkes Association which is shallow and excessively drained (Reference 24).

Temperatures vary widely, averaging 34 degrees Fahrenheit (°F) in January and 76°F in July. Annual precipitation averages 43 inches and average humidity is a comfortable 62 percent (Reference 1).

The City of Bedford is situated in the Otter River Watershed which is part of the Roanoke River Basin. Johns Creek is located in the eastern part of the city. This creek originates within the city and flows in a northeasterly direction. The headwaters and tributaries of Johns Creek are in developed areas, the floodplain in the study

reach, however, is mainly undeveloped with the exception of a pump station. Future land use for this area is designated for public and semi-public facilities.

The Little Otter River Tributary No. 1 is located in the western part of Bedford. It originates in the city and flows in a northwest direction until it turns and flows almost due north forming the northwest boundary of the city. Floodplain development along this creek consists of residential, commercial, and industrial, with most of the development located along the upstream portion of the study reach.

2.3 Principal Flood Problems

Low-lying areas of Bedford County are subject to periodic flooding caused by overflow of the studied streams. The most severe flooding is usually the result of heavy rains from tropical storms; however, creek flooding occurs after locally heavy thunderstorms.

Major flooding occurred in Bedford County in 1936, 1940, 1969, and 1972. These floods on the James River generally had a frequency of about 50 years. The 1969 flood exceeded the 50-year flood elevation at the USGS Holcomb Rock gage, and the 1972 flood on the Roanoke River at Smith Mountain Dam had a stage one foot below the 50-year flood. Damage from these floods has been limited mainly to bridge structures and to agricultural crops in the flood plains (Reference 2). More recent floods occurred in 1986, 1992 and 1996. During the flood of November 1985, 23 percent of the streamflow-gaging stations in Virginia recorded significant discharges. The flood was caused by a complex weather system that was affected by remnants of Hurricane Juan and moisture from the Gulf of Mexico. Maximum discharge for the Roanoke River at Roanoke (station 02055000), had the highest flow and was 25 percent greater than the previous maximum discharge that occurred during the flood of 1972. There were 22 deaths and $753 million in damages (References 33 and 34).

Low-lying areas adjacent to the streams studied in the City of Bedford are subject to periodic flooding. The most severe flooding is generally a result of heavy rains associated with tropical storms. Flooding is more often a result of local thunderstorms. Bedford was fortunate not to have major flooding problems during the 1969 and 1972 tropical storms, even though many parts of Virginia had record flooding associated with those two storms. There is no specific historical flood data available.

Fill placement in the floodway has modified water-surface elevations from the downstream end of the Westgate Shopping

Center culvert to West Main Street due to loss of storage and changes to the type, diameter, and length of drainage structure.

2.4 Flood Protection Measures

The Appalachian Power Company's Smith Mountain Combination Project provides significant flood protection along the Roanoke River downstream of Bedford County; however, it does not provide significant protection within the county.

There are several low dams along the James River for hydroelectric power generation and water supply. None of these dams, however, has significant storage for flood control although these structures do cause large head losses.

Floodplain management measures in the City of Bedford are described in the Virginia Uniform Statewide Building Code. This building code was adopted and is enforced by the City of Bedford. The code states that, where a structure is located in the 1-percent annual chance floodplain, the lowest floor must be built at or above the 1-percent annual chance flood elevation, except for nonresidential structures which may be flood-proofed to that level (Reference 25).

There are no other flood protection measures on streams in the area, and none are proposed for future construction.

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 study. 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 1-percent annual chance flood (1 percent chance of annual exceedance) 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 community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

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

Frequency-discharge, drainage area relationships were determined by a regional analysis of 16 streamflow gaging stations on the Roanoke River and its tributaries (Reference 3). Data for the James River were developed from a regional frequency study of the James River Basin gages. Data for all other streams studied in detail were developed from a regional study of 114 stream gages in hydrologically similar stream basins in southwestern Virginia and northwestern North Carolina (References 3 and 4). Values of the 10-, 50-, 100-, and 500-year peak discharges for each stream studied in detail were obtained from a log-Pearson Type III distribution of annual peak flow data (Reference 5). Adjustments were made to the data at restrictive bridge crossings where significant volumes of runoff were stored. Macon Street crossing restricts flows on the Little Otter River, and the Norfolk and Western Railway bridge restricts flows on the North Fork of Goose Creek.

Within the City of Bedford, discharge-frequency relationships for the 10-, 50-, 100-, and 500- year recurrence intervals for Johns Creek were based upon an urban regional frequency procedure (Reference 26). This method included consideration of watershed development as determined by aerial photographs (1971) and field reconnaissance to determine drainage area, stream length, stream slope, and soil permeability.

For the Little Otter River, Little Otter River Tributary No. 1, and West Branch, peak discharges for the 10-, 2-, 1-, and 0.2-percent annual chance floods were obtained from the Flood Insurance Study for the unincorporated areas of Bedford County (Reference 23). These discharges were based on a regional study of 114 stream gages in hydrologically similar basins in southwestern Virginia and northwestern North Carolina. Adjustments were made to discharges to account for flood water storage effects behind the Norfolk and Western Railway bridge.

The peak discharge-frequency estimates for the revised portion of Little Otter River Tributary No. 1 above Macon Street were calculated using U. S. Geological Survey (USGS) No. 78-5 to estimate the undeveloped 100-year discharges and USGS No. 2207 (modified by Roanoke County, Virginia, Flood Insurance Study restudy, March 1990) to account for urbanization. Flood hydrographs were developed utilizing the USDA-SCS dimensionless hydrograph method (Reference 27). The flood

hydrographs were flood-routed through the Westgate Shopping Center drainage structure accounting for the reduction in peak discharge due to flood storage. A topographic map and plans for the Westgate Shopping Center, both at a scale of 1" = 50', and April 1989 aerial photography, scales 1" = 600' and 1" = 2,000', were used for urban development estimates and horizontal control.

New hydrologic analysis was developed for this FIS. Using the topographic data and stream centerlines, subbasins were delineated using HMSPrePro (University of Texas). The average size of each basin is 0.5 mi^2. Runoff calculations were performed using NRCS methodologies. Times of concentrations for existing conditions were computed using the NRCS Technical Release No. 55 3-segment approach. Existing conditions curve numbers were developed from the existing land cover and NRCS hydrologic soils groups. The NRCS unit hydrograph was used in the runoff calculations.

Channel routings between subbasins were performed using the Muskingum-Cunge routing technique. Routing data (reach length and slope, Manning's "n" values, and 8-point cross-section) were developed from the topographic and land cover data referenced previously. In the Little Otter River subbasin a reservoir routing was performed at the Norfolk & Western railroad crossing since a reservoir routing was performed at this location in the FEMA effective FIS analyses. Several ponds have been constructed in the Ivy Creek watershed; however, they are not included in the hydrologic model because the plans available for the ponds do not meet FEMA requirements. Routings in the Ivy – Blackwater Creek were included where reservoir routings were performed in the FEMA analysis: Dreaming Creek at the Norfolk & Western Railroad crossing and Rock Castle Creek at U.S. Route 460.

Data for the 10-, 50-, and 100-year recurrence interval, 24-hour precipitation events were obtained from the National Weather Service (NWS) Technical Paper No. 40 (TP-40), "Rainfall Frequency Atlas of the United States for Durations from 30 minutes to 24 hours and Return periods from 1 to 100 Years" (1963). The 500-year precipitation was extrapolated using the methodology from TP-40. The NRCS Type II synthetic rainfall distribution was used in the hydrologic modeling.

Using the information and data listed above, existing conditions HEC-1 hydrologic models were developed for both the Little Otter River watershed and the Ivy Creek watershed. Peak discharges were computed for the 10-, 2-, 1-, and 0.2-percent annual chance recurrence interval floods.

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

TABLE 4- SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
BATTERY CREEK					
Cross Section E	1.7	700	1,700	2,400	5,200
Confluence with James River	4.3	1,300	3,100	4,300	9,400
BEAVERDAM CREEK					
VA Route 619	1.6	700	1,600	2,300	4,900
Private Drive	27.0	4,400	10,100	14,000	29,400
BIG OTTER RIVER					
Confluence of Little Otter River	243.0	15,900	29,700	37,700	62,700
Downstream corporate limits	276.0	17,100	31,850	40,350	66,900
BORE AUGER CREEK					
Cross Section N	2.1	800	1,900	2,700	5,800
VA Route 755	16.0	3,100	7,200	10,000	21,000
EAST FORK BEAVERDAM CREEK					
VA Route 755	2.1	800	2,000	2,700	6,000
Confluence with Beaverdam Creek	5.2	1,500	3,500	4,800	10,300
FALLING CREEK					
Cross Section G	4.5	1,300	3,200	4,400	9,500
Confluence with Smith Mountain Lake	13.0	2,700	6,500	9,000	18,700
GOOSE CREEK					
Private Drive	44.0	6,100	14,000	19,000	36,000
HUNTING CREEK					
VA Route 602	4.8	1,400	3,300	4,600	9,850

TABLE 4- SUMMARY OF DISCHARGES – continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
HUNTING CREEK (Continued)					
Confluence with James River	8.6	2,050	4,800	6,700	14,300
IVY CREEK					
Approximately 0.57 mi upstream of Quail Ridge Drive	7.1	4,318	7,284	8,739	12,884
Approximately 0.29 mi upstream of Quail Ridge Drive	7.5	4,253	7,479	8,976	13,278
Approximately 0.59 mi downstream of Quail Ridge Drive	8.2	4,509	7,965	9,567	14,206
Approximately 0.55 mi upstream of Ivy Lake Drive	9.7	4,345	7,991	9,648	14,386
Approximately 350 ft upstream of Ivy Lake Drive	10.0	4,398	8,081	9,760	14,556
Approximately 950 ft downstream of Ivy Lake Drive	10.6	4,442	8,166	9,881	14,767
Approximately 0.71 mi upstream of Hooper Road	11.9	4,626	8,519	10,336	15,548
Approximately 450 ft upstream of Hooper Road	14.1	4,773	8,813	10,743	16,316
Approximately 725 ft downstream of the confluence with Tributary No.10 To Ivy Creek	16.6	5,270	9,733	11,900	18,168
Just upstream of Cottontown Road	19.5	6,505	11,312	13,495	20,357
Approximately 400 ft downstream of Hawkins Mill Road	21.9	6,900	12,034	14,381	21,669

TABLE 4- SUMMARY OF DISCHARGES – continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
JAMES RIVER					
Upstream county boundary	2,100	53,000	87,000	103,000	152,000
Downstream county boundary	3,500	81,000	134,000	165,000	273,000
JOHNS CREEK					
Approximately 375 ft upstream of East Main Street	0.6	1,109	1,586	1,780	2,295
Approximately 425 ft downstream of East Main Stream	1.5	1,947	2,922	3,318	4,336
At Independence Boulevard	1.7	1,982	2,957	3,379	4,412
Approximately 0.41 mi downstream of Independence Boulevard	2.3	2,525	3,804	4,360	5,754
Approximately 0.61 mi downstream of Independence Boulevard	2.7	2,781	4,248	4,894	6,520
Approximately 1.18 mi upstream of the confluence with Little Otter River	3.2	2,997	4,621	5,345	7,215
Approximately 0.98 mi upstream of the confluence with Little Otter River	4.1	3,453	5,409	6,294	8,596
JUDITH CREEK					
U.S.501	3.6	1,150	2,750	3,850	8,300
Confluence with James River	12.9	2,700	6,250	8,700	18,400
LITTLE OTTER RIVER					
Downstream of the confluence with Tributary No.10 To Little Otter River	13.9	6,517	10,926	13,074	19,195

TABLE 4- SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
LITTLE OTTER RIVER (Continued)					
Approximately 600ft downstream of the confluence with Tributary No.9 To Little Otter River	15.7	6,645	11,256	13,499	19,921
Approximately 0.67 mi downstream of the confluence with Tributary No. 9 To Little Otter River	16.6	6,713	11,424	13,694	20,233
Approximately 575 ft upstream of Big Island Highway	18.3	6,794	11,506	13,859	20,485
Approximately 1.17 mi downstream of Big Island Highway	19.0	6,850	11,622	13,990	20,707
Just downstream of Railroad	21.4	6,128	9,908	11,592	14,603
Approximately 0.44 mi downstream of Railroad	22.4	6,177	10,002	11,701	14,774
Just upstream of Belltown Road	23.2	6,184	10,020	11,712	14,838
Approximately 0.58 mi downstream of the confluence with Johns Creek	27.6	6,467	10,499	12,271	15,702
Approximately 0.44 mi upstream of East Lynchburg Salem Turnpike	30.1	6,469	10,499	12,271	15,880
Approximately 700 ft downstream of East Lynchburg-Salem Turnpike	30.9	6,469	10,499	12,271	15,947
Approximately 1.37 mi upstream of Nicopolis Drive	32.2	6,498	10,540	12,337	16,094
Approximately 0.41 mi upstream of Nicopolis Drive	35.7	6,682	10,820	12,666	16,581

TABLE 4- SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
MACHINE CREEK					
Confluence of Wells Creek	4.4	1,300	3,000	4,200	9,300
Confluence with Little Otter River	28.0	4,500	10,300	14,200	29,900
MILL CREEK					
Cross Section D	0.30	225	550	800	1,700
Cross Section A	1.45	630	1,520	2,150	4,600
NAT BRANCH					
Limit of Study	2.6	900	2,200	3,100	6,750
Confluence with West Beaverdam Creek	7.7	1,900	4,500	6,200	13,300
NORTH FORK GOOSE CREEK					
Cross Section G	21	3,700	8,500	11,900	25,000
Upstream of Norfolk & Western Railway Bridge	32	5,000	11,000	15,500	32,500
Downstream of Norfolk & Western Railway Bridge	33	4,000	7,800	10,000	18,000
NORTH OTTER CREEK					
VA Route 122	13	2,700	6,400	8,900	18,800
Confluence with Big Otter River	51	6,700	15,100	20,900	43,700
ROANOKE RIVER					
Upstream Corporate Limit	510	19,000	32,000	39,000	60,000
Headwaters of Smith Mountain Lake	580	21,000	36,000	43,000	66,000
Leesville Dam	1,500	24,000	39,000	48,000	76,000
SANDY CREEK					
VA Route 635	0.76	400	1,000	1,400	3,200
Confluence with Falling Creek	2.8	1,000	2,300	3,200	6,500

TABLE 4- SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
SOUTH FORK GOOSE CREEK					
Norfolk & Western Railway Bridge	1.0	500	1,200	1,700	3,700
Confluence with Goose Creek	12.0	2,600	6,000	8,350	17,700
TRIBUTARY NO.1 TO LITTLE OTTER RIVER					
At Crenshaw Street	0.7	370	810	1,060	2,160
At Jeter Street	0.9	490	1,020	1,330	2,660
Access Road	1.0	400	1,000	1,400	2,300
Approximately 250 feet downstream of U. S. Route 460	1.2	630	1,320	1,740	3,440
Approximately 275 feet downstream of Merchants Street [1]	1.2	530	740	1,020	2,500
Approximately 825 feet upstream of confluence of West Branch	1.3	560	780	1,100	2,600
At West Branch	3.4	1,000	2,550	3,550	7,600
Upstream of Macon Street	3.4	1,050	2,600	3,600	7,600
Approximately 425 feet downstream of confluence of West Branch	3.8	950	1,750	2,200	3,600
TRIBUTARY NO.8 TO LITTLE OTTER RIVER					
At confluence with Little Otter River	0.9	675	1,113	1,309	1,833
TRIBUTARY NO.8A TO LITTLE OTTER RIVER					
At confluence with Little Otter River	0.2	274	426	492	669
TRIBUTARY NO.9 TO LITTLE OTTER RIVER					
At confluence with Little Otter River	0.9	859	1,365	1,588	2,195

[1] Discharges include both flow over parking lot and flow through drainage structure.

TABLE 4- SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
TRIBUTARY NO.10 TO LITTLE OTTER RIVER					
At confluence with Little Otter River	0.4	266	433	508	708
TRIBUTARY NO.10 TO IVY CREEK					
At confluence with Ivy Creek	2.2	1,456	2,588	3,114	4,543
TRIBUTARY NO.11 TO IVY CREEK					
At confluence with Ivy Creek	2.9	2,656	4,119	4,768	6,499
TRIBUTARY NO.14 TO IVY CREEK					
At confluence with Ivy Creek	2.0	656	1,114	1,320	1,938
TRIBUTARY NO.15 TO IVY CREEK					
At confluence with Ivy Creek	4.3	1,877	3,541	4,333	6,528
WELLS CREEK					
VA Route 747	2.3	850	2,050	2,900	5,200
Confluence with Machine Creek	5.7	1,550	3,650	5,100	9,750
WEST BRANCH					
At Tributary No. 1 To Little Otter River	3.4	1,000	2,550	3,550	7,600
WEST FORK BEAVERDAM CREEK					
Confluence of Nat Branch	8.0	2,200	4,600	6,500	13,750
Confluence with Beaverdam Creek	11.0	2,400	5,600	7,900	16,700

TABLE 4- SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
LICK RUN					
At Private Bridge	3.53	730	1,389	1,733	2,702
At US 460	1.81	454	878	1,100	1,731

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 Flood Insurance Rate Map (FIRM) represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data table in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to us the flood elevation data presented in this FIS report in conjunction with the data shown on the FIRM.

Cross section data for streams studied in detail were obtained from field surveys. 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 Flood Insurance Rate Map (Exhibit 2). Bridges, culverts, and other structures within the detailed study area were field surveyed to obtain elevation data and structural geometry in order to compute the significant backwater effects of these structures.

Roughness coefficients (Manning's "n") for all streams except the James and Roanoke Rivers were estimated by field inspection in conjunction with aerial photography (Reference 6) and USGS topographic maps (Reference 7). Roughness coefficients for the James and Roanoke Rivers were determined from a roughness-discharge relationship developed from historic flood profiles. Roughness coefficients in the study area range from 0.035 to 0.07 in the main channels and from 0.04 to 0.11 in the overbank areas.

In the City of Bedford, channel roughness factors (Manning's "n") for each of these streams were estimated by field inspection at each cross section. For Johns Creek, the channel "n" value ranged from

0.050 to 0.065 and the overbank "n" values ranged from 0.065 to 0.070. In the April 2, 1992 revision, the channel "n" values for Little Otter River Tributary No. 1 ranged from 0.014 to 0.070 and the overbank "n" values ranged from 0.020 to 0.150. For West Branch and the Little Otter River, the channel "n" values ranged from 0.035 to 0.070 and the overbank "n" values ranged from 0.040 to 0.110. For the unrevised portions of Unnamed Tributary to Little Otter River, the channel "n" values ranged from 0.040 to 0.060 and the overbank "n" values ranged from 0.040 to 0.100.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. 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 is computed (Section 4.2); selected cross section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-2 step-backwater computer program (Reference 8). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations for all streams studied in detail were computed by the slope-area method. The hydraulic analyses on the James River and Roanoke River were conducted as a complete river unit with pertinent data selected for inclusion in this report. On tributary streams, the profile computations were started by the slope-area method assuming annual discharge on the parent stream.

In the April 2, 1992 revision for the City of Bedford, flood profile information for a portion of Little Otter River Tributary No. 1, extending approximately 1 mile upstream from its confluence with the Little Otter River and for all of West Branch was taken from the Flood Insurance Study for the unincorporated areas of Bedford County (Reference 23). In the remaining portion of Little Otter River Tributary No. 1 affected by the April 2, 1992 revision, flood stages at the Westgate Shopping Center were determined by split flow analysis. To facilitate the analysis, the "tributary stream profile" option of HEC-2 was utilized (Reference 8). Overland flow through the parking lot was modeled as being part of the main stream. This modeling scheme was halted just below West Main Street. The tributary model was then used to model the flow through the culvert as well as the remainder of the channel upstream to the upper limit of detailed study, approximately 850 feet upstream of Crenshaw Street. At the transition point between the two modeling schemes, flows were combined and water-surface elevations were matched for each flood frequency.

In the February 4, 2005 detailed study for Lick Run, the Manning’s

"n" values were based on photographs taken at the private drive and the indicated tree/open areas on the USGS Quad sheet Forest, VA. The water surface elevations were computed using the US Army Corps of Engineers HEC-RAS version 3.1.1 May 2003. The surveyed sections were evaluated as to how close they were to a line that was perpendicular to the flood plain. Surveyed section B (station 29,379) was taken on approximately a 20 degree skew and was adjusted. The model section indicates the adjusted location and orientation. The flood plains were put on the map by locating the ground intersection at each cross section and a line drawn between the section using the contours on the quadrangle sheet as a guide. The floodway limits are based on a computed width at each cross section and an interpolation between the sections. The interpolation is generally straight line with some smoothing to give a hydraulically acceptable shape. The maximum allowable increase caused by the floodway is 1.0 foot. The floodway computations were started with a 1.0 foot increase, but has less than that due to changes in velocity and the need to have smooth floodway lines.

For the City of Bedford, hydraulic analyses for the Little Otter River were taken from the Flood Insurance Study for the unincorporated areas of Bedford County (Reference 23).

The approximate flood boundaries were established from USGS Maps of Flood Prone Areas (Reference 9). On unmapped streams, the boundaries were determined using a regional stage-frequency relation using known stages and frequencies (References 10 and 11), aerial photography (Reference 6), and engineering judgment.

For the City of Bedford, approximate flood boundaries were determined by some combination of the following: 1) correlation, considering size of drainage area, slope, vegetation, and hydrologic conditions, with other streams studied by detailed methods within the region; 2) field reconnaissance; and 3) engineering judgment.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1), and selected cross section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

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

New hydraulic analyses were performed for this revision. This entire study was updated to the North American Vertical Datum of 1988 (NAVD 88). Additionally, hydraulic modeling for the revised stream reaches outlined in Table 3 was performed using HEC-

RAS, version 3.1.1, from the U.S. Army Corps of Engineers, Hydrologic Engineering Center (HEC). Basic modeling data for the detailed hydraulic analyses was performed using GeoRAS, a Geographic Information Systems (GIS) interface developed by HEC for the preparation of hydraulic models.

Effective cross section locations were used as a guide for developing new cross-sections based on the updated topographic information. Underwater sections were taken from the FEMA effective model where available. Where no effective model was available, underwater sections were obtained from field measurements.

Stream crossing information was incorporated from plans provided by the County and VDOT (where available). Field notes consisting of structure dimensions and channel geometry, as well as the structure material (i.e. corrugated metal pipe), were used to incorporate crossings where plans were not available. Roughness coefficients were assigned based on aerial photography and field reconnaissance. Peak flow values were obtained from the existing conditions HEC-1 model.

In analyses that started at a natural confluence, the starting water surface elevation was computed using normal depth. For Little Otter River and Ivy Creek where the models start within a FEMA studied reach, the FEMA elevation was used as a starting water surface elevation to tie into the FEMA effective model.

The results of the hydraulic models were reviewed and checked using FEMA's CHECK-RAS software. CHECK-RAS reports were reviewed and modifications to the HEC-RAS models were made where appropriate.

For detailed analyses, flood profiles were computed for the 10-, 2-, 1-, and 0.2-percent annual chance recurrence interval flood events. In addition, the floodway was determined using equal reduction of conveyance on opposite sides of the stream while allowing a maximum surcharge of 1.0 ft.

For limited detail analyses, flood profiles were computed for the 10- and 1-percent annual chance recurrence interval flood events. Floodways were not computed.

Floodplains were delineated using GeoRAS. Floodplains were mapped to include backwater effects that govern each flooding source near its downstream extent. Floodplains were reviewed for accuracy and adjusted as necessary.

All qualifying benchmarks 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.

Benchmarks 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 the most reliable nature, expected to hold position/elevation (e.g., mounted in bedrock)
- Stability B: Monuments which generally hold their position/elevation (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 benchmarks, the FIRM may also show vertical control monuments established by a local jurisdiction; these monuments will be shown on the FIRM with the appropriate designations. Local monuments will only be placed on the FIRM if the community has requested that they be included, and if the monuments meet the aforementioned NSRS inclusion criteria.

To obtain current elevation, description, and/or location information for benchmarks shown on the FIRM for this jurisdiction, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their Web site 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 the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the National

Geodetic Vertical Datum of 1929 (NGVD 29). With the completion of the North American Vertical Datum of 1988 (NAVD 88), many FIS reports and FIRMs are now prepared using NAVD 88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are now referenced to NAVD 88. In order to perform this conversion, effective NGVD 29 elevation values were adjusted downward by 0.72 foot. 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.

For more information on NAVD 88, see Converting the National Flood Insurance Program to the North American Vertical Datum of 1988, FEMA Publication FIA-20/June 1992, or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242
http://www.ngs.noaa.gov/

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

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

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the county. For the streams studied

in detail, the 100- and 500-year floodplain boundaries have been determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps enlarged to a scale of l"=1,000', with a contour interval of 20 feet (Reference 7), along with stereoscopic aerial photography (Reference 6). For the City of Bedford, between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 20 feet enlarged to a scale of 1:7,200 (Reference 7).

For streams studied by approximate methods, the boundaries of the 1 percent annual chance flood were developed from USGS Maps of Flood Prone Areas (Reference 9) and normal depth calculations based on regional stage- frequency relations (References 10 and 11) and the maps referenced above.

For the areas studied by approximate methods within the City of Bedford, the 1 percent annual chance floodplain boundaries were delineated using topographic maps and the previously printed Flood Insurance Study for the City of Bedford (References 7 and 28).

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

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

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 FIS 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.

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage, and heightens potential flood hazards by further increasing velocities. A listing of stream velocities at selected cross sections is provided in Table 5, "Floodway Data." In order 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.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 5). The computed floodways are shown on the Flood Insurance Rate Map (Exhibit 2). In cases where the floodway and 1 percent annual chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown. No floodway was computed for West Branch and for the limited detail studies outlined in Table 5.

For the Little Otter River Tributary No. 1 in that reach between the downstream end of the Westgate Drainage Structure and the downstream side of Jeter Street, any fill in the Westgate Shopping Center parking lot, including Summit Street, will reduce the conveyance of the Westgate Drainage Structure. In addition, any fill in the floodplain between Summit Street and Jeter Street will reduce the flood storage and can be expected to increase the flood stages upstream.

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 at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

The Roanoke River and James River form part of the county boundary, the Tributary No.1 To Little Otter River forms part of the Bedford City corporate limits and Judith Creek forms part of the Lynchburg corporate limits; consequently, part of their floodways lie in adjacent communities.

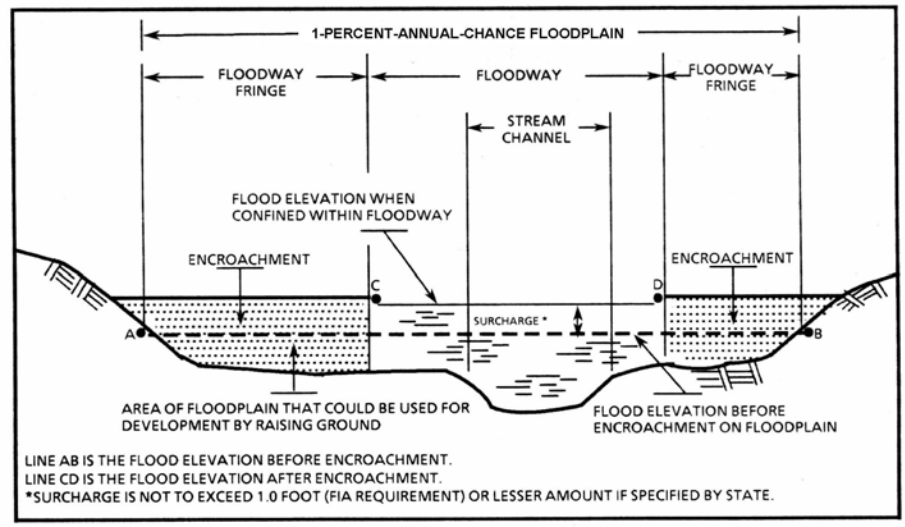

FIGURE 1: FLOODWAY SCHEMATIC

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Battery Creek								
A	400[1]	160	1,428	3.0	629.0	626.6[2]	626.8[2]	0.2
B	500[1]	130	1,416	3.0	629.0	627.2[2]	627.5[2]	0.3
C	6,400[1]	170	554	6.9	747.6	747.6	747.8	0.2
D	11,795[1]	195	514	6.8	902.5	902.5	902.5	0.0
E	16,050[1]	260	464	5.2	1,053.9	1,053.9	1,053.9	0.0
Beaverdam Creek								
A	19,000[3]	180	2,064	6.8	813.9	813.9	813.9	0.0
B	21,830[3]	215	2,584	5.4	826.4	826.4	826.4	0.0
C	25,340[3]	225	1,241	11.3	836.0	836.0	836.0	0.0
D	31,820[3]	115	1,100	8.3	851.5	851.5	851.5	0.0
E	36,300[3]	415	1,885	4.8	860.9	860.9	860.9	0.0
F	40,580[3]	175	2,008	3.1	877.2	877.2	877.2	0.0
G	42,400[3]	145	1,008	6.2	880.7	880.7	880.7	0.0
H	45,950[3]	230	1,520	3.8	889.9	889.9	889.9	0.0
I	51,030[3]	245	972	4.4	911.2	911.2	911.2	0.0
J	54,800[3]	95	337	10.7	935.4	935.4	935.4	0.0
K	58,820[3]	160	1,152	3.1	972.6	972.6	972.6	0.0

[1] Feet above confluence with James River

[2] Elevations computed without consideration for backwater effect of James River

[3] Feet above confluence with Roanoke River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA AND INCORPORATED AREAS

FLOODWAY DATA

BATTERY CREEK – BEAVERDAM CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Big Otter River								
A	14.83[1]	410	6,406	6.3	582.6	582.6	583.5	0.9
B	15.62[1]	390	9,605	4.2	588.0	588.0	588.4	0.4
C	16.67[1]	410	6,888	5.8	589.0	589.0	589.7	0.7
D	18.47[1]	310	4,972	8.1	595.3	595.3	595.7	0.4
Bore Auger Creek								
A	16,930[2]	400	2,365	4.1	864.5	864.5	864.8	0.3
B	25,350[2]	250	1,959	4.7	906.3	906.3	906.3	0.0
C	26,870[2]	295	1,032	9.0	912.6	912.6	912.7	0.1
D	29,235[2]	120	989	8.5	934.6	934.6	934.6	0.0
E	32,790[2]	135	755	9.8	959.4	959.4	959.4	0.0
F	36,050[2]	315	1,167	6.0	999.1	999.1	999.1	0.0
G	36,770[2]	165	917	6.2	1,004.6	1,004.6	1,004.6	0.0
H	38,580[2]	190	1,409	4.0	1,026.1	1,026.1	1,026.1	0.0
I	40,600[2]	115	957	5.6	1,051.8	1,051.8	1,051.8	0.0
J	43,170[2]	175	905	6.0	1,082.1	1,082.1	1,082.2	0.1
K	46,475[2]	215	1,203	3.9	1,136.8	1,136.8	1,136.8	0.0
L	48,080[2]	160	563	8.4	1,157.5	1,157.5	1,157.5	0.0
M	49,100[2]	180	1,135	3.5	1,175.2	1,175.2	1,175.3	0.1
N	51,300[2]	155	370	7.3	1,211.3	1,211.3	1,211.4	0.1

[1] Miles above County Boundary
[2] Feet above Limit of Detailed Study

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA AND INCORPORATED AREAS

FLOODWAY DATA

BIG OTTER RIVER – BORE AUGER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
East Fork Beaverdam Creek								
A	1,600[1]	185	1,081	4.4	878.3	878.3	878.3	0.0
B	7,300[1]	200	1,108	3.8	906.4	906.4	906.4	0.0
C	9,990[1]	130	464	5.8	918.0	918.0	918.3	0.3
Falling Creek								
A	2,200[2]	155	811	10.9	815.1	815.1	815.1	0.0
B	8,630[2]	140	1,505	5.8	830.0	830.0	830.1	0.1
C	12,000[2]	115	835	10.5	853.1	853.1	853.1	0.0
D	13,660[2]	135	1,826	3.3	867.7	867.7	867.7	0.0
E	19,200[2]	145	504	10.1	897.1	897.1	897.1	0.0
F	21,200[2]	170	853	6.0	919.6	919.6	919.6	0.0
G	22,650[2]	130	711	6.3	938.8	938.8	938.8	0.0
Goose Creek								
A	38.26[3]	115	1,309	14.7	879.3	879.3	879.4	0.1
B	39.06[3]	150	2,079	9.3	905.8	905.8	905.8	0.0

[1] Feet above confluence with Beaverdam Creek
[2] Feet above confluence with Roanoke River
[3] Miles above Limit of Detailed Study

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA AND INCORPORATED AREAS

FLOODWAY DATA

EAST FORK BEAVERDAM CREEK
FALLING CREEK – GOOSE CREEK

FLOODING SOURCE		FLOODWAY			BASE 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
Hunting Creek								
A	60	205	1,818	3.7	625.1	618.9[2]	`618.9[2]	0.0
B	120	210	1,647	4.0	625.1	619.7[2]	619.7[2]	0.0
C	2,200	130	1,857	3.6	647.8	647.8	647.8	0.0
D	7,600	390	795	7.4	735.0	735.0	735.0	0.0
E	10,500	215	1,249	4.7	800.3	800.3	800.3	0.0
F	12,800	530	1,000	5.9	849.1	849.1	849.1	0.0
G	14,400	150	821	7.2	886.0	886.0	886.0	0.0
H	20,470	170	1,219	4.3	1,042.1	1,042.1	1,042.1	0.0
I	23,220	140	707	7.4	1,113.3	1,113.3	1,113.3	0.0
J	24,850	125	659	6.8	1,170.1	1,170.1	1,170.1	0.0
Ivy Creek								
A	49,940	260	3,657	3.7	683.1	683.1	683.9	0.8
B	56,300	230	2,040	6.6	693.7	693.7	694.0	0.3
C	60,825	170	1,778	6.0	702.9	702.9	703.8	0.9
D	65,225	175	1,428	7.5	713.7	713.7	714.5	0.8
E	72,875	80	843	11.7	747.7	747.7	748.2	0.5
F	81,000	640	32,944	0.3	828.6	828.6	828.6	0.0
G	89,000	130	1,489	5.9	829.4	829.4	829.5	0.1
H	91,250	295	1,309	4.9	835.2	835.2	835.2	0.0
I	97,420	195	934	3.7	875.7	875.7	875.7	0.0

[1] Feet above confluence with James River

[2] Elevations computed without consideration for backwater effect of James River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA AND INCORPORATED AREAS

FLOODWAY DATA

HUNTING CREEK – IVY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
James River								
A	256.19	975/530	40,858	3.9	566.9	566.9	567.1	0.2
B	256.53	918/460	27,115	5.9	567.0	567.0	567.2	0.2
C	257.00	890/450	32,748	4.9	567.7	567.7	567.9	0.2
D	258.55	990/480	27,773	5.7	569.5	569.5	569.7	0.2
E	259.70	700/440	20,287	7.8	571.7	571.7	571.8	0.1
F	261.39	740/260	18,872	8.4	577.3	577.3	577.4	0.1
G	263.17	610/350	18,343	8.7	584.3	584.3	584.4	0.1
H	264.00	742/115	21,628	7.4	587.3	587.3	587.5	0.2
I	264.89	610/280	16,728	9.5	593.8	593.8	593.8	0.0
J	266.20	697/350	20,474	7.8	598.5	598.5	598.5	0.0
K	267.60	590/310	17,464	9.1	612.4	612.4	612.4	0.0
L	268.85	600/330	18,060	8.8	616.7	616.7	616.8	0.1
M	269.71	900/630	17,072	9.3	619.5	619.5	620.1	0.6
N	270.13	1,060/820	25,932	6.1	621.5	621.5	622.3	0.8
O	270.47	790/485	23,944	6.6	623.0	623.0	623.7	0.7
P	271.23	1,290/225	22,674	7.0	626.5	626.5	626.9	0.4
Q	271.91	717/490	16,775	9.5	629.5	629.5	629.9	0.4
R	273.68	733/290	17,348	9.2	639.2	639.2	640.0	0.8
S	274.28	600/320	12,657	12.6	646.1	646.1	646.2	0.1

[1] Miles above confluence with Chesapeake Bay
[2] Width/width within County Boundary

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA AND INCORPORATED AREAS

FLOODWAY DATA

JAMES RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
James River (continued)								
T	274.62[1]	556/250[2]	14,509	11.0	649.5	649.5	649.6	0.1
U	274.85[1]	1,040/500[2]	25,798	6.2	652.2	652.2	652.3	0.1
V	275.24[1]	1,450/715[2]	25,985	6.1	668.9	668.9	668.9	0.0
W	276.34[1]	540/230[2]	12,499	12.7	673.3	673.3	673.3	0.0
X	277.21[1]	540/180[2]	12,150	13.1	681.7	681.7	681.7	0.0
Y	278.48[1]	580/150[2]	10,614	15.0	697.7	697.7	697.7	0.0
Johns Creek								
A	11,000[3]	95	527	7.6	817.8	817.8	818.7	0.9
B	12,260[3]	80	566	5.7	825.6	825.6	826.1	0.5
C	13,190[3]	50	392	11.7	833.2	833.2	833.2	0.0
D	13,730[3]	75	553	5.6	841.9	841.9	842.4	0.5
E	14,480[3]	75	458	6.8	847.8	847.8	848.7	0.9
F	15,300[3]	75	418	7.4	854.7	854.7	855.6	0.9
G	16,290[3]	75	283	5.9	861.1	861.1	861.8	0.7

[1] Miles above confluence with Chesapeake Bay
[2] Width/width within County Boundary
[3] Feet above confluence with Little Otter River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA AND INCORPORATED AREAS

FLOODWAY DATA

JAMES RIVER – JOHNS CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Judith Creek								
A	630[1]	160/100[2]	1,004	8.7	567.0	562.3[3]	562.3[3]	0.0
B	6,880[1]	75/45[2]	625	13.3	611.2	611.2	611.2	0.0
C	10,050[1]	185/75[2]	1,460	5.7	637.9	637.9	638.0	0.1
D	12,800[1]	95/50[2]	940	8.3	648.6	648.6	648.7	0.1
E	17,240[1]	145/130[2]	899	8.1	664.5	664.5	664.6	0.1
F	28,380[1]	170	982	6.5	708.5	708.5	708.5	0.0
G	39,470[1]	145	1,219	5.3	764.4	764.4	764.4	0.0
H	40,800[1]	95	1,164	4.3	769.8	769.8	769.8	0.0
I	44,910[1]	65	368	9.7	809.3	809.3	809.3	0.0
Lick Run								
A	28,353[4]	100	448	3.9	726.4	726.4	727.4	1.0
B	29,379[4]	95	408	4.3	732.9	732.9	733.6	0.7
C	30,324[4]	80	351	4.3	738.2	738.2	739.0	0.8
D	30,774[4]	70	299	5.0	740.2	740.2	740.9	0.7
E	31,919[4]	87	262	4.6	746.7	746.7	746.9	0.2
F	32,680[4]	126	322	3.7	751.2	751.2	752.1	0.9
G	33,104[4]	90	327	3.7	753.4	753.4	754.4	1.0
H	33,775[4]	69	193	5.7	758.1	758.1	758.5	0.4

[1] Feet above confluence with James River

[2] Width/width within County Boundary

[3] Elevations computed without consideration for backwater effect of James River

[4] Feet above confluence with Big Otter River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA AND INCORPORATED AREAS

FLOODWAY DATA

JUDITH CREEK – LICK RUN

FLOODING SOURCE		FLOODWAY			BASE 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
Little Otter River								
A	0.16	165	2,291	10.3	602.3	602.3	602.3	0.0
B	1.82	255	3,990	5.9	621.0	621.0	621.2	0.2
C	3.92	270	4,168	5.6	638.4	638.4	638.4	0.0
D	4.29	315	4,111	5.6	640.2	640.2	640.4	0.2
E	5.45	195	2,096	6.8	647.4	647.4	647.8	0.4
F	8.34	95	1,287	9.8	672.7	672.7	673.3	0.6
G	9.74	325	2,868	4.3	684.6	684.6	685.3	0.7
H	11.14	95	1,499	9.0	697.6	697.6	698.6	1.0
I	12.01	195	2,256	5.4	706.6	706.6	707.6	1.0
J	14.81	460	4,412	2.2	732.9	732.9	733.9	1.0
K	15.78	205	1,436	6.8	739.6	739.6	739.6	0.0
L	16.20	155	2,332	5.1	756.8	756.8	756.8	0.0
M	16.64	155	2,178	5.5	761.1	761.1	761.1	0.0
N	17.03	145	2,702	4.4	763.6	763.6	763.7	0.1
O	19.20	230	3,127	4.4	795.8	795.8	796.5	0.7
P	21.43	175	1,895	6.9	833.5	833.5	834.4	0.9
Q	22.01	280[2]	2,698	3.4	838.9	838.9	838.9	0.0
R	22.30	360	1,665	3.4	840.3	840.3	841.0	0.7
S	22.82	315	931	6.1	846.8	846.8	846.8	0.0
T	24.34	365	973	4.6	879.3	879.3	879.3	0.0
U	24.95	270	843	4.4	892.9	892.9	893.3	0.4

[1] Miles above confluence with Big Otter River

[2] This width extends beyond the County Boundary

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA AND INCORPORATED AREAS

FLOODWAY DATA

LITTLE OTTER RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Machine Creek								
A	900[1]	285	1,915	7.5	640.9	634.8[2]	635.2[2]	0.4
B	6,500[1]	185	2,100	6.8	652.1	652.1	652.2	0.1
C	14,900[1]	260	2,805	4.6	667.9	667.9	668.0	0.1
D	23,370[1]	350	2,911	3.2	678.3	678.3	678.4	0.1
E	30,500[1]	245	1,851	5.0	692.4	692.4	692.4	0.0
F	34,200[1]	230	2,240	4.2	703.6	703.6	703.6	0.0
G	37,140[1]	140	953	8.9	707.1	707.1	707.7	0.6
H	43,220[1]	395	2,296	3.3	723.2	723.2	723.2	0.0
Mill Creek								
A	23,300[3]	140	496	4.3	754.3	754.3	754.9	0.6
B	27,500[3]	115	410	3.9	796.7	796.7	797.3	0.6
C	30,650[3]	50	268	3.0	845.7	845.7	845.8	0.1
D	32,640[3]	50	108	2.1	862.6	862.6	863.0	0.4

[1] Feet above confluence with Little Otter River

[2] Elevations computed without consideration for backwater effect of Little Otter River

[3] Feet above confluence with Goose Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA AND INCORPORATED AREAS

FLOODWAY DATA

MACHINE CREEK - MILL CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Nat Branch								
A	280[1]	550	2,194	2.8	920.6	920.6	920.6	0.0
B	3,350[1]	270	1,462	3.8	931.9	931.9	931.9	0.0
C	6,000[1]	110	1,681	3.2	965.8	965.8	965.8	0.0
D	9,880[1]	190	928	5.1	996.8	996.8	996.8	0.0
E	12,580[1]	210	546	6.8	1,075.9	1,075.9	1,075.9	0.0
F	15,780[1]	175	450	8.2	1,154.2	1,154.2	1,154.2	0.0
North Fork Goose Creek								
A	600[2]	325	3,687	2.8	907.9	904.7[3]	904.7[3]	0.0
B	1,220[2]	255	4,191	3.7	912.4	912.4	912.4	0.0
C	2,370[2]	280	4,848	3.2	912.7	912.7	912.7	0.0
D	5,460[2]	400	4,969	3.1	913.4	913.4	913.5	0.1
E	8,820[2]	635	4,012	3.2	914.2	914.2	914.7	0.5
F	11,520[2]	475	2,601	4.9	921.2	921.2	921.2	0.0
G	13,665[2]	485	3,052	3.9	924.4	924.4	924.4	0.0

[1] Feet above confluence with West Fork Beaverdam Creek

[2] Feet above confluence with Goose Creek

[3] Elevations computed without consideration for backwater effect of Goose Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA AND INCORPORATED AREAS

FLOODWAY DATA

NAT BRANCH – NORTH FORK GOOSE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
North Otter Creek								
A	1,720[1]	175	2,366	8.8	690.6	690.6	691.2	0.6
B	5,820[1]	200	2,973	5.2	708.2	708.2	708.2	0.0
C	12,770[1]	255	2,210	7.0	731.9	731.9	731.9	0.0
D	18,170[1]	585	3,358	4.6	754.2	754.2	754.2	0.0
E	21,780[1]	823	1,857	7.1	772.8	772.8	772.8	0.0
F	26,240[1]	492	1,355	8.0	804.6	804.6	804.6	0.0
G	31,620[1]	600	2,481	4.0	852.7	852.7	852.7	0.0
H	35,700[1]	450	2,409	3.7	897.6	897.6	897.6	0.0
I	38,020[1]	875	2,731	3.2	929.9	929.9	929.9	0.0
J	40,900[1]	210	846	10.4	961.0	961.0	961.0	0.0
Roanoke River								
A	310.58[2]	550/280[3]	---[4]	---[4]	617.3	617.3	617.3	0.0
B	312.93[2]	1,000/410[3]	---[4]	---[4]	618.6	618.6	618.6	0.0
C	314.56[2]	250/100[3]	---[4]	---[4]	619.4	619.4	619.4	0.0
D	350.96[2]	253/128[3]	5,153	8.3	803.9	803.9	804.7	0.8
E	352.35[2]	344/181[3]	5,461	7.9	808.2	808.2	809.1	0.9

[1] Feet above confluence with Big Otter River
[2] Miles above confluence with Albemarle Sound
[3] Width/width within County Boundary
[4] Cross sections in Leesville Lake

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA AND INCORPORATED AREAS

FLOODWAY DATA

NORTH OTTER CREEK – ROANOKE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Sandy Creek								
A	2,800[1]	125	411	6.8	880.2	880.2	880.2	0.0
B	4,530[1]	160	598	4.7	894.9	894.9	895.2	0.3
C	8,230[1]	105	529	3.2	926.9	926.9	926.9	0.0
D	10,950[1]	115	503	2.8	957.1	957.1	957.1	0.0
South Fork Goose Creek								
A	2,500[2]	315	1,729	4.8	907.6	902.2[3]	902.2[3]	0.0
B	7,750[2]	230	2,187	3.8	931.9	931.9	931.9	0.0
C	11,550[2]	390	2,614	2.6	949.2	949.2	949.2	0.0
D	13,830[2]	175	1,747	2.9	969.9	969.9	969.9	0.0
E	15,800[2]	140	959	4.8	987.1	987.1	987.1	0.0
F	23,850[2]	90	430	10.7	1,162.7	1,162.7	1,162.7	0.0
G	26,500[2]	70	467	3.6	1,224.0	1,224.0	1,224.1	0.1

[1] Feet above confluence with Falling Creek
[2] Feet above confluence with Goose Creek
[3] Elevations computed without consideration for backwater effect of Goose Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA AND INCORPORATED AREAS

FLOODWAY DATA

SANDY CREEK – SOUTH FORK GOOSE CREEK

FLOODING SOURCE		FLOODWAY			BASE 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
Tributary No.1 To Little Otter River								
A	3,100	190	964	3.1	850.2	850.2	850.2	0.0
B	6,300	276	915	2.0	862.2	862.2	863.2	1.0
C	7,550	327	7,191	0.2	891.6	891.6	892.6	1.0
D	8,250	238	3,963	0.3	891.6	891.6	892.6	1.0
E	8,776	127	167	6.1	896.3	896.3	896.4	0.1
F	9,700	43	475	3.7	897.1	897.1	897.1	0.0
G	9.900	53	405	3.9	897.2	897.2	897.3	0.1
H	10,620	80	345	3.9	899.6	899.6	900.4	0.8
I	11,530	70	206	5.2	907.2	907.2	907.3	0.1
J	11,840	68	186	5.7	911.0	911.0	911.0	0.0
K	12,390	60	230	4.6	916.5	916.5	917.4	0.9
A	3,100	190	964	3.1	850.2	850.2	850.2	0.0

[1]Feet above confluence with Little Otter River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA AND INCORPORATED AREAS

FLOODWAY DATA

TRIBUTARY NO.1 TO LITTLE OTTER RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Wells Creek								
A	1,200[1]	370	838	6.0	727.2	727.2	727.2	0.0
B	6,060[1]	125	739	3.9	752.5	752.5	752.5	0.0
West Branch								
A	9,640[2]	50	1,138	1.2	911.9	911.9	911.9	0.0
B	9,940[2]	50	1,117	1.3	911.9	911.9	911.9	0.0
West Fork Beaverdam Creek								
A	1,540[3]	150	1,581	5.1	845.7	845.7	846.1	0.4
B	5,660[3]	250	1,885	4.1	849.9	849.9	850.0	0.1
C	8,730[3]	210	807	9.7	857.2	857.2	857.2	0.0
D	12,880[3]	110	832	7.7	896.8	896.8	896.8	0.0

[1]Feet above confluence with Machine Creek
[2]Feet above confluence with Little Otter River
[3]Feet above confluence with Beaverdam Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA AND INCORPORATED AREAS

FLOODWAY DATA

WELLS CREEK – WEST BRANCH WEST FORK BEAVERDAM CREEK

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. The zones are as follows:

Zone A

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

Zone AE

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

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2 percent annual chance floodplain, areas within the 0.2 percent annual chance floodplain, and to 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 base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

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

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0. In the 1 percent annual chance floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations 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 percent and 0.2 percent annual chance floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

The current FIRM presents flooding information for the entire geographic area of Bedford County. Previously, separate Flood Hazard Boundary Maps and/or

FIRMs were prepared for each identified flood-prone incorporated community and the unincorporated areas of the county. This countywide FIRM also includes flood hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community, up to and including this countywide FIS, are presented in Table 6, "Community Map History."

7.0 OTHER STUDIES

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

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting Federal Insurance and Mitigation Division, Federal Emergency Management Agency, One Independence Mall, Sixth Floor, 615 Chestnut Street, Philadelphia, Pennsylvania 19106-4404.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Bedford County (Unincorporated Areas)	April 25, 1975	None	September 29, 1978	September 29, 2010
Bedford, City of (Independent City)	June 28, 1974	May 14, 1976	June 1, 1978	April 2, 1992 September 29, 2010

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

9.0 BIBLIOGRAPHY AND REFERENCES

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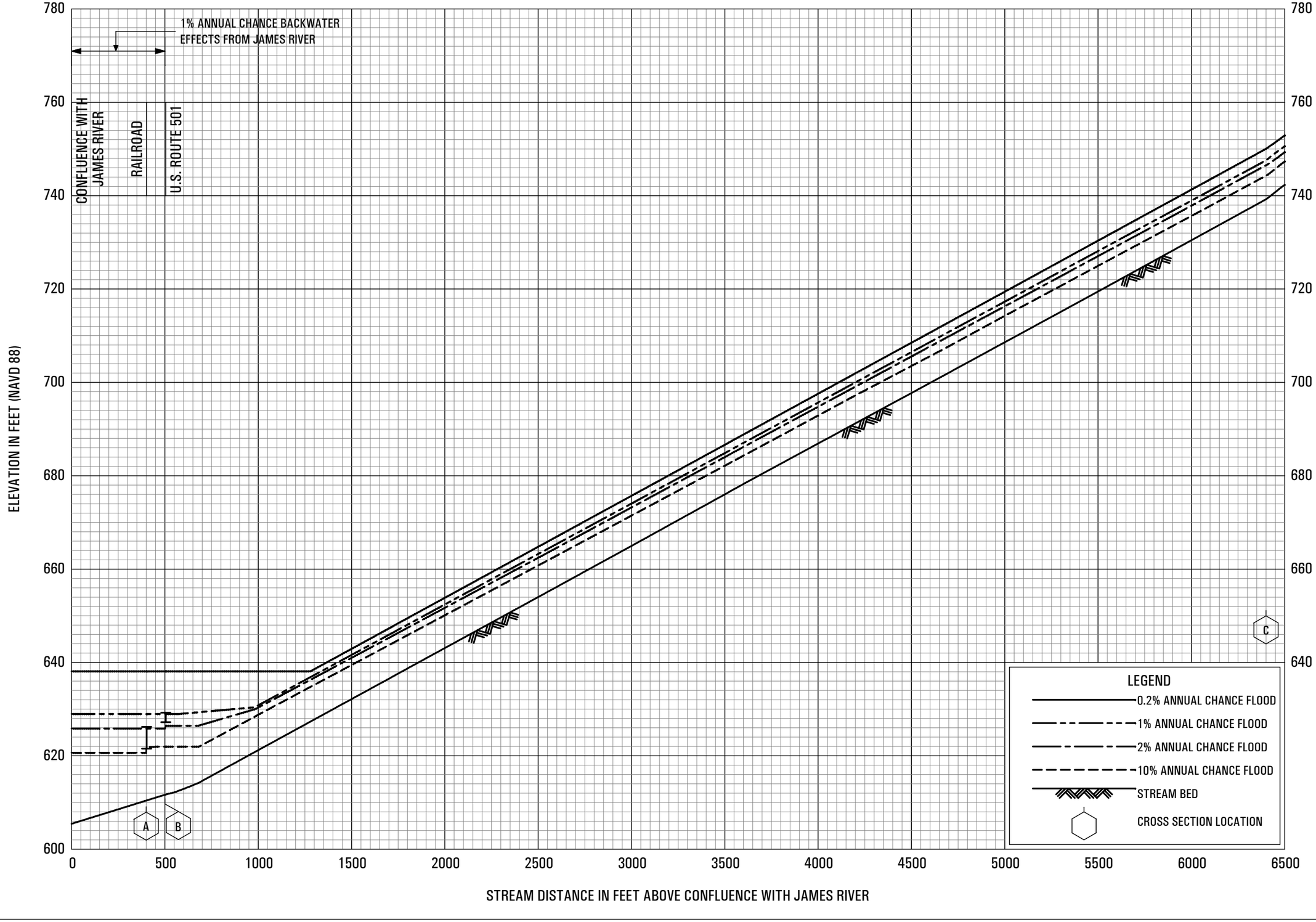

FLOOD PROFILES

BATTERY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEFORD COUNTY, VA

AND INCORPORATED AREAS

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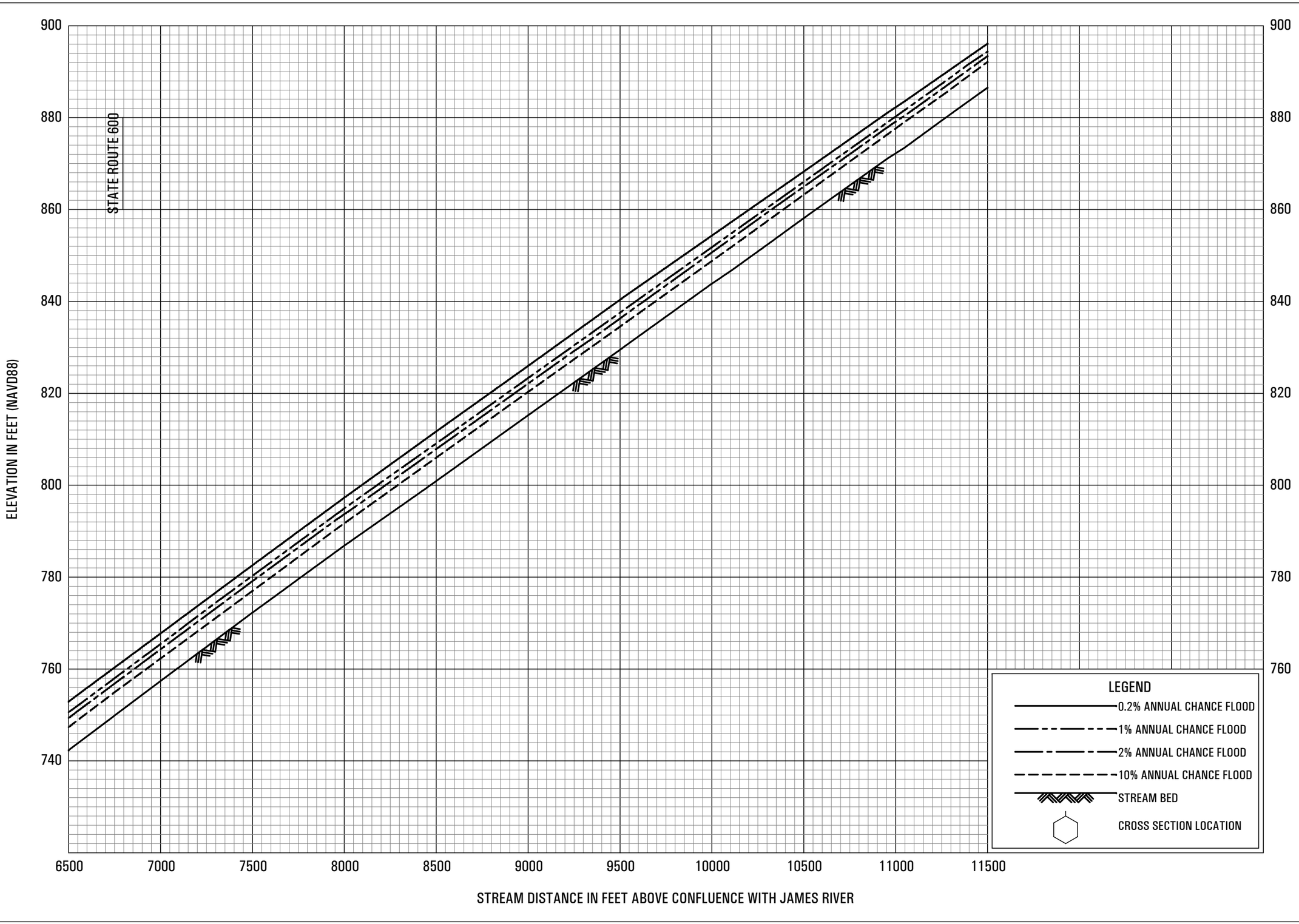

FLOOD PROFILES

BATTERY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEFORD COUNTY, VA

AND INCORPORATED AREAS

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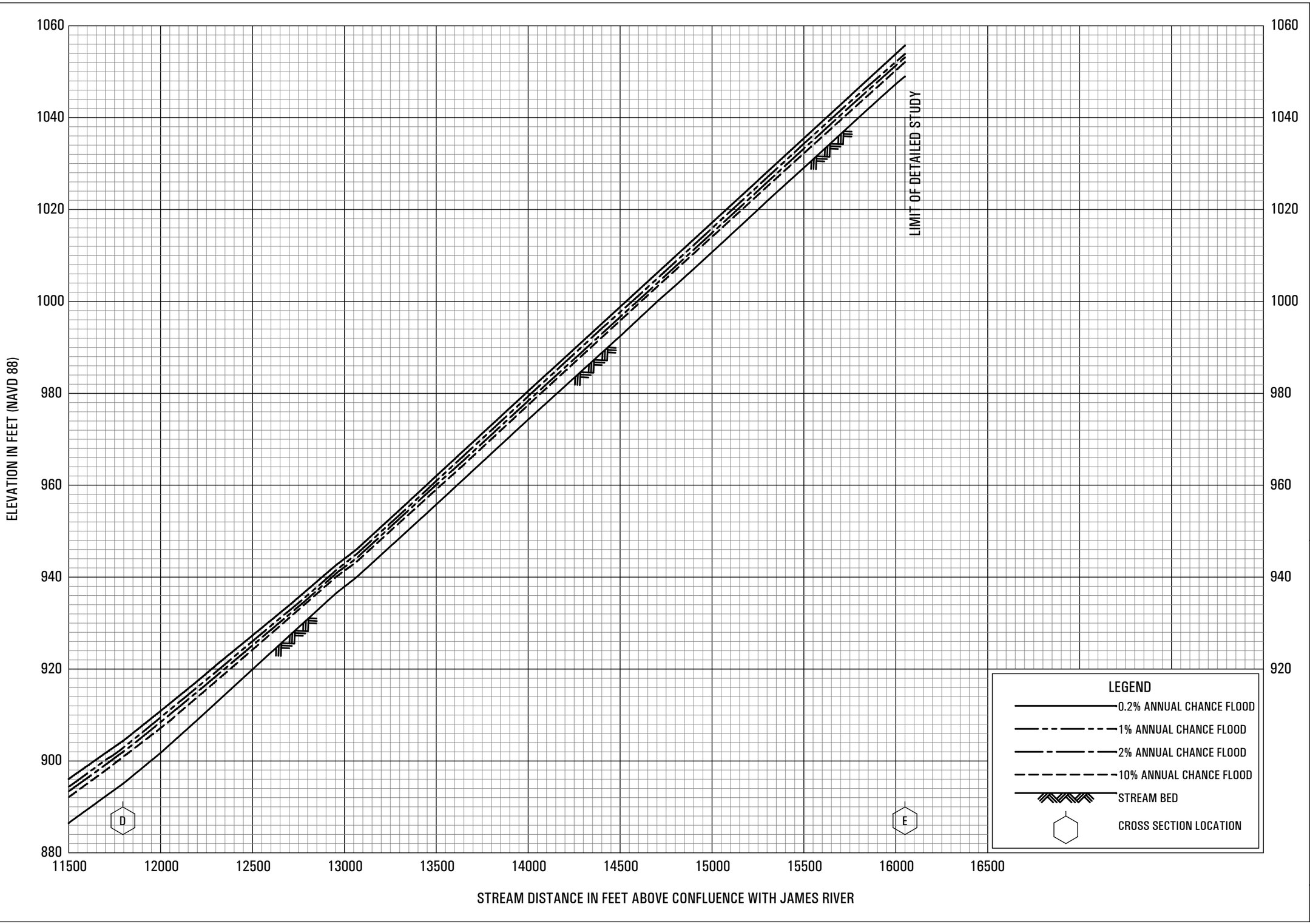

FLOOD PROFILES

BATTERY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEFORD COUNTY, VA

AND INCORPORATED AREAS

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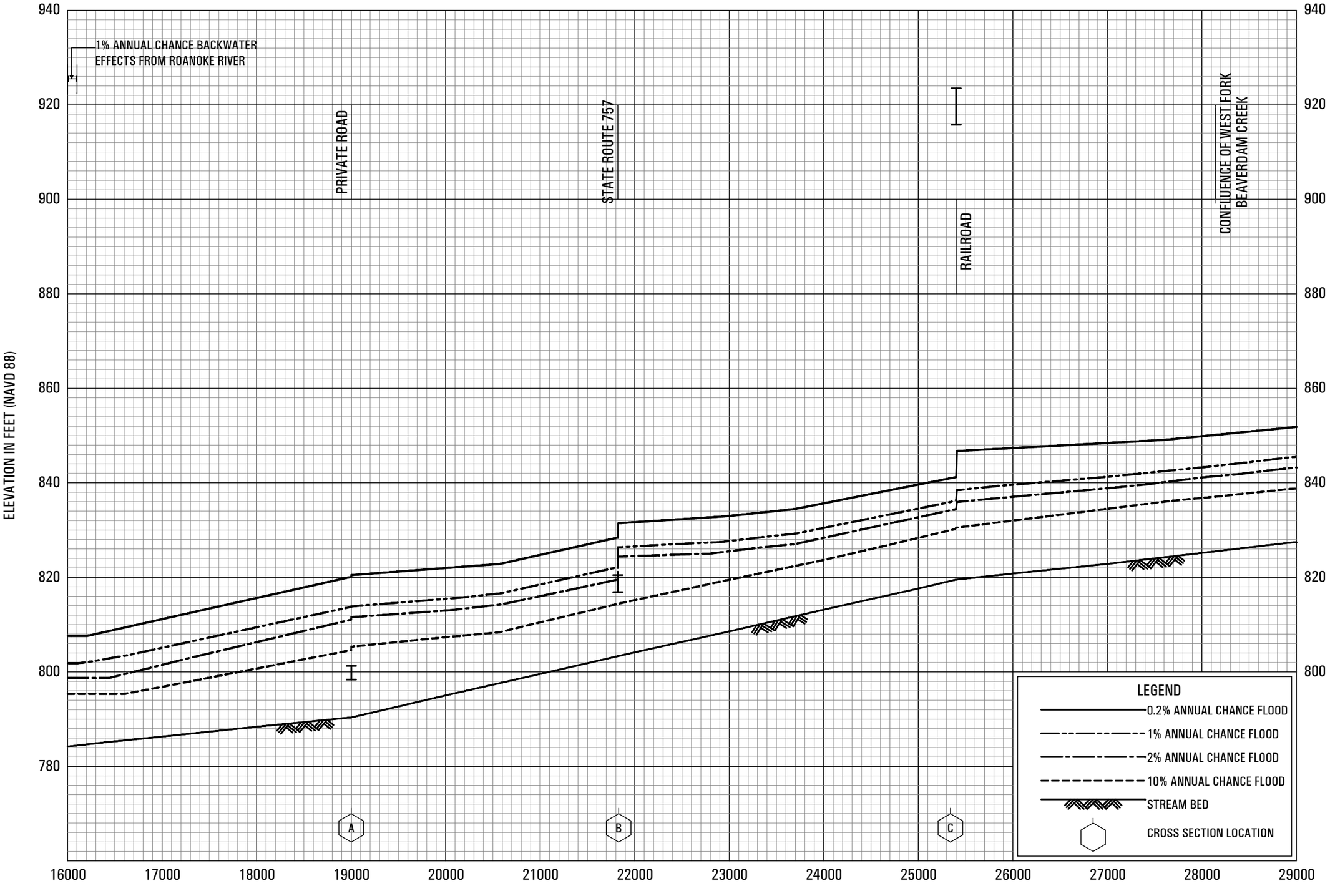

FLOOD PROFILES

BEAVERDAM CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

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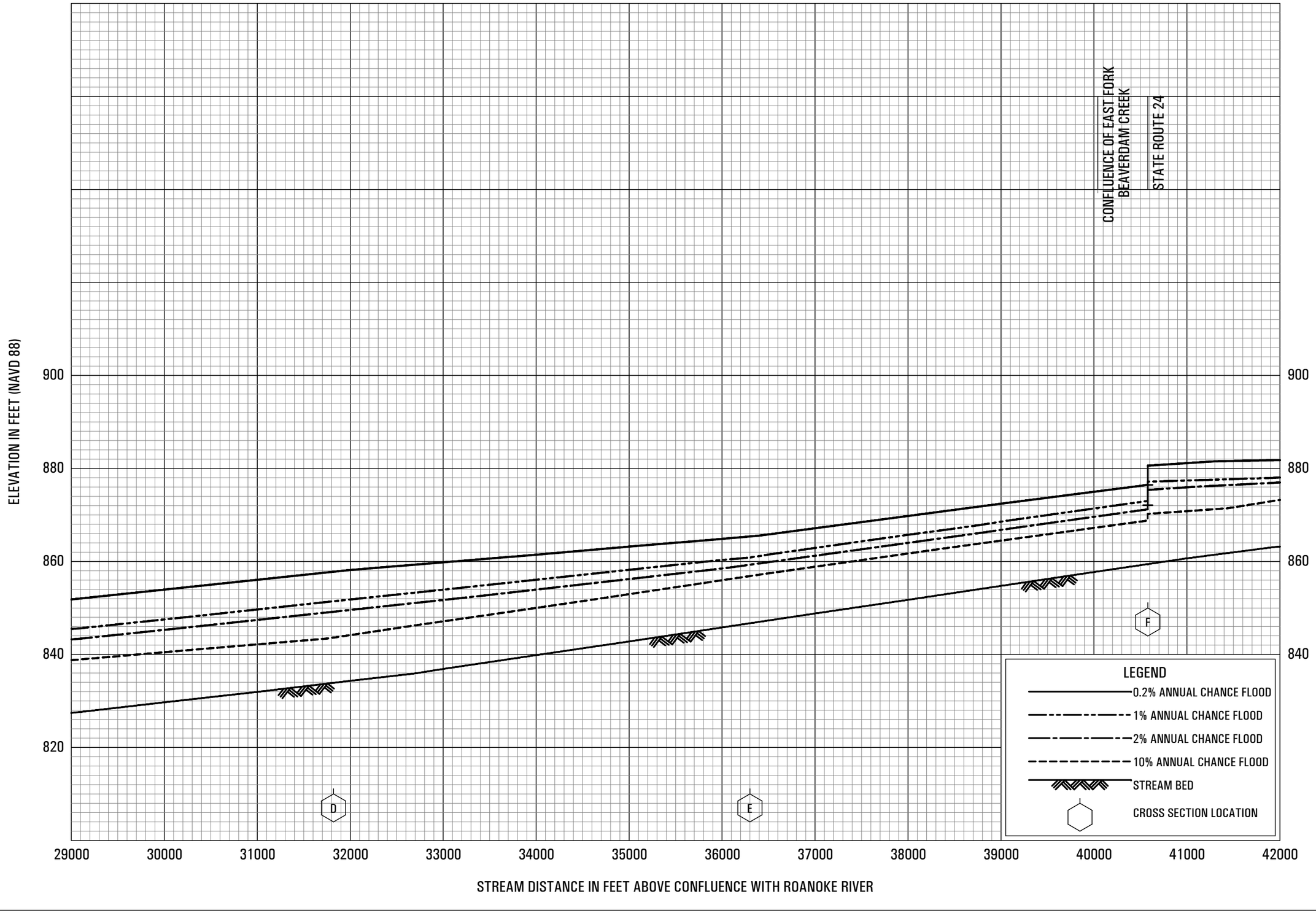

FLOOD PROFILES

BEAVERDAM CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

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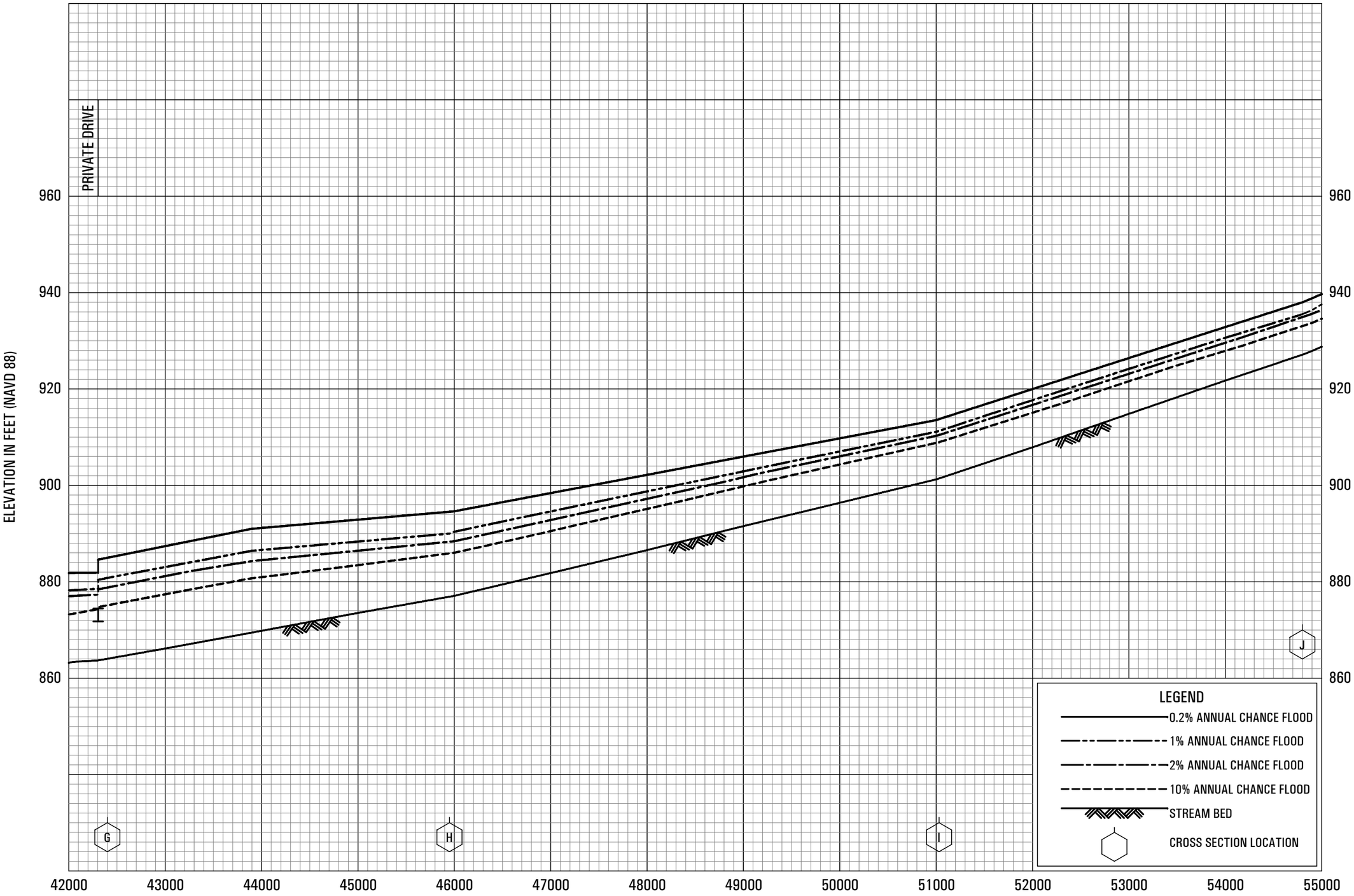

FLOOD PROFILES

BEAVERDAM CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

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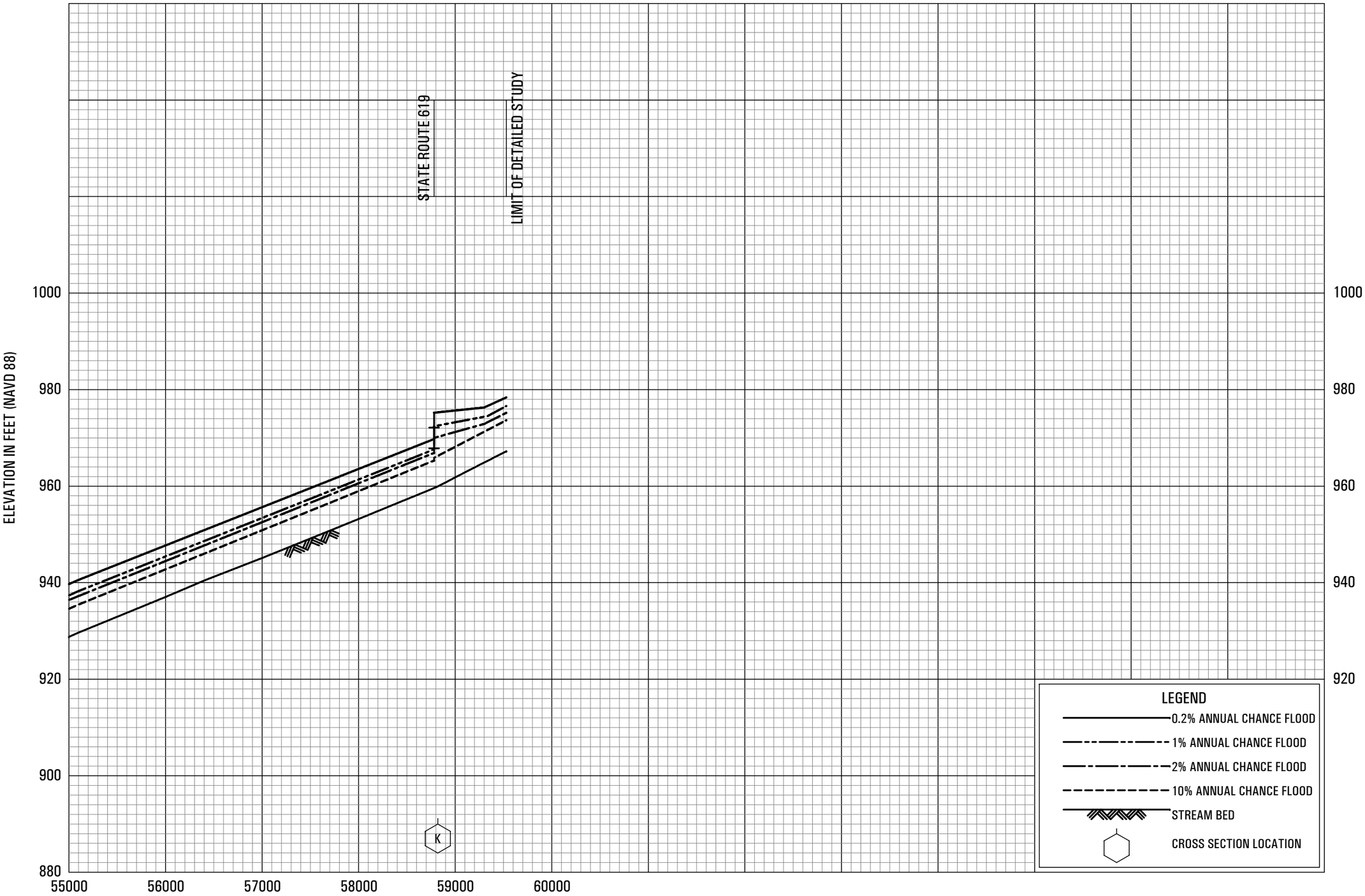

FLOOD PROFILES

BEAVERDAM CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

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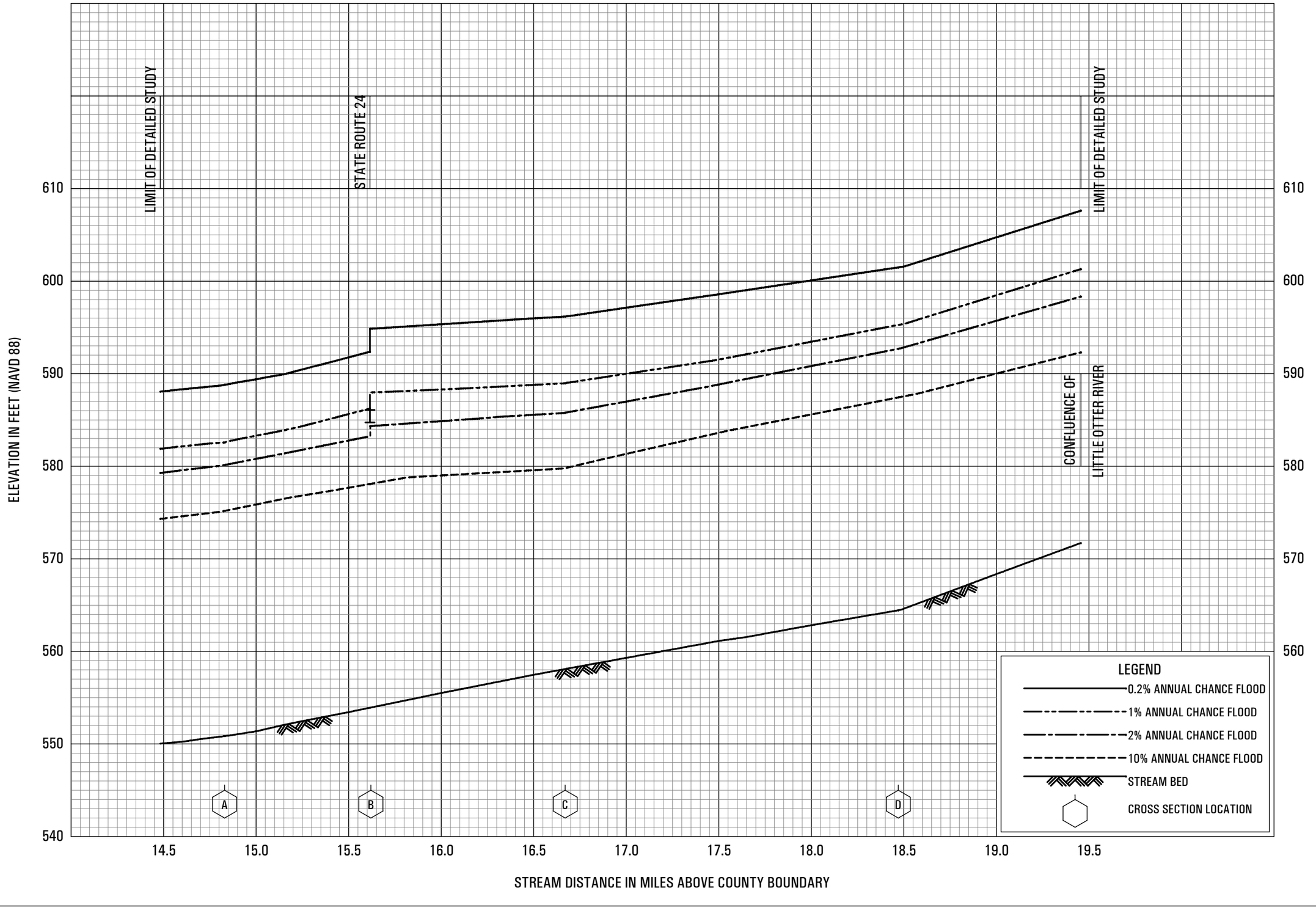

FLOOD PROFILES

BIG OTTER RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

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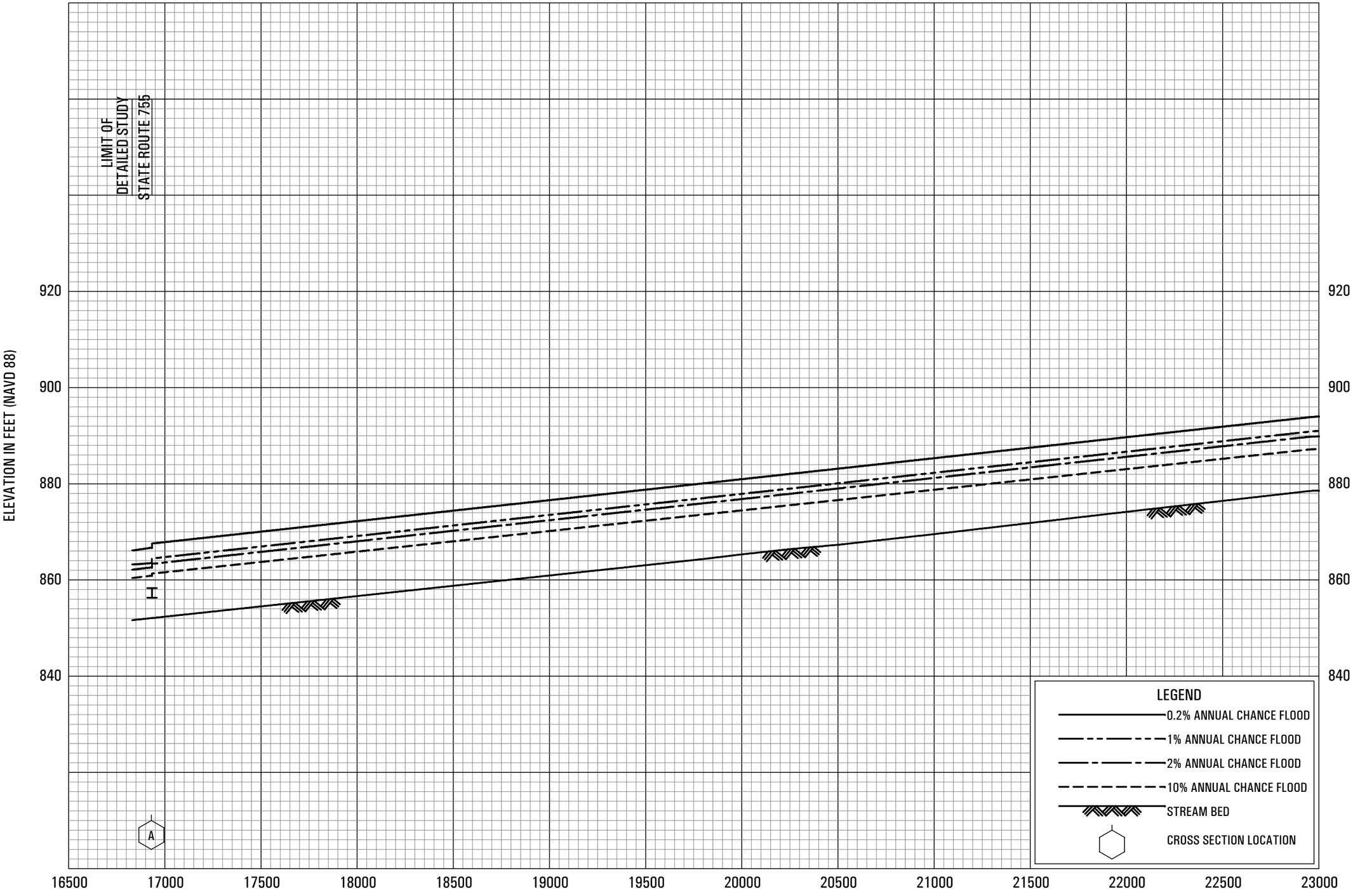

FLOOD PROFILES

BORE AUGER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

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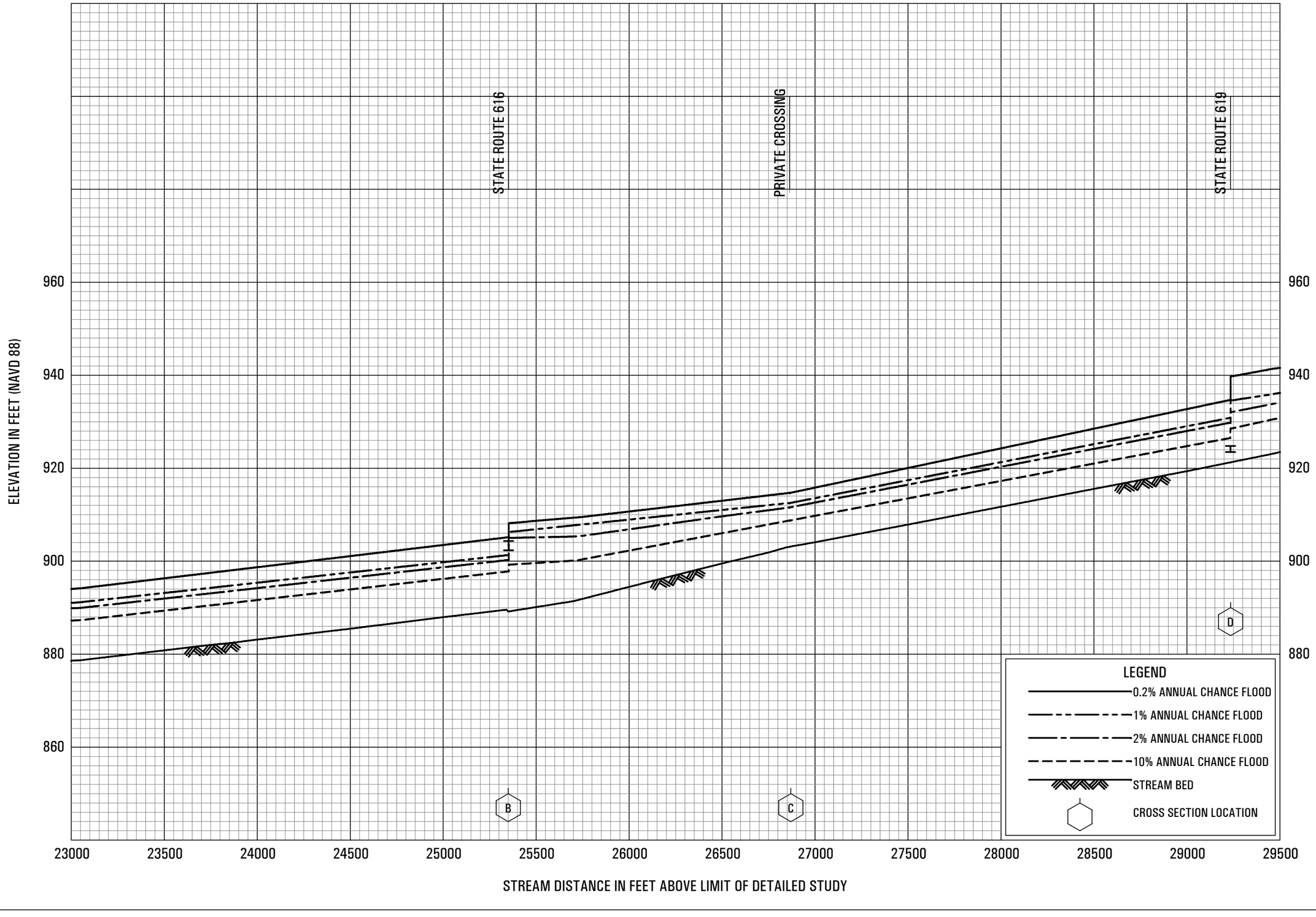

FLOOD PROFILES

BORE AUGER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

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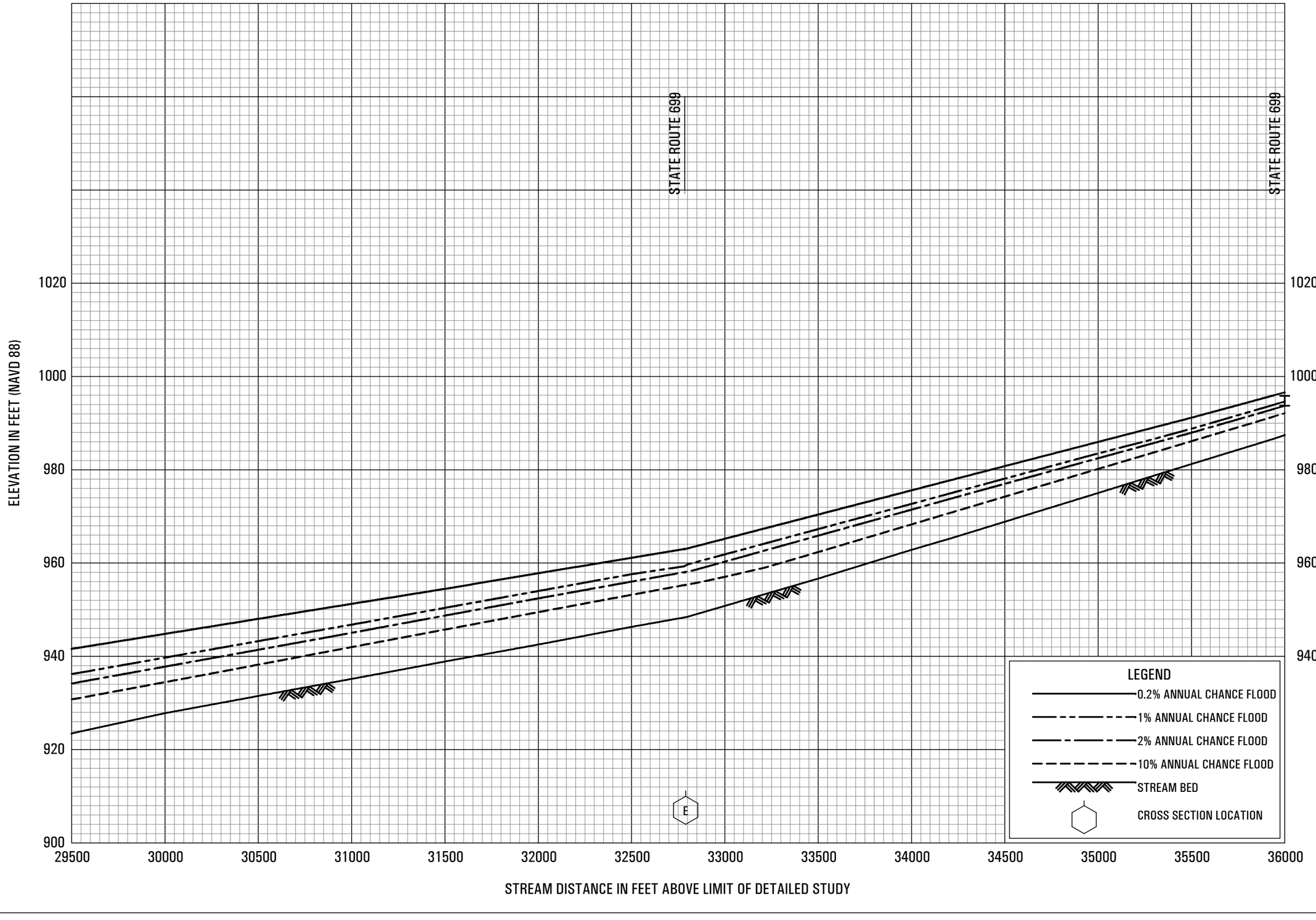


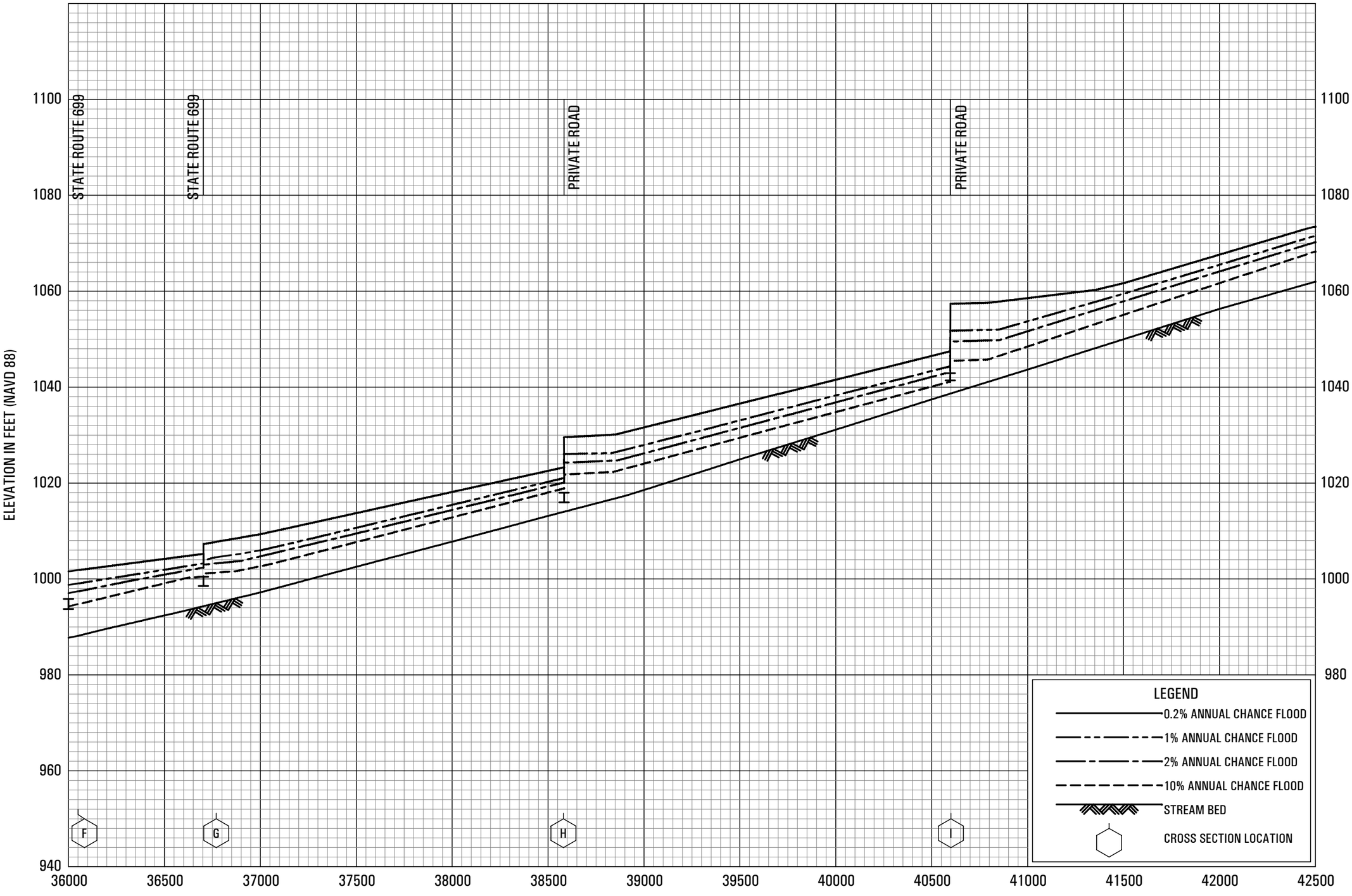
FLOOD PROFILES

BORE AUGER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



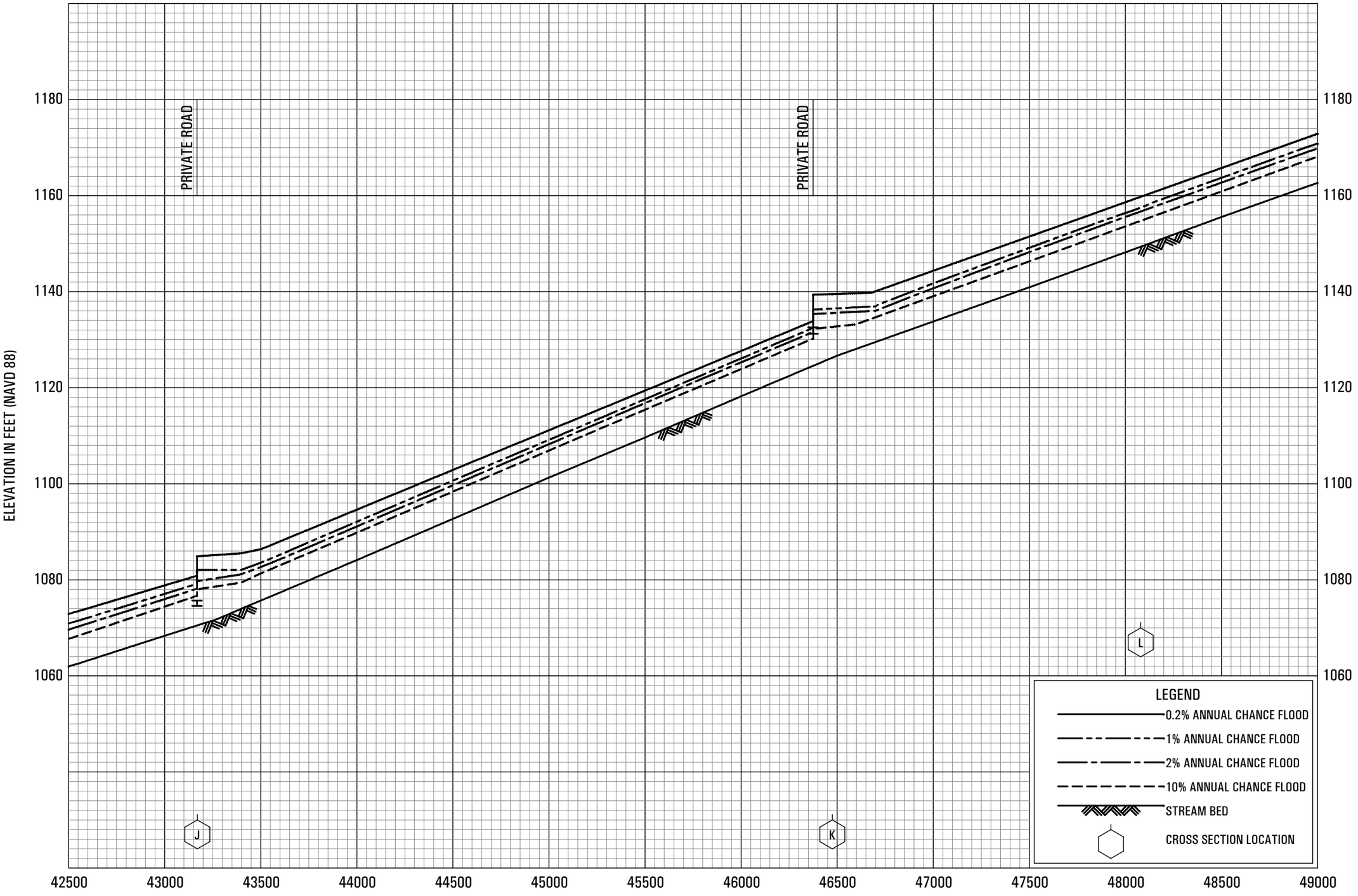
FLOOD PROFILES

BORE AUGER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



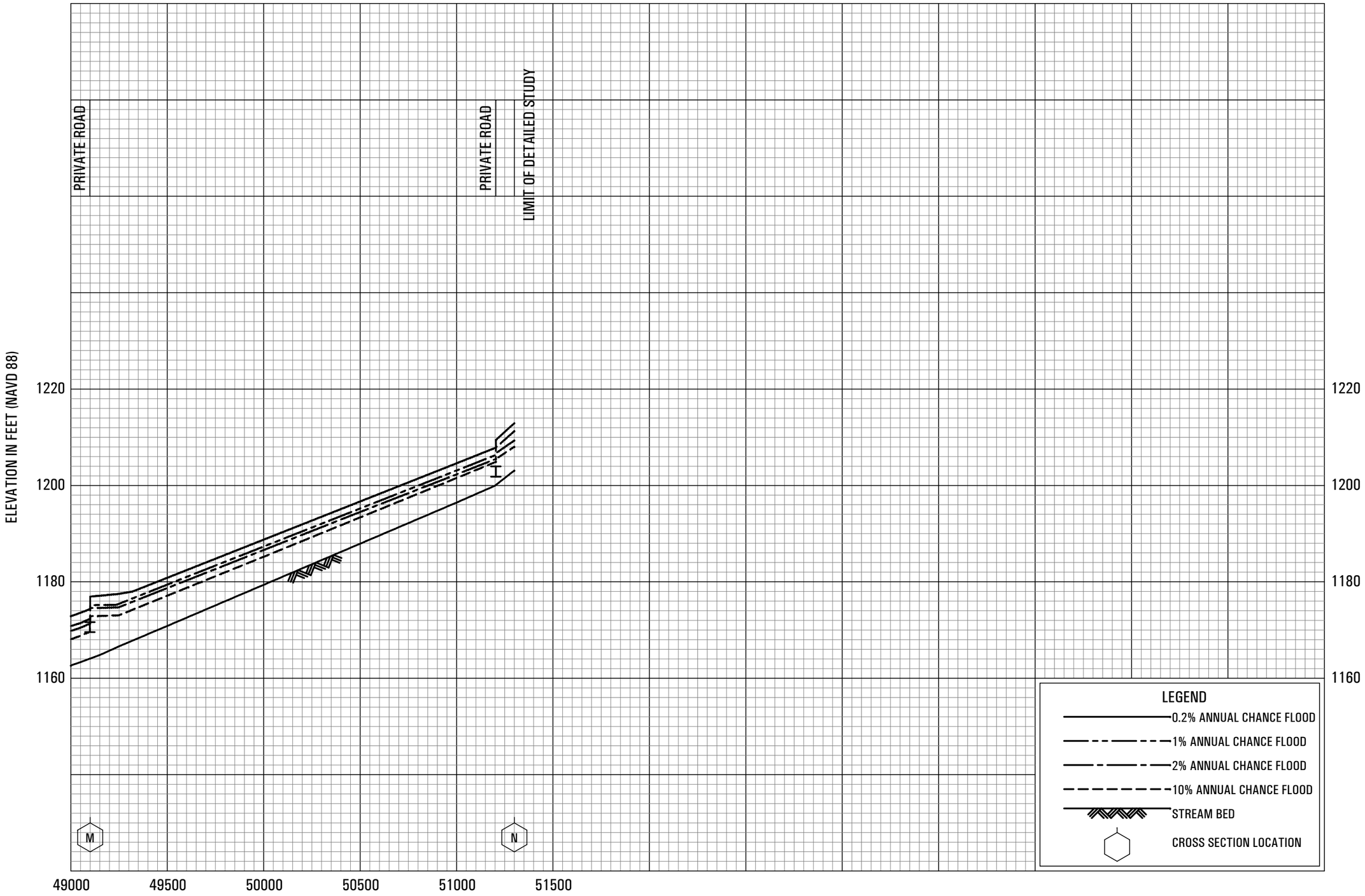
FLOOD PROFILES

BORE AUGER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



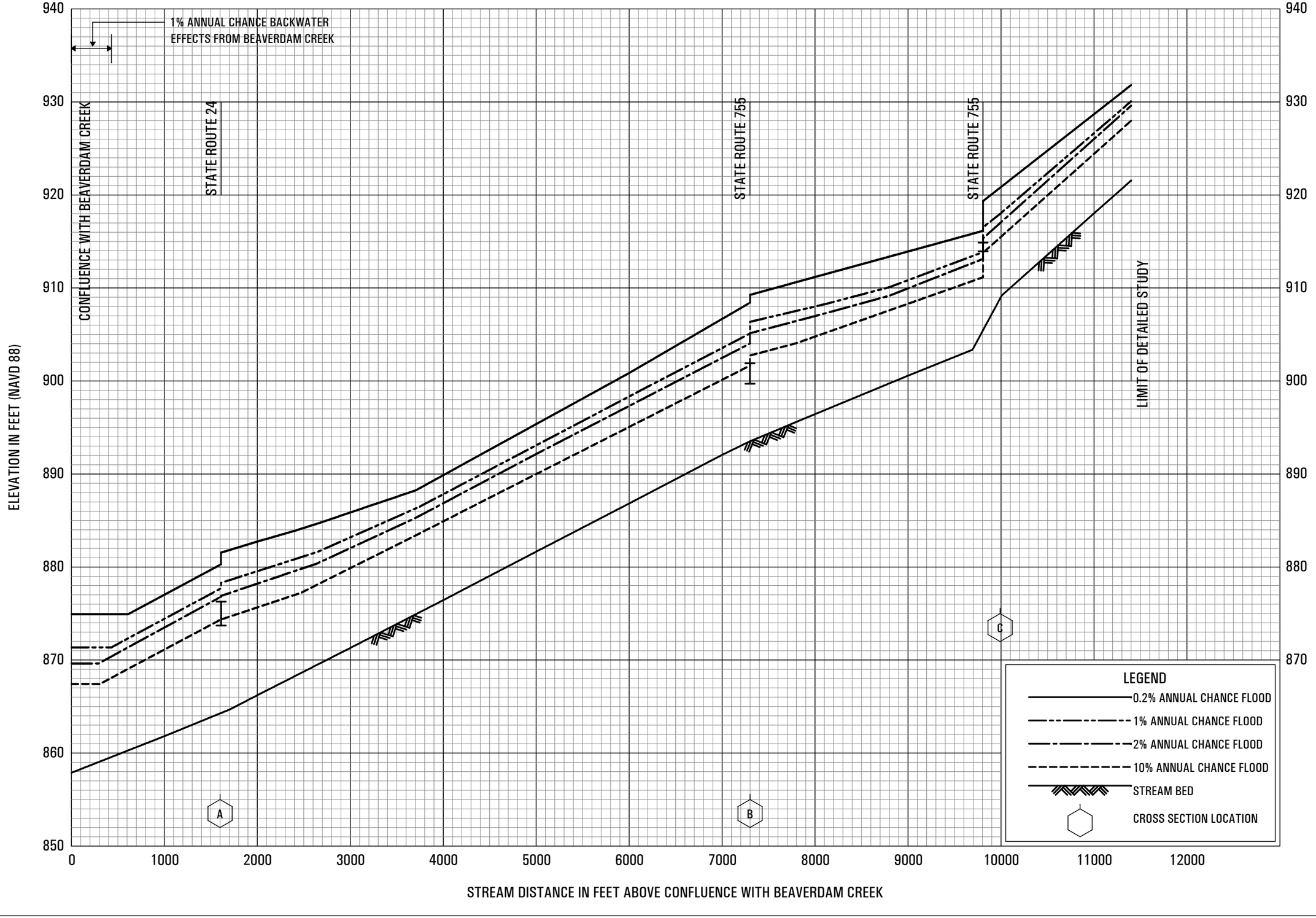
FLOOD PROFILES

BORE AUGER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



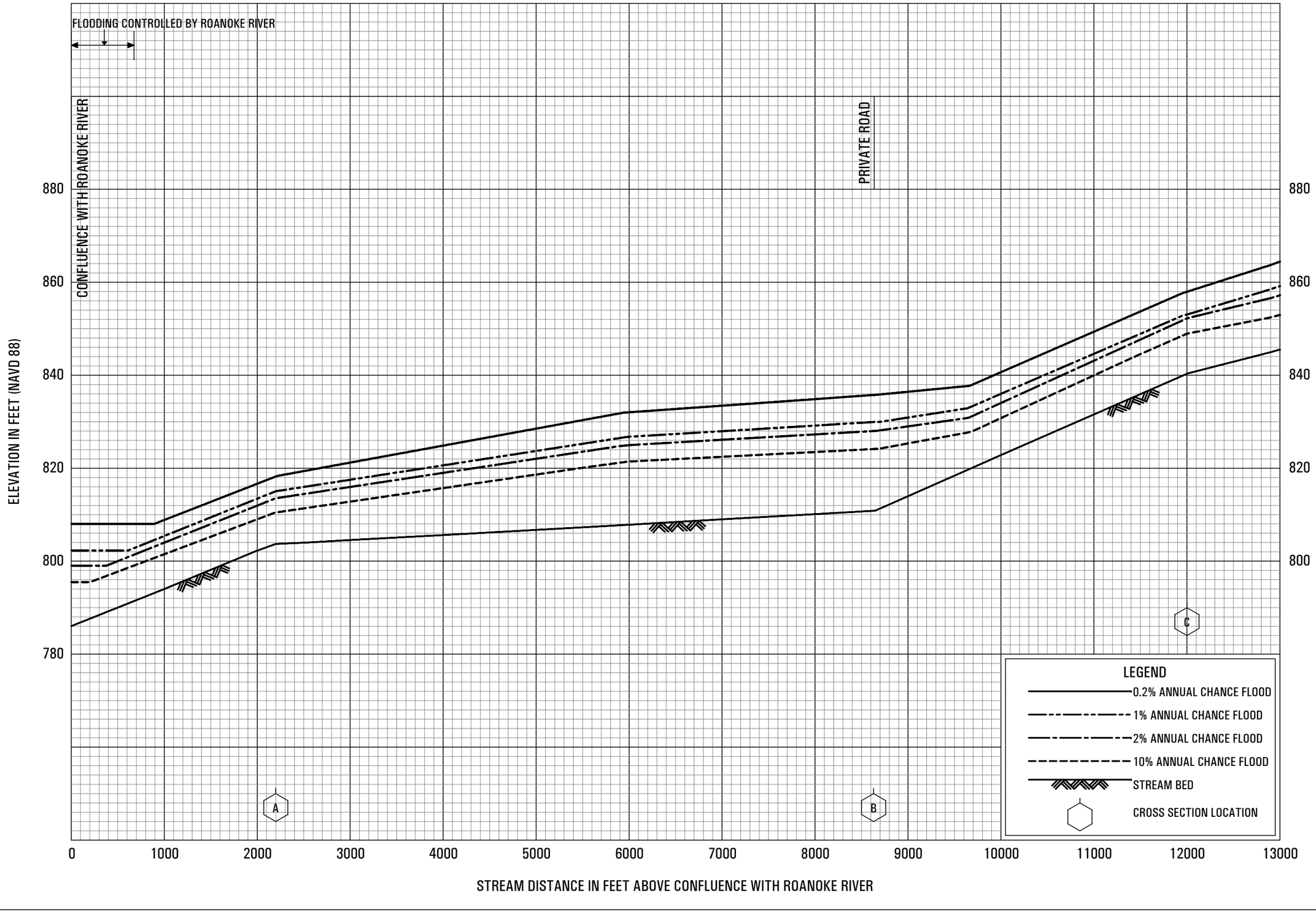
FLOOD PROFILES

EAST FORK BEAVERDAM CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



FLOOD PROFILES

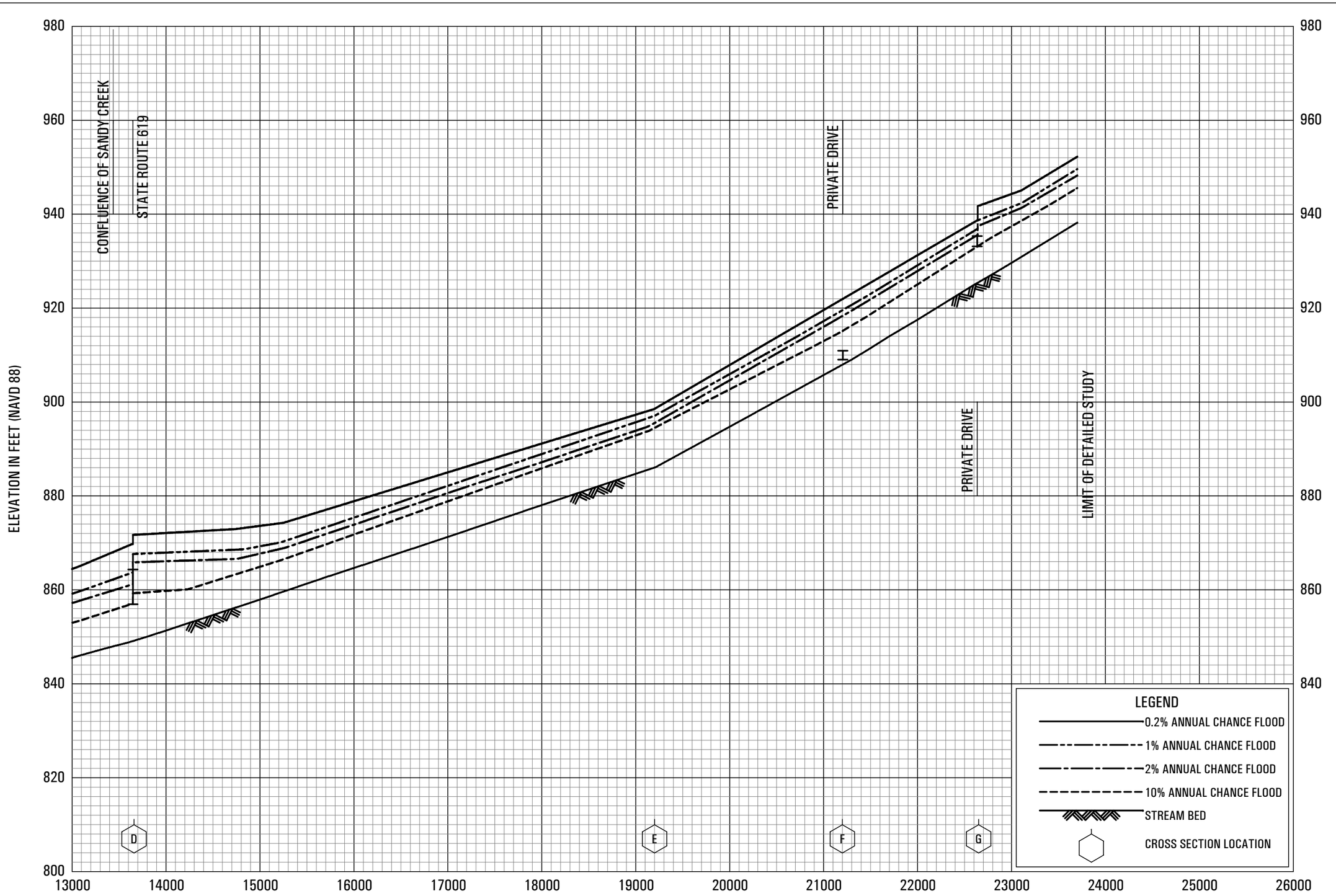
FALLING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

16P



FLOOD PROFILES

FALLING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

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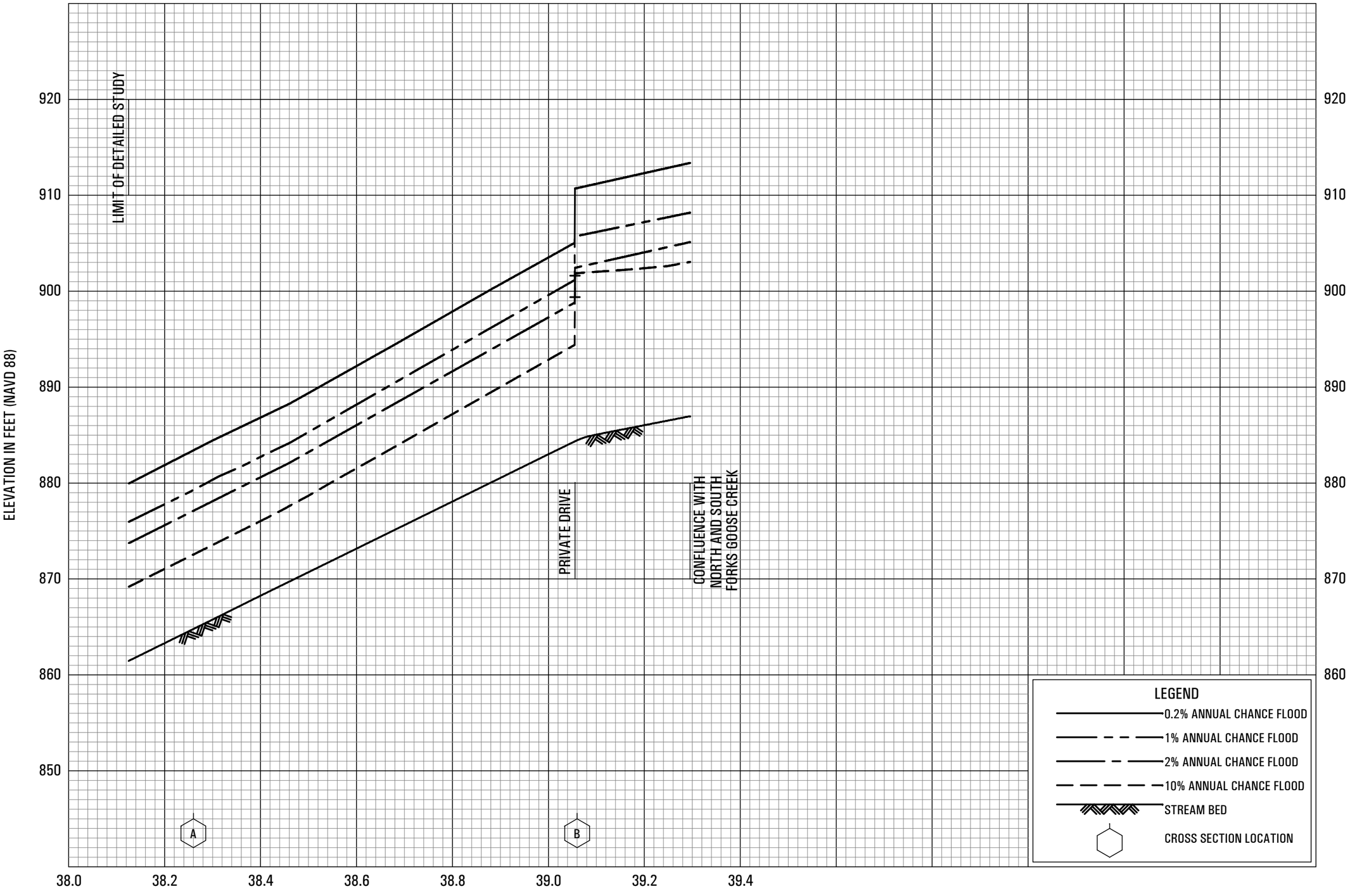


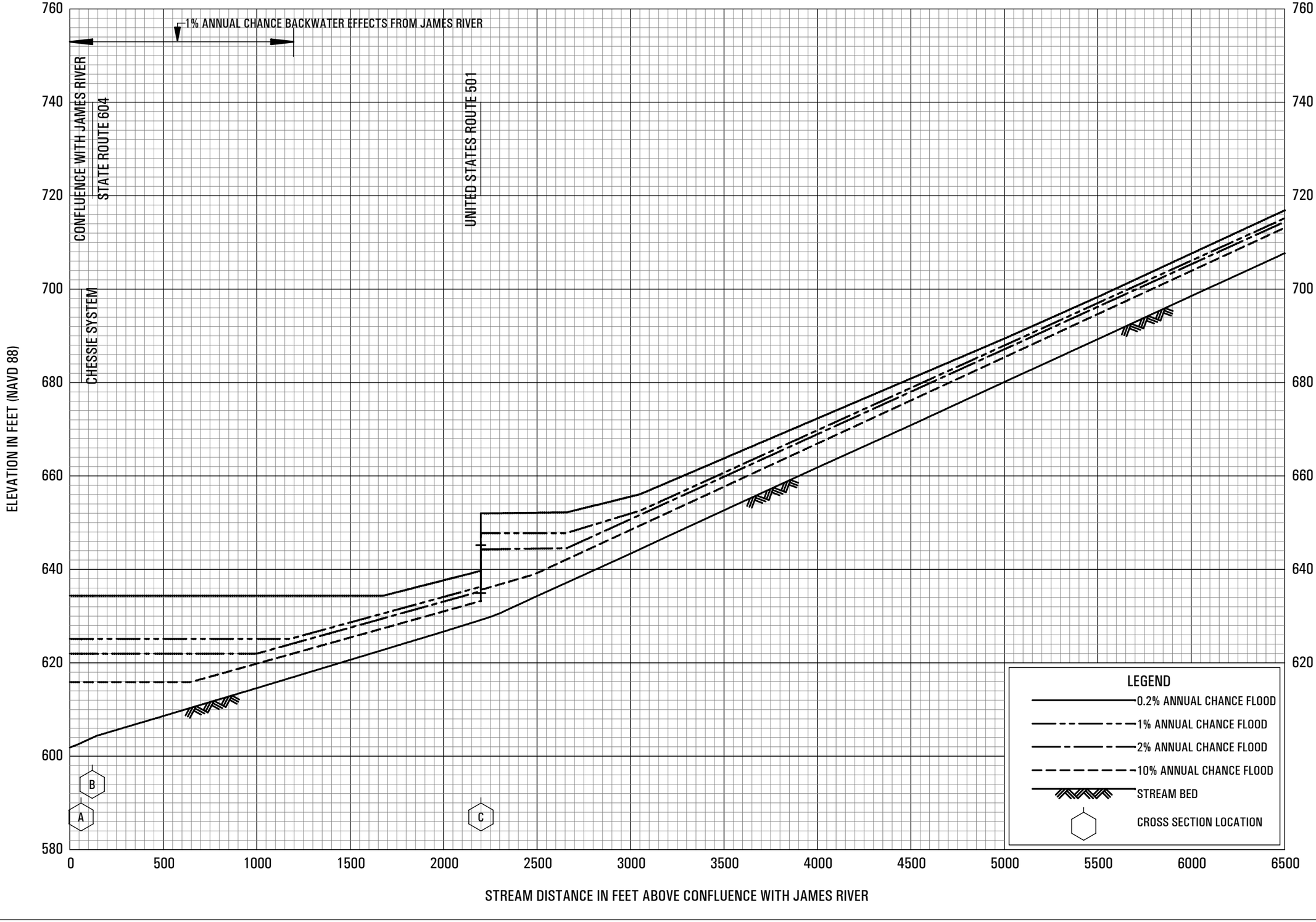
FLOOD PROFILES

GOOSE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



FLOOD PROFILES

HUNTING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

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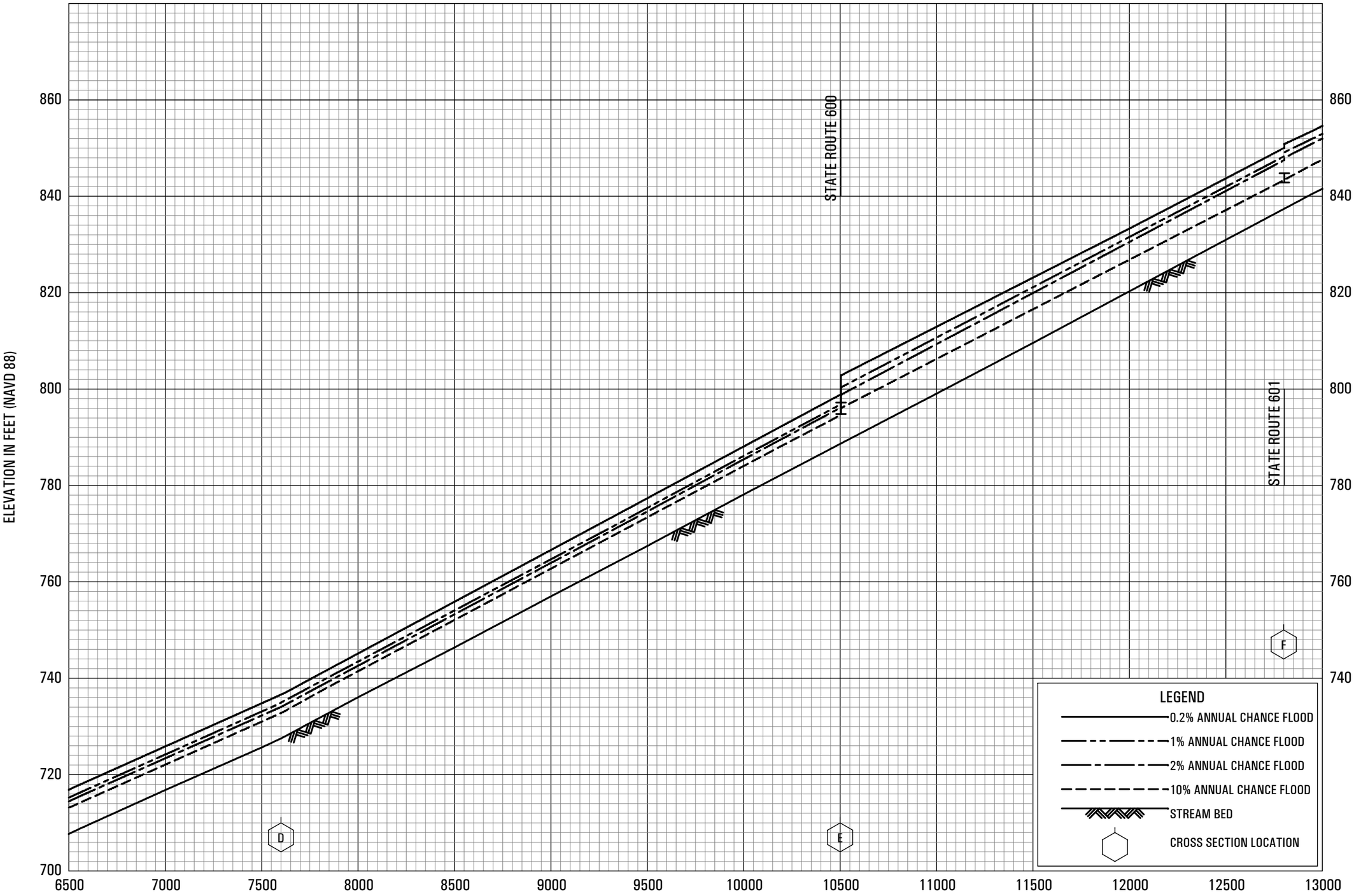


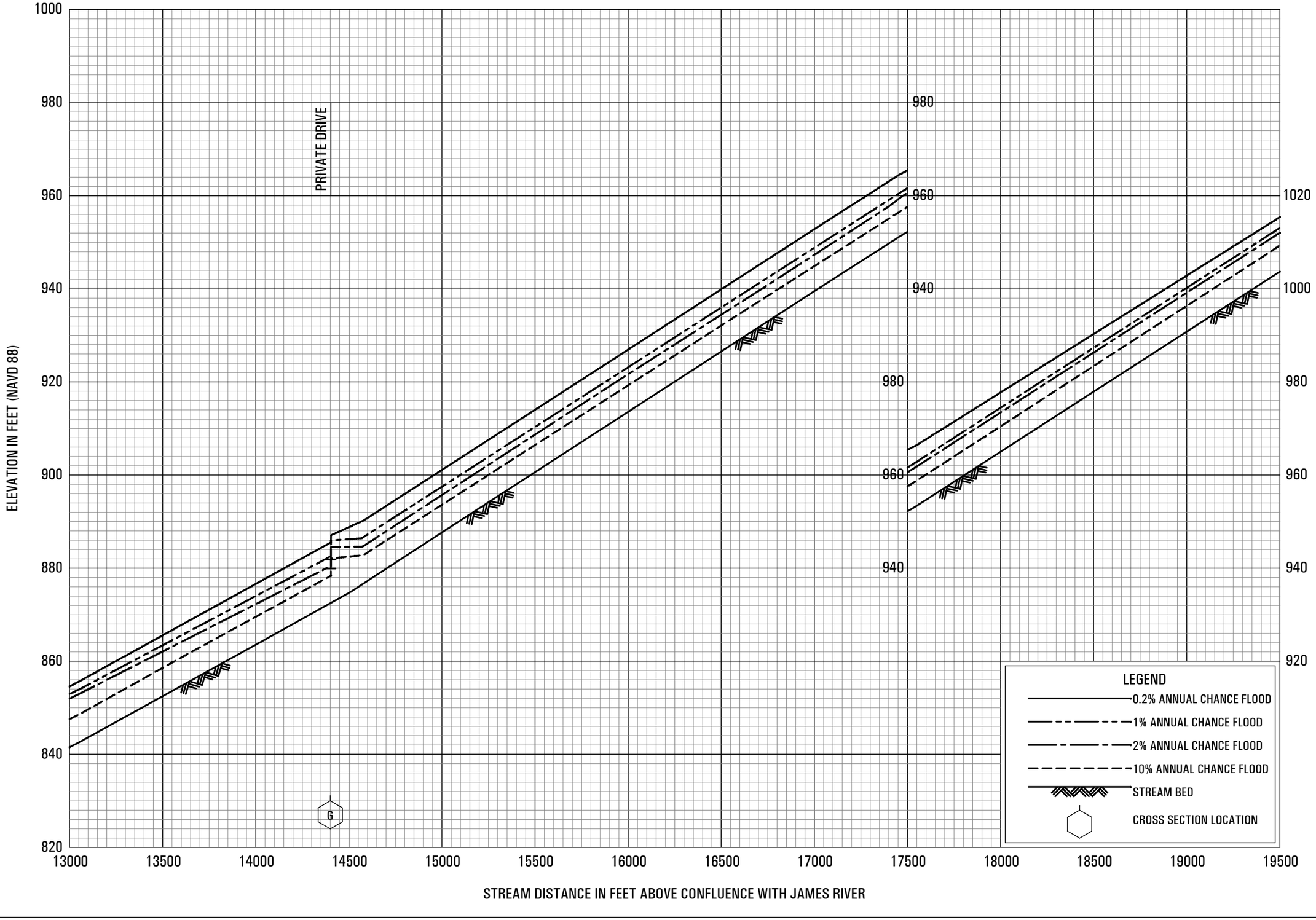
FLOOD PROFILES

HUNTING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



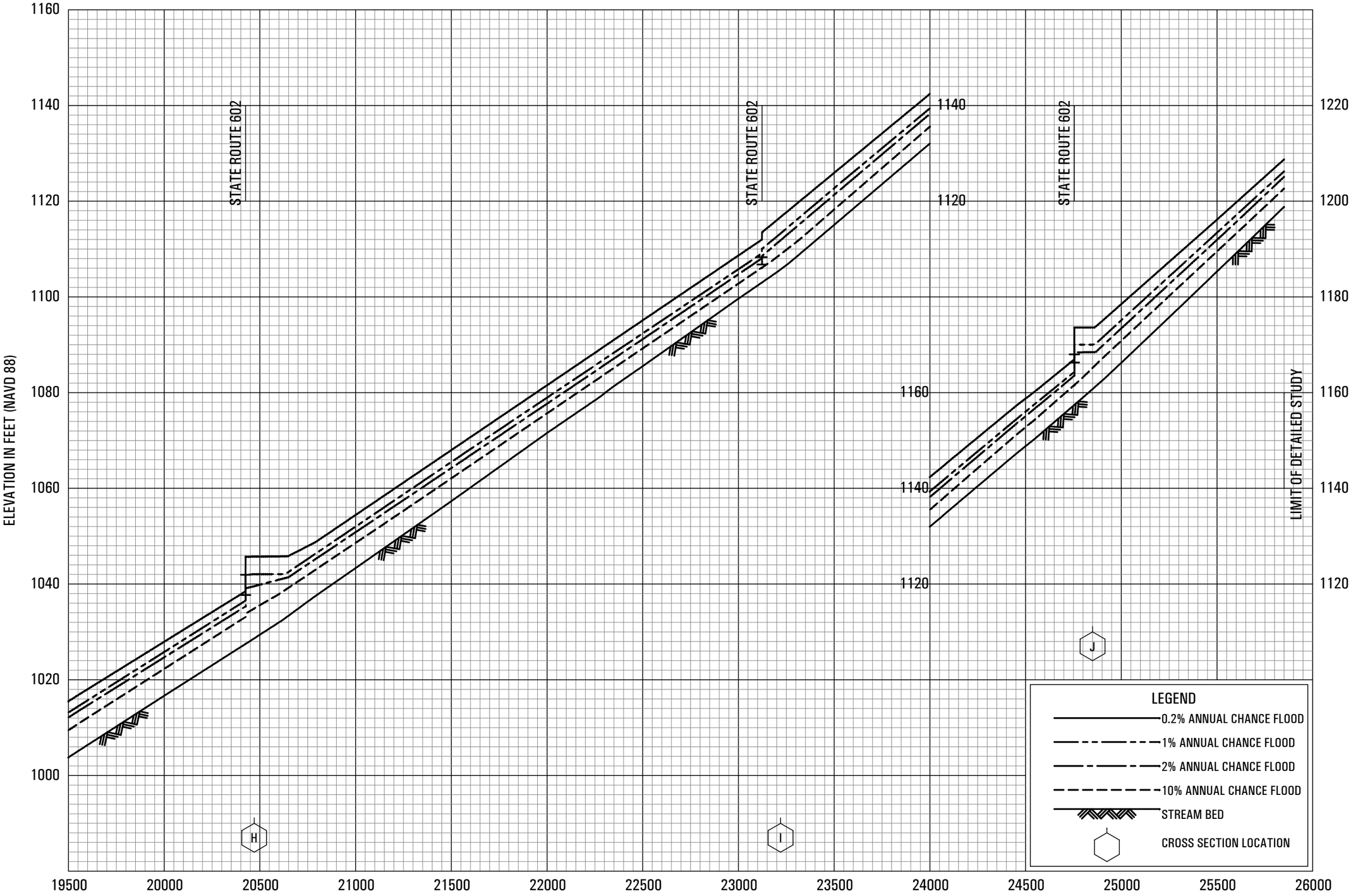
FLOOD PROFILES

HUNTING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



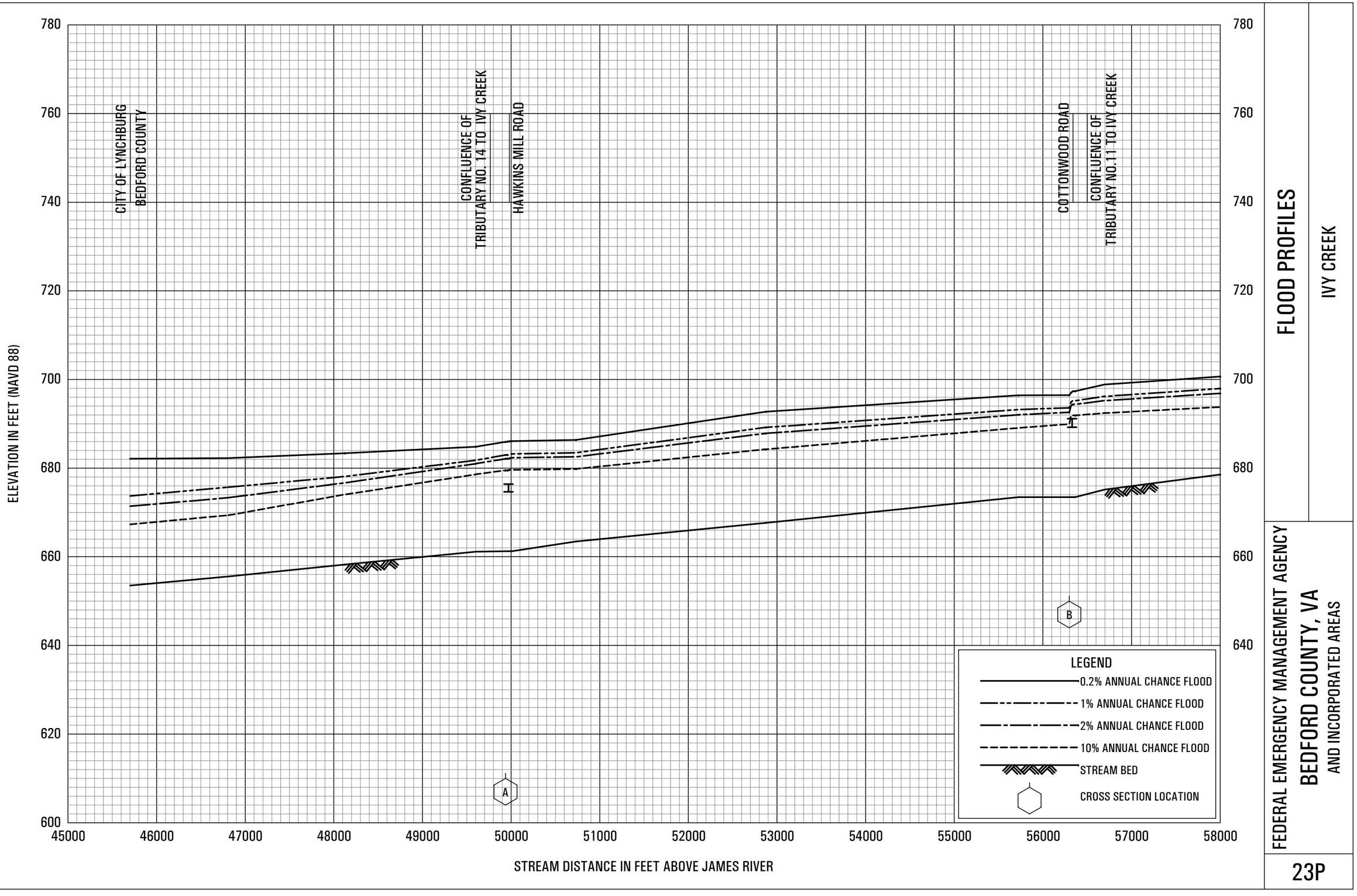
FLOOD PROFILES

HUNTING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



FLOOD PROFILES

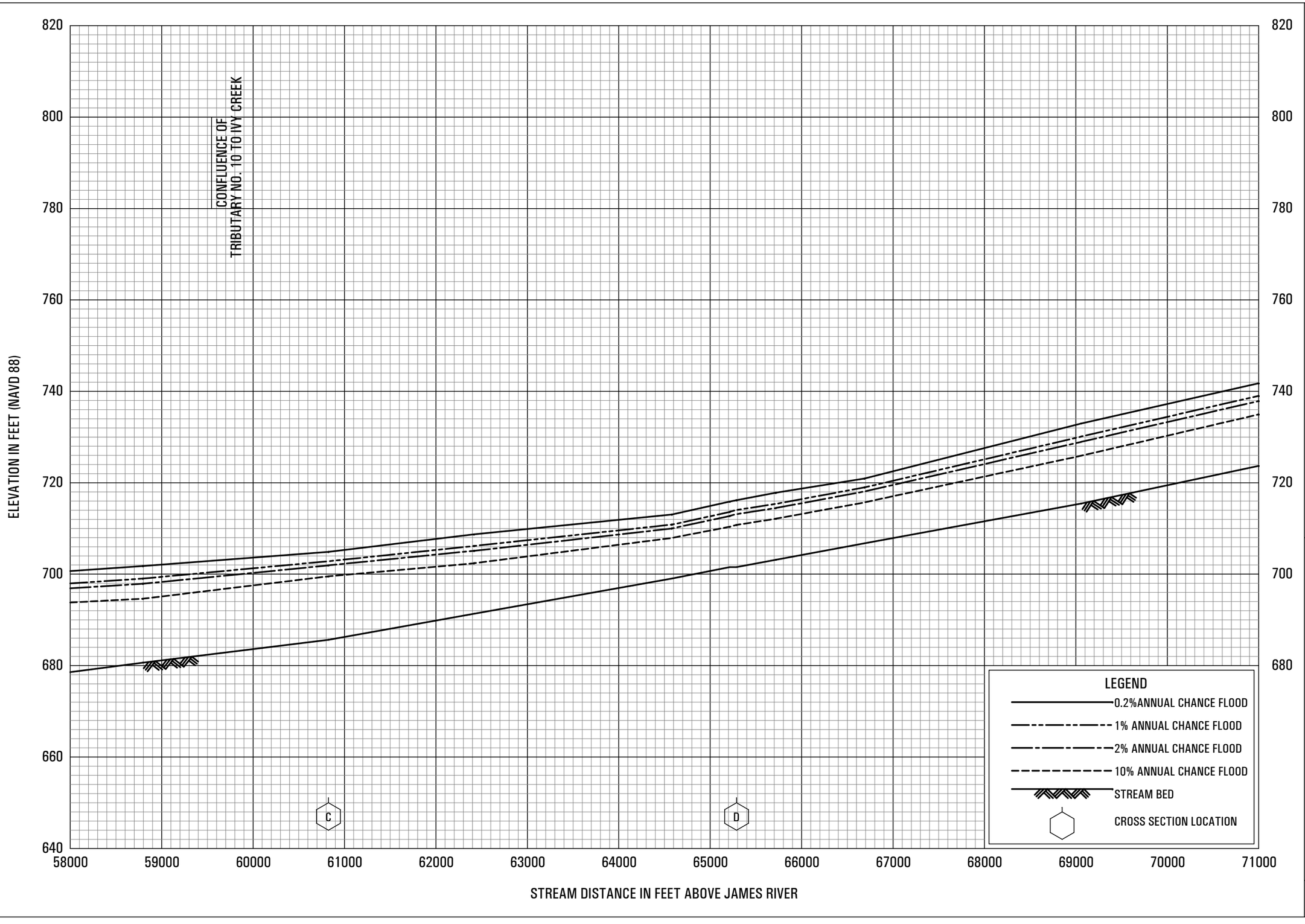
IVY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

23P



FLOOD PROFILES

IVY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

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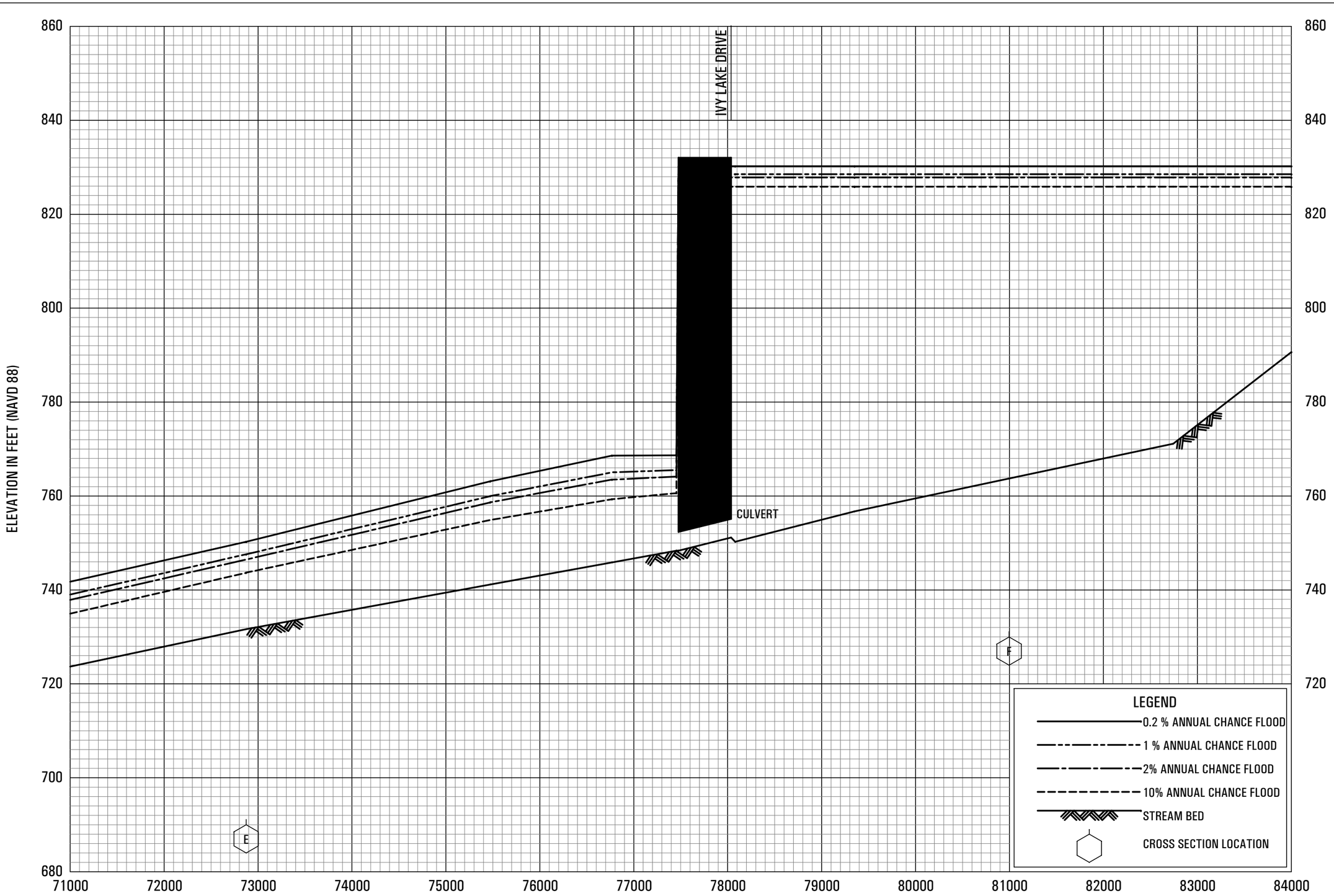


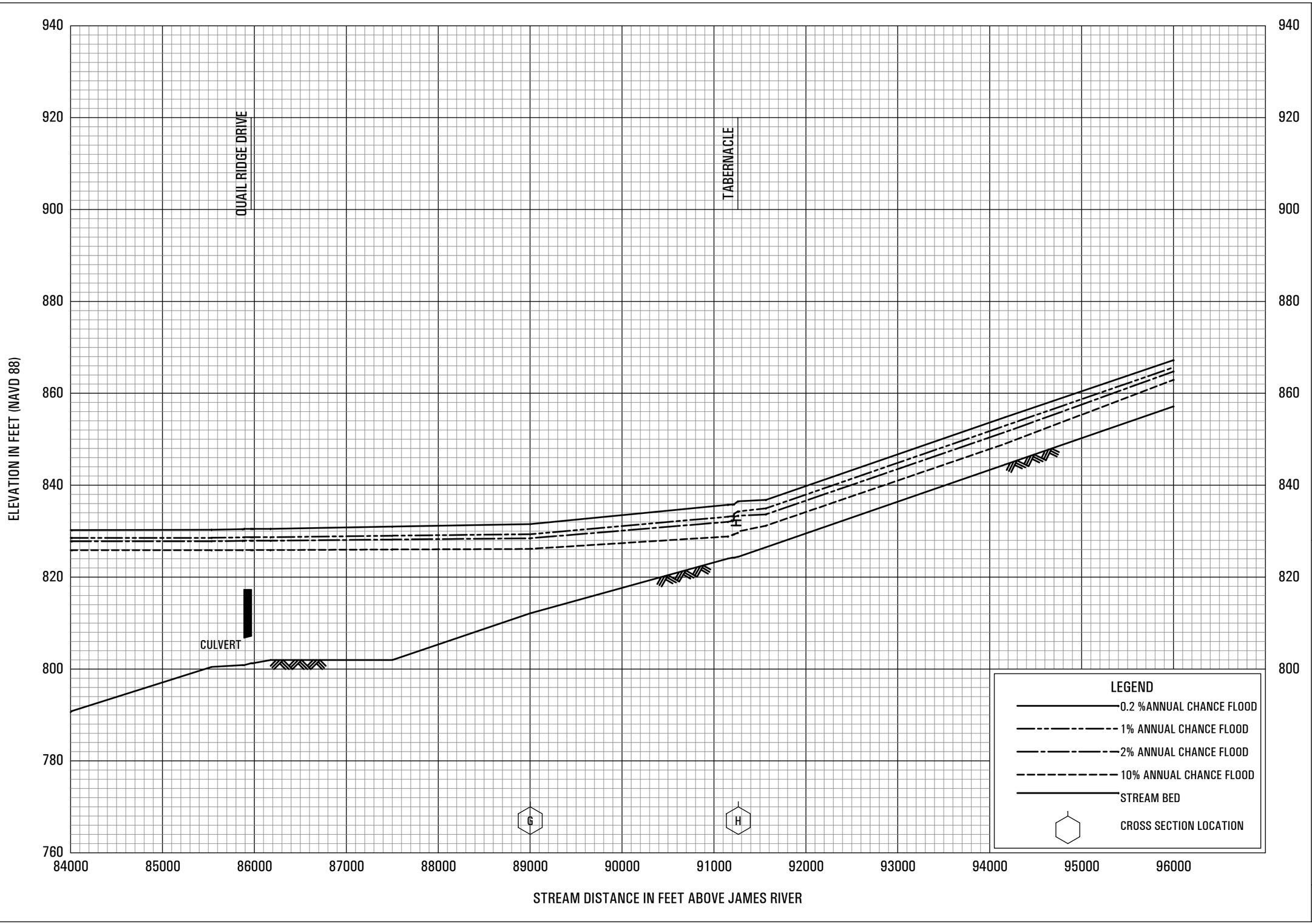
FLOOD PROFILES

IVY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



FLOOD PROFILES

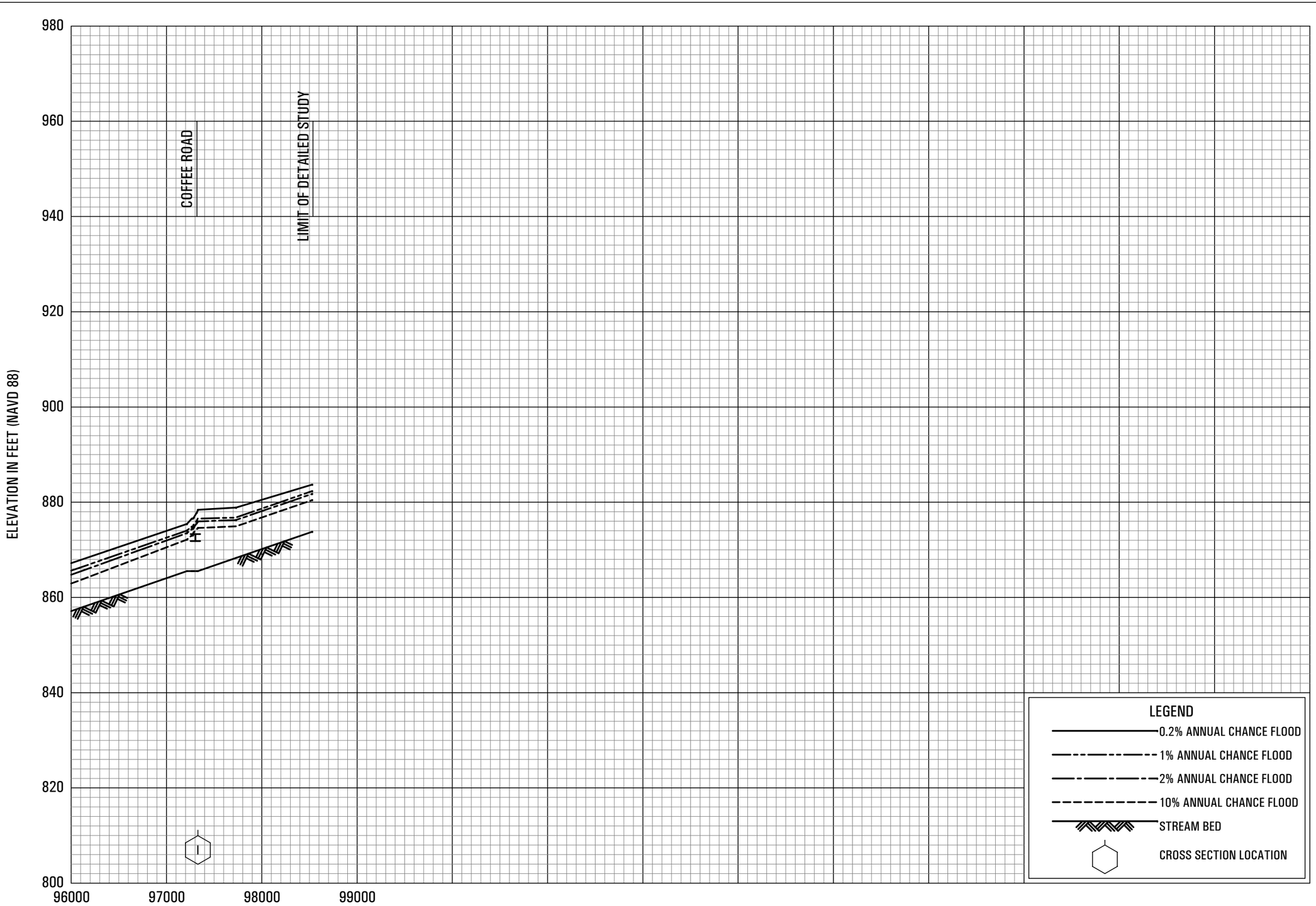
IVY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

26P



FLOOD PROFILES

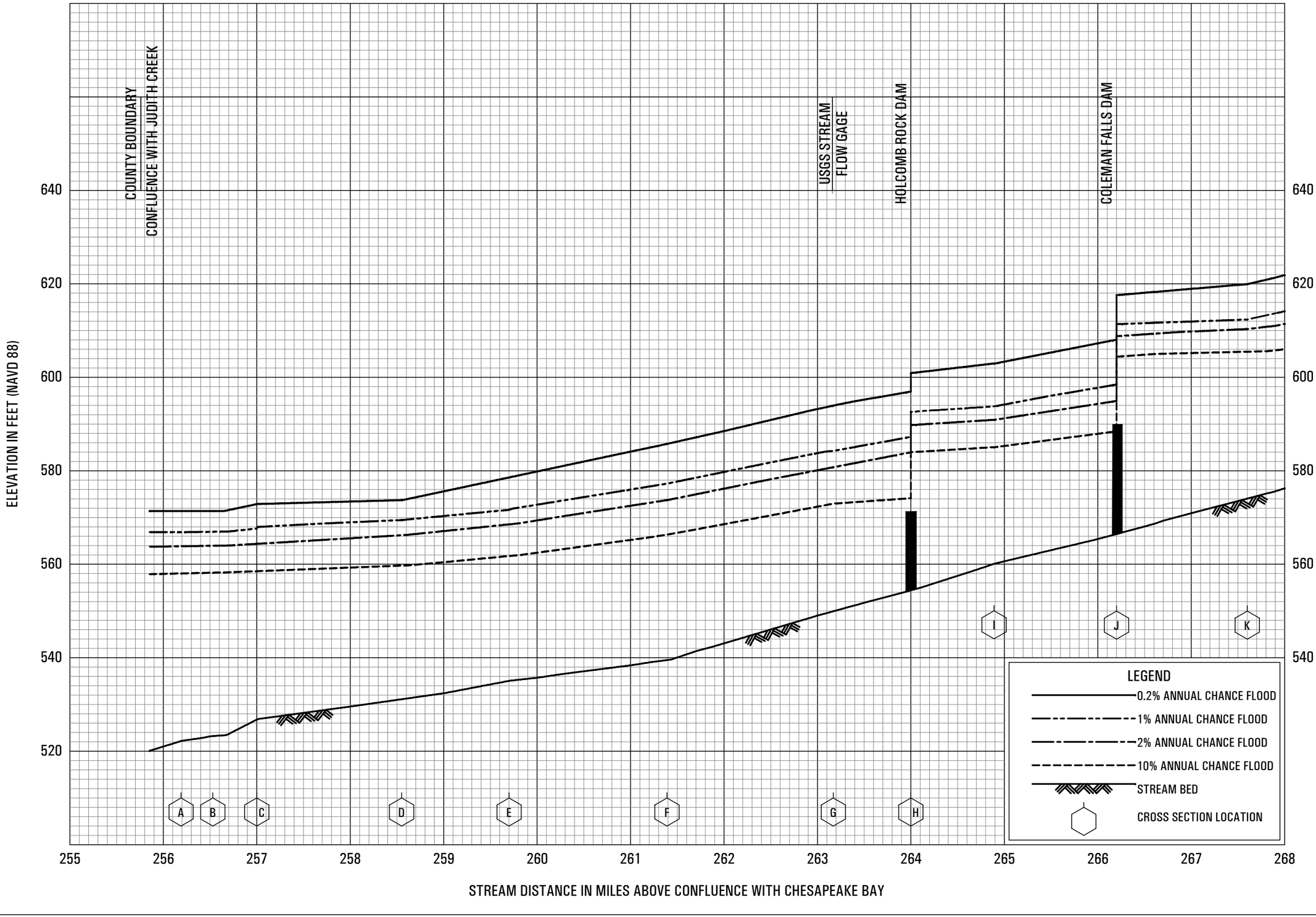
IVY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

27P



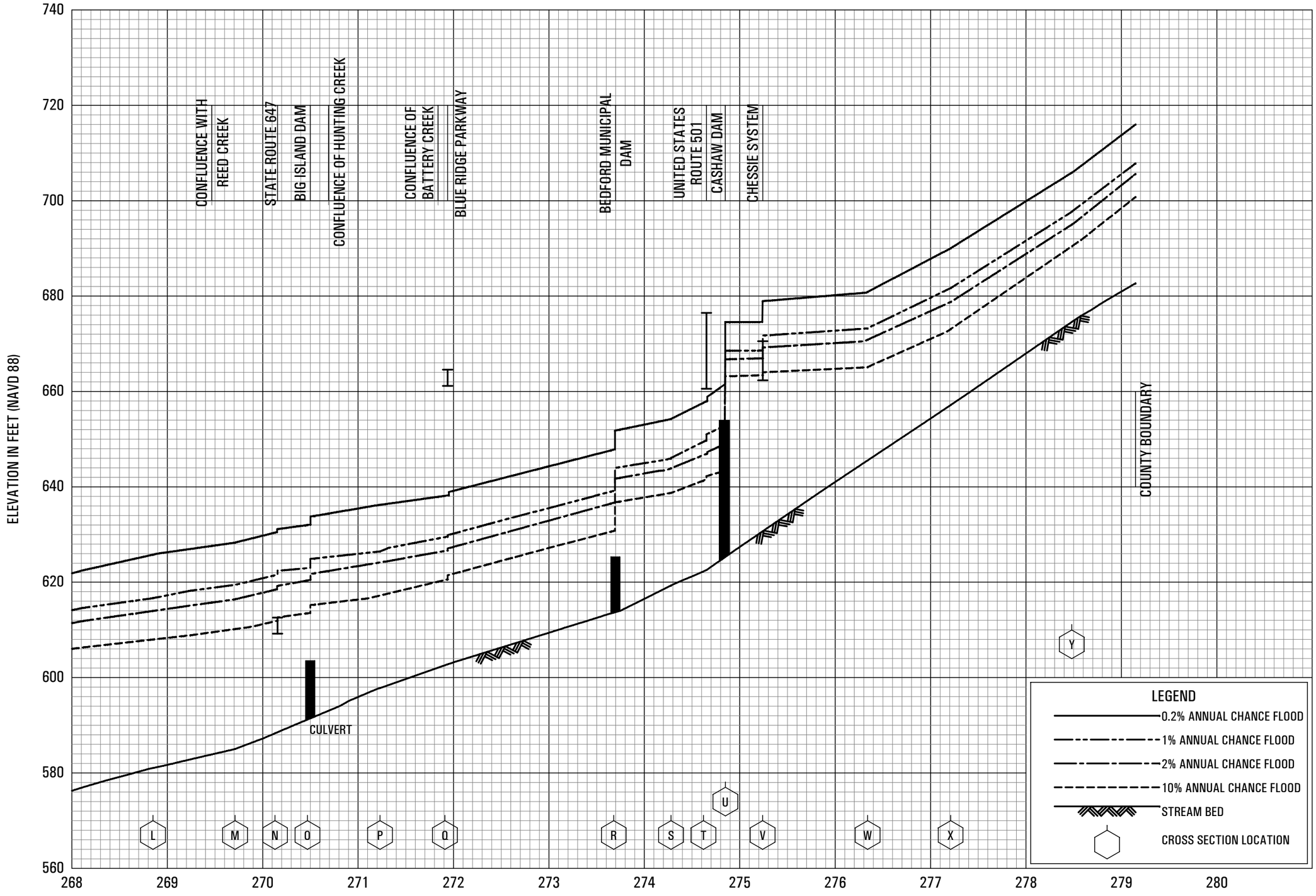
FLOOD PROFILES

JAMES RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



FLOOD PROFILES

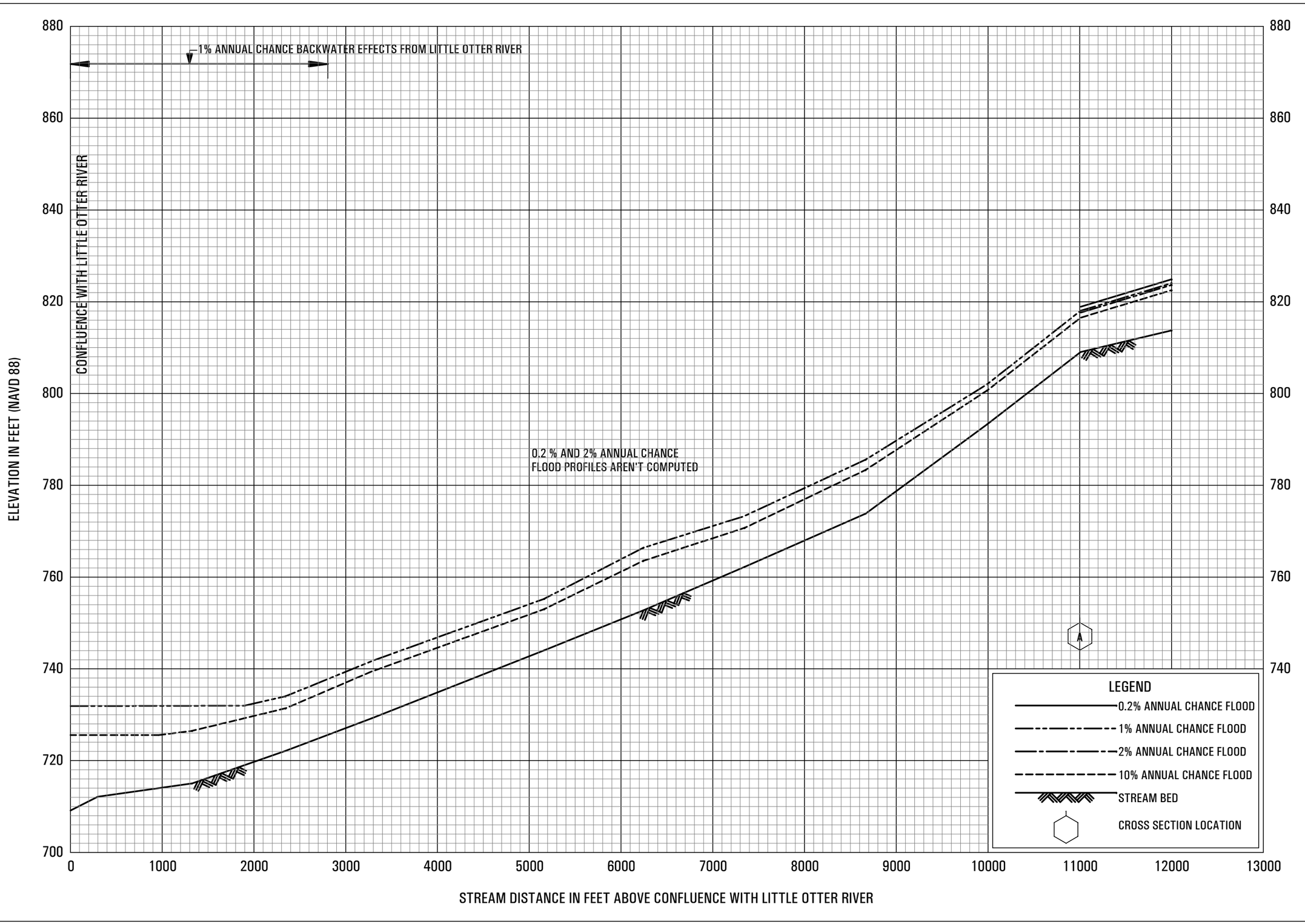
JAMES RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

29P



FLOOD PROFILES

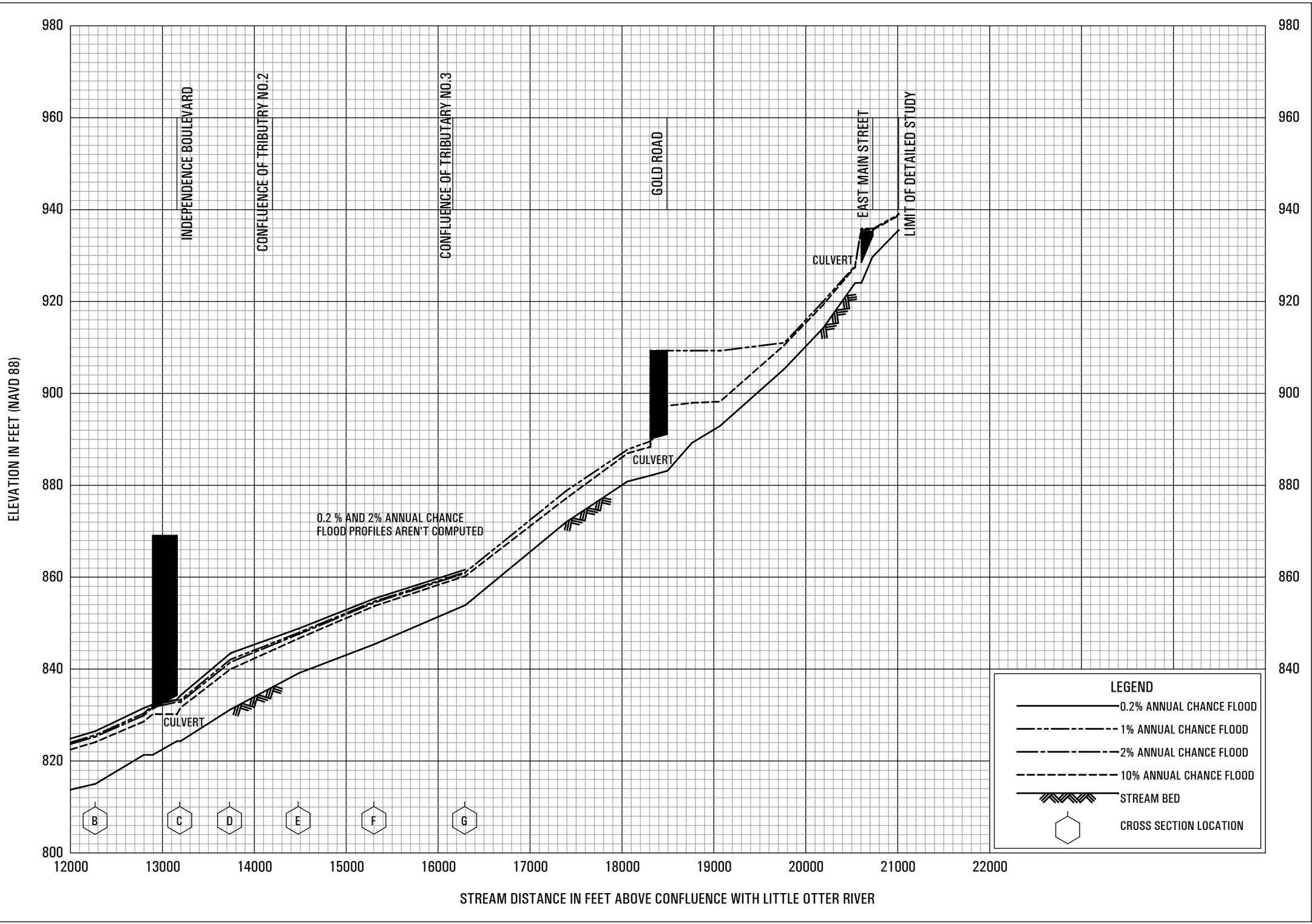
JOHNS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

30P



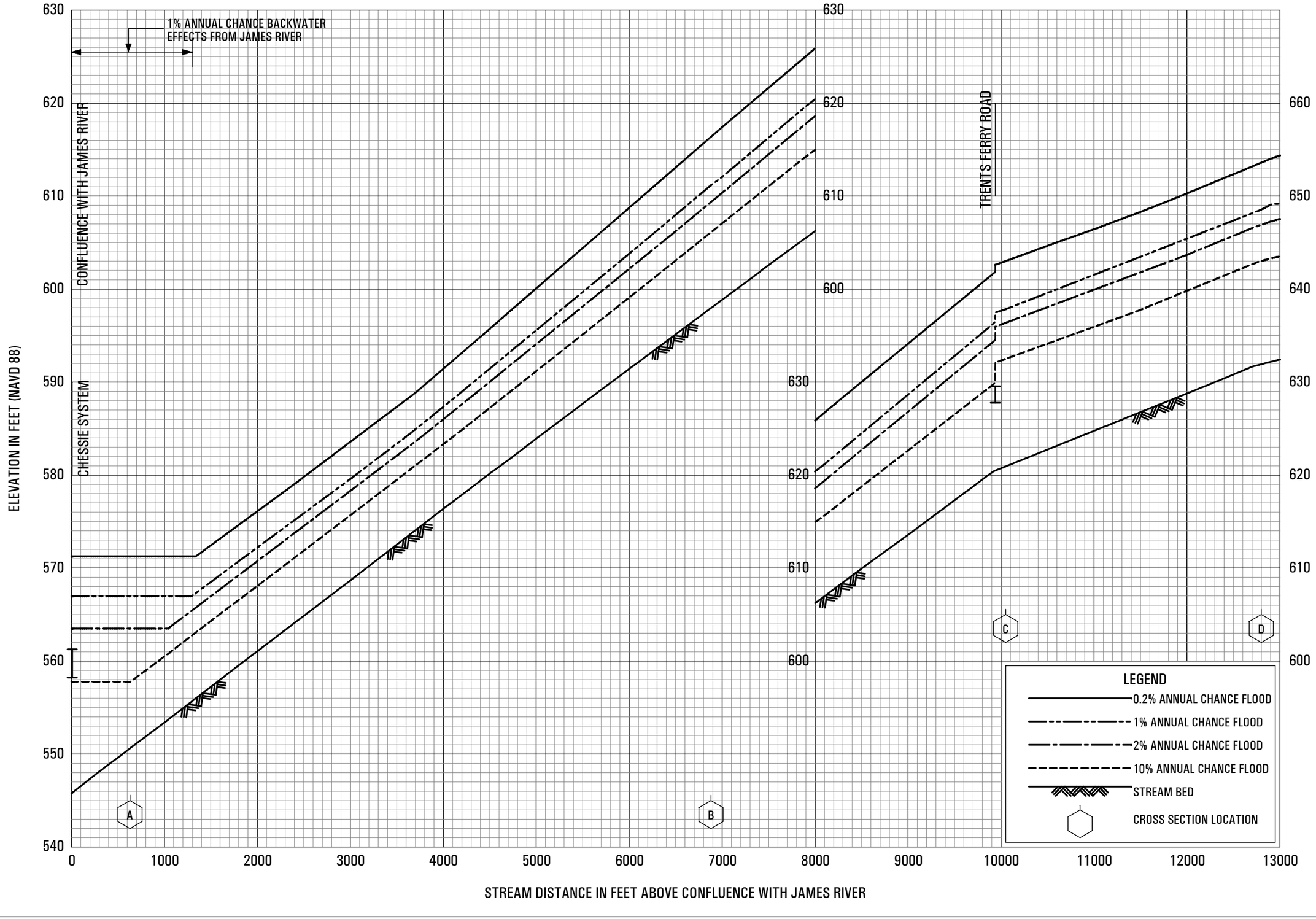
FLOOD PROFILES

JOHNS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



FLOOD PROFILES

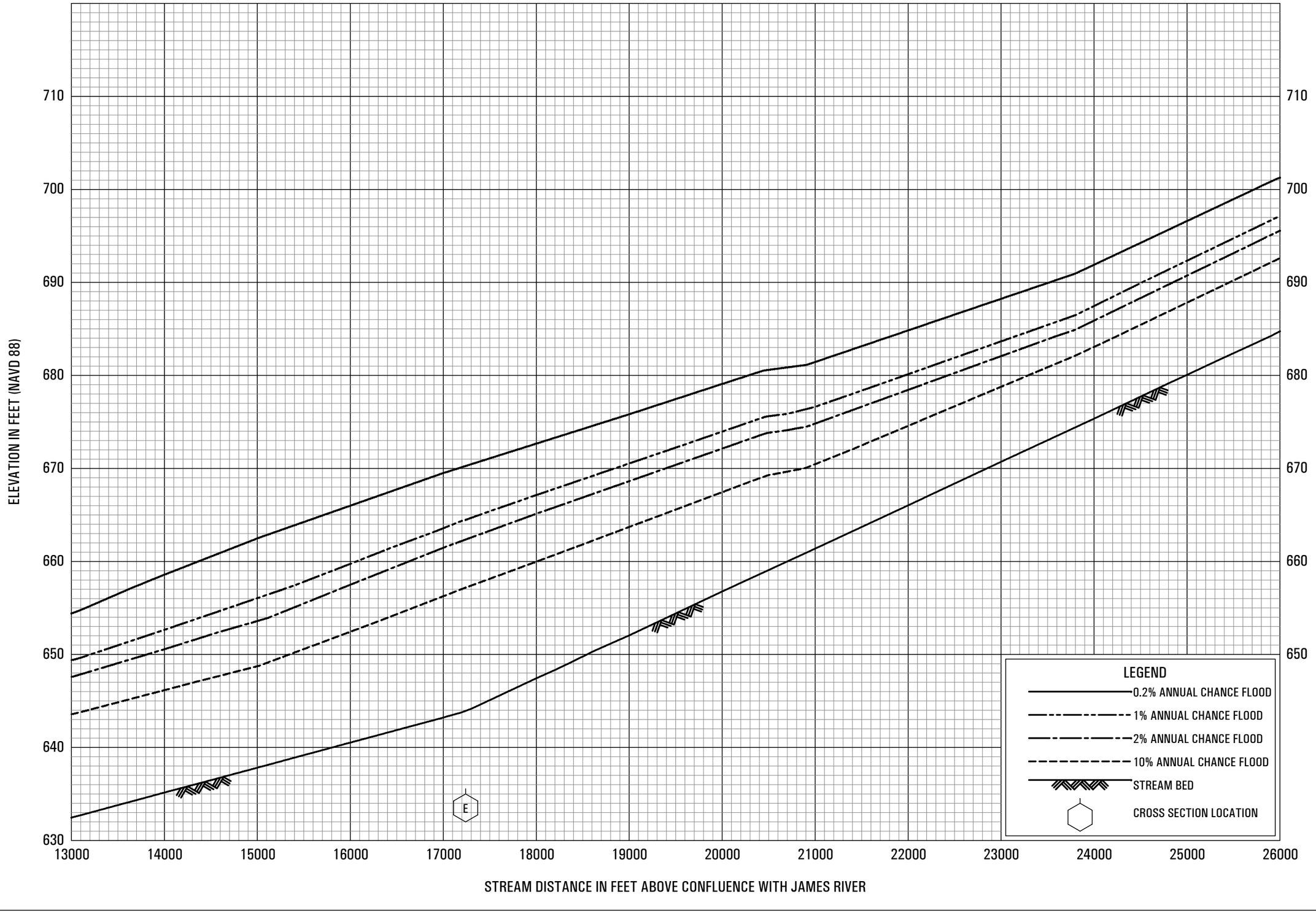
JUDITH CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

32P



FLOOD PROFILES

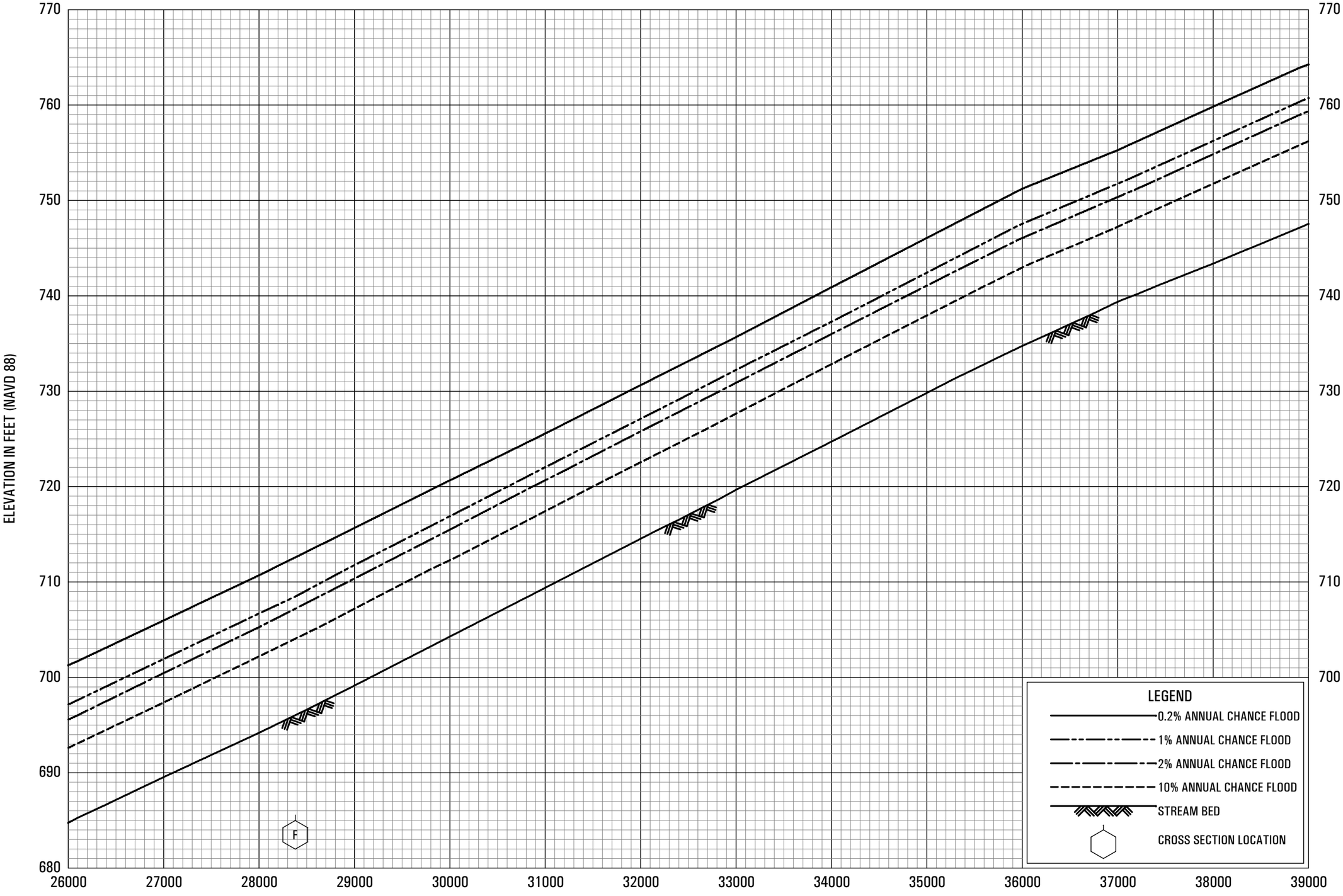
JUDITH CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

33P



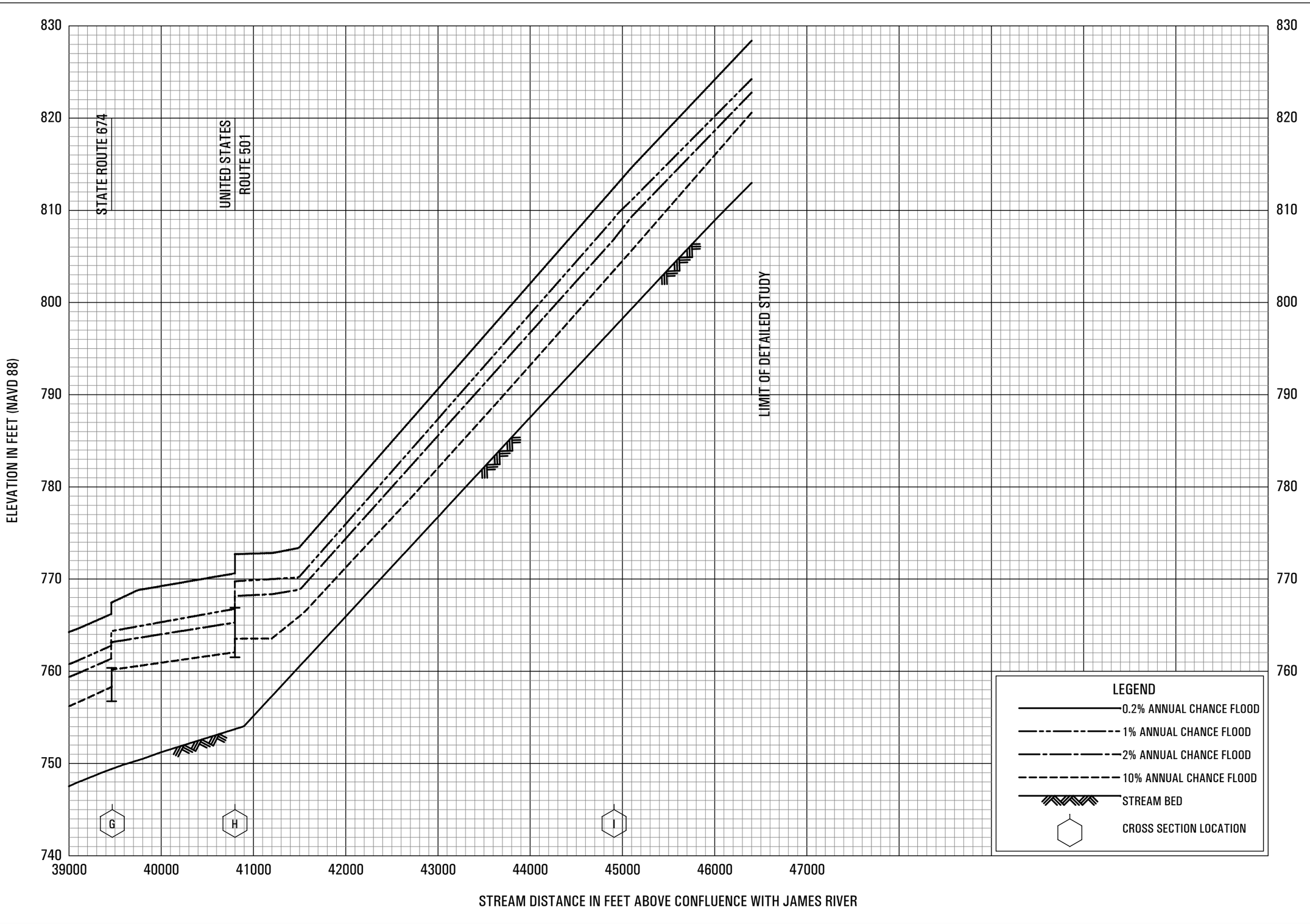
FLOOD PROFILES

JUDITH CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



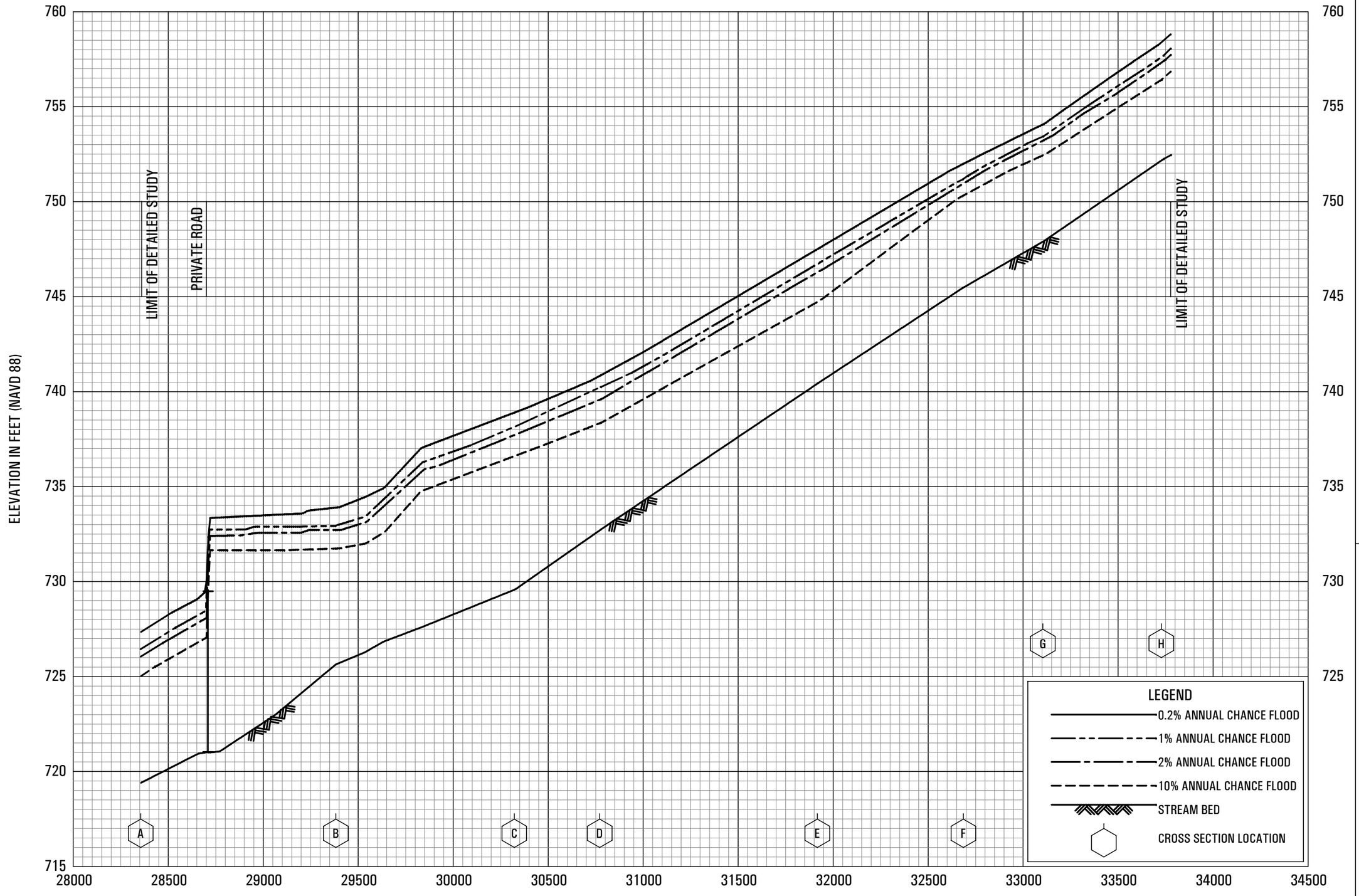
FLOOD PROFILES

JUDITH CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



FLOOD PROFILES

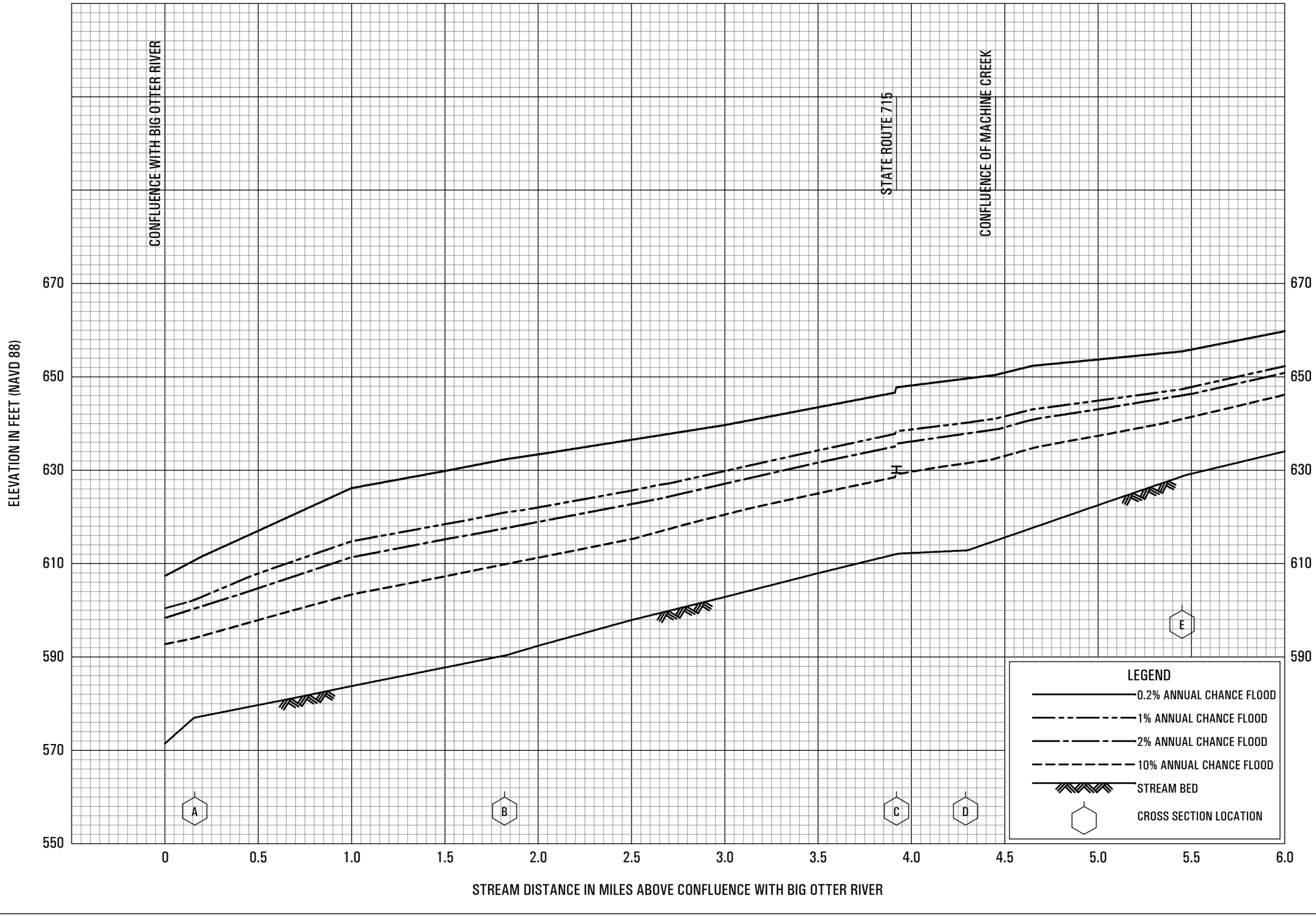
LICK RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

35aP



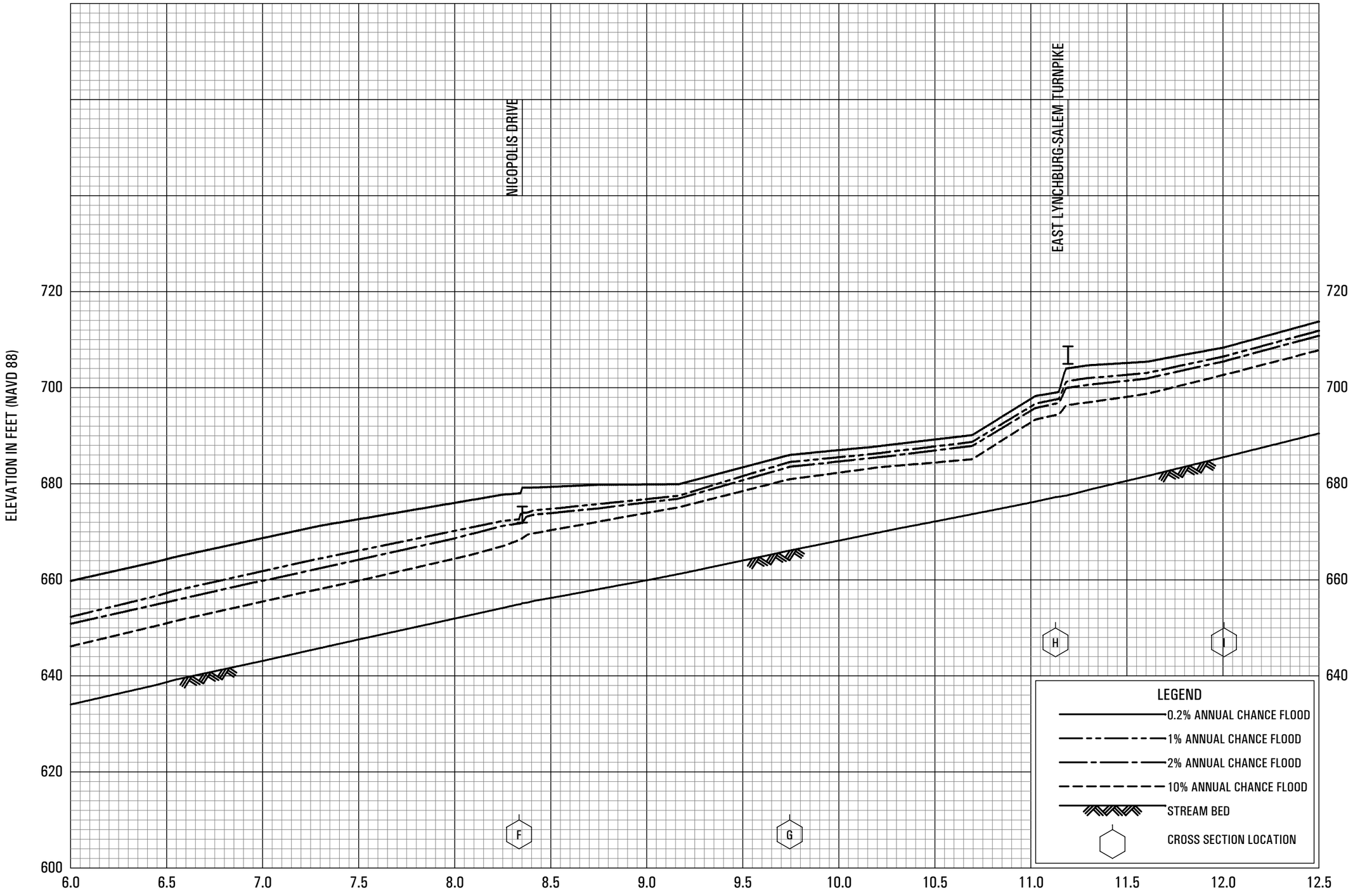
FLOOD PROFILES

LITTLE OTTER RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



FLOOD PROFILES

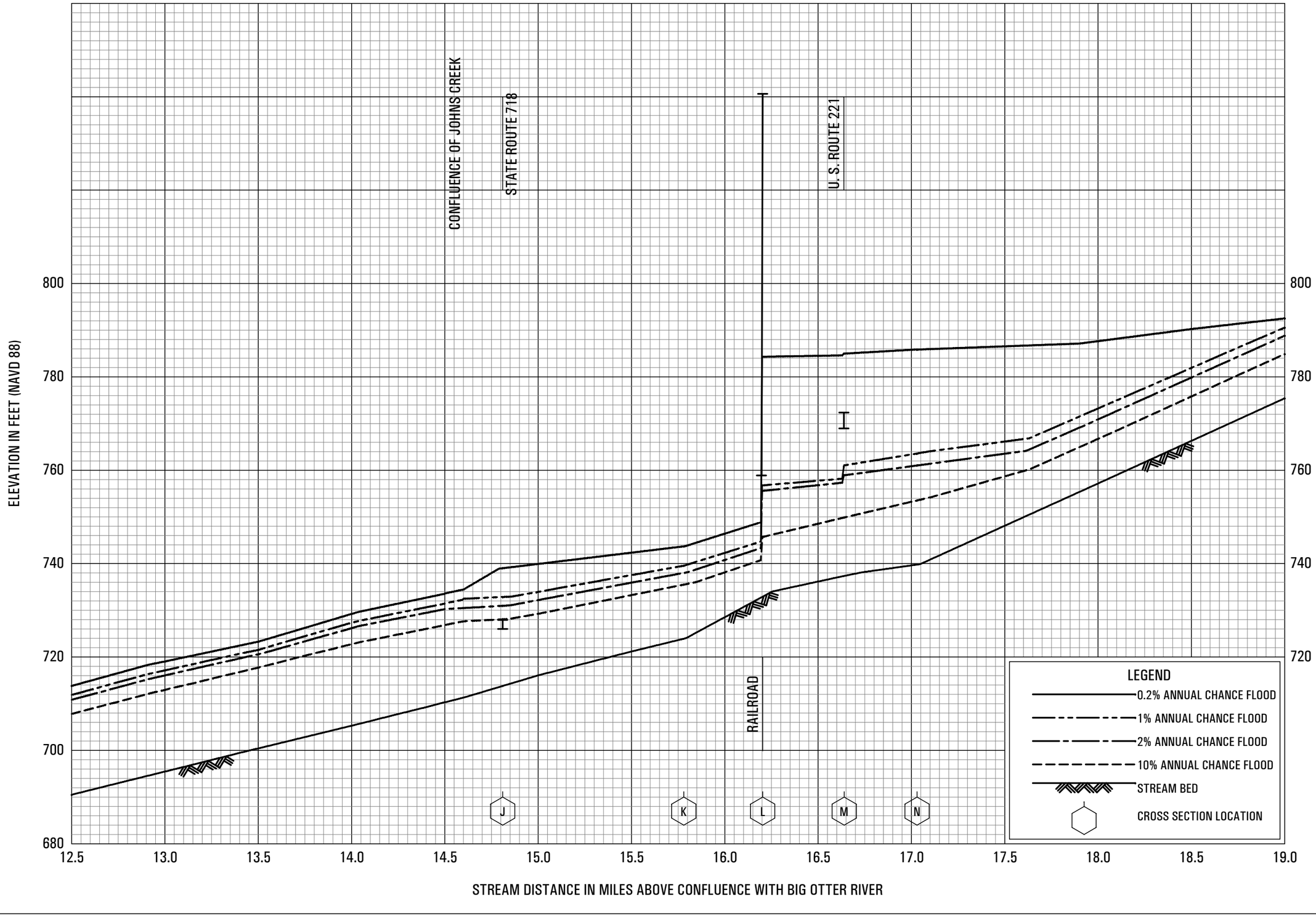
LITTLE OTTER RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

37P



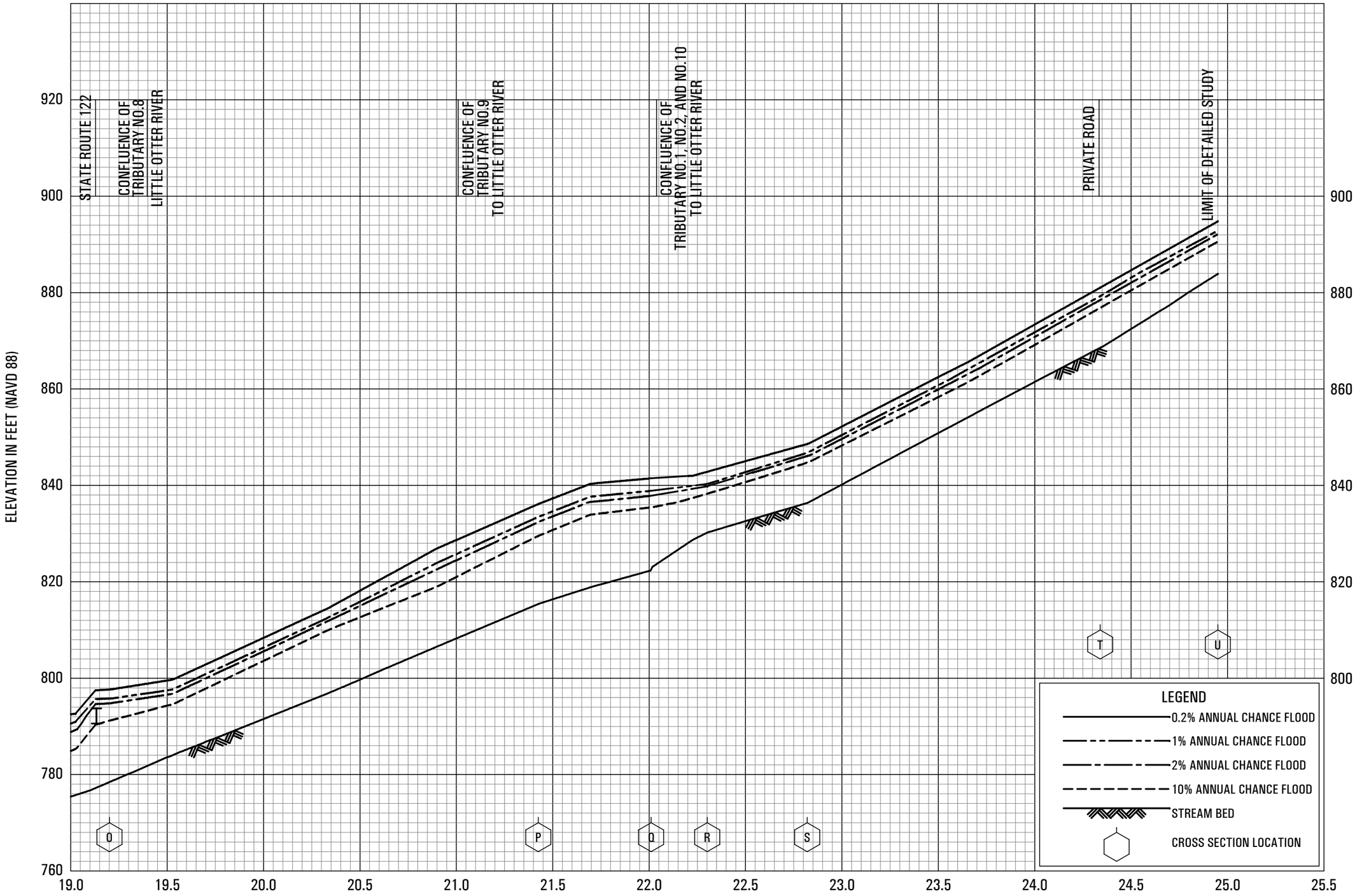
FLOOD PROFILES

LITTLE OTTER RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



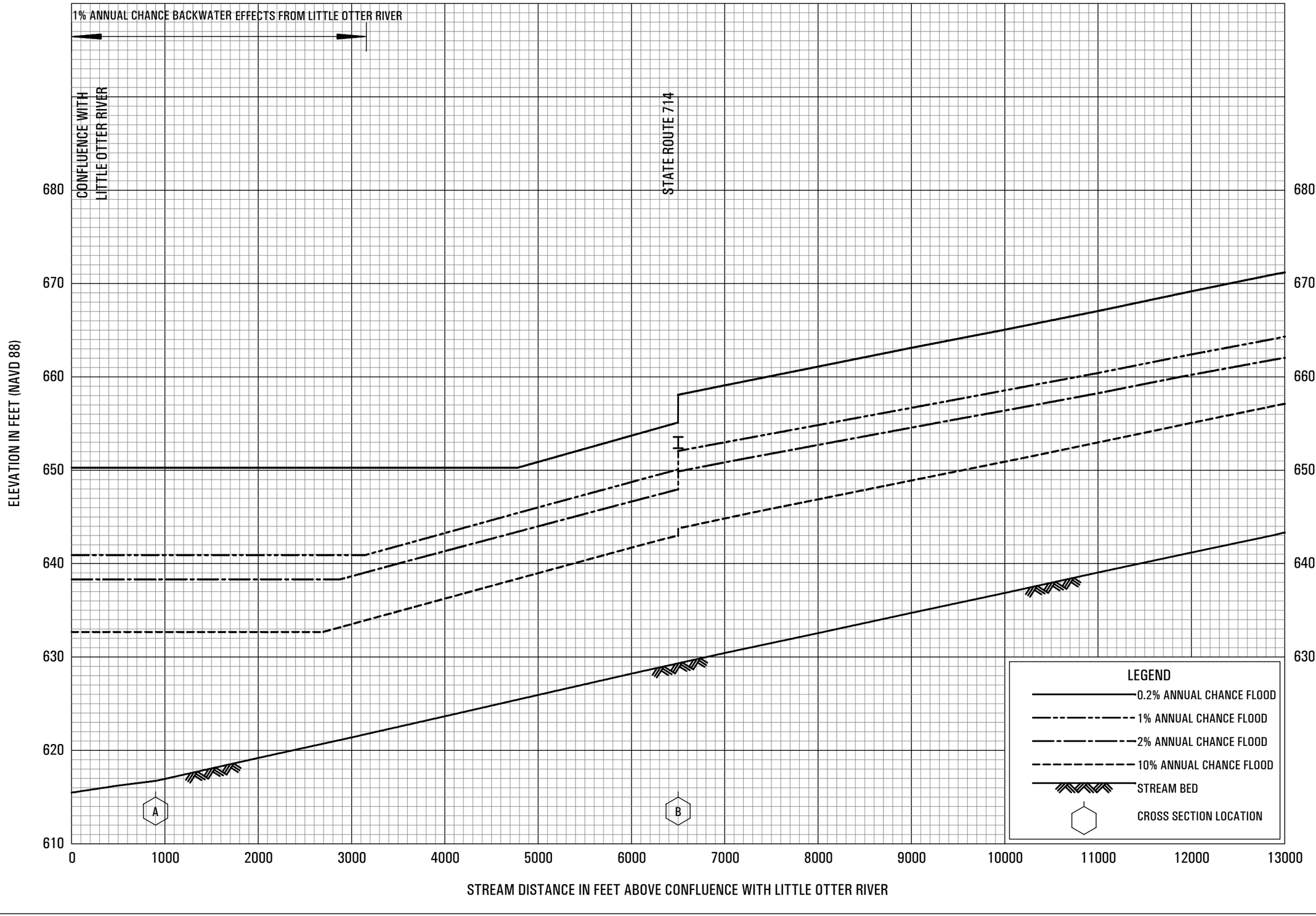
FLOOD PROFILES

LITTLE OTTER RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



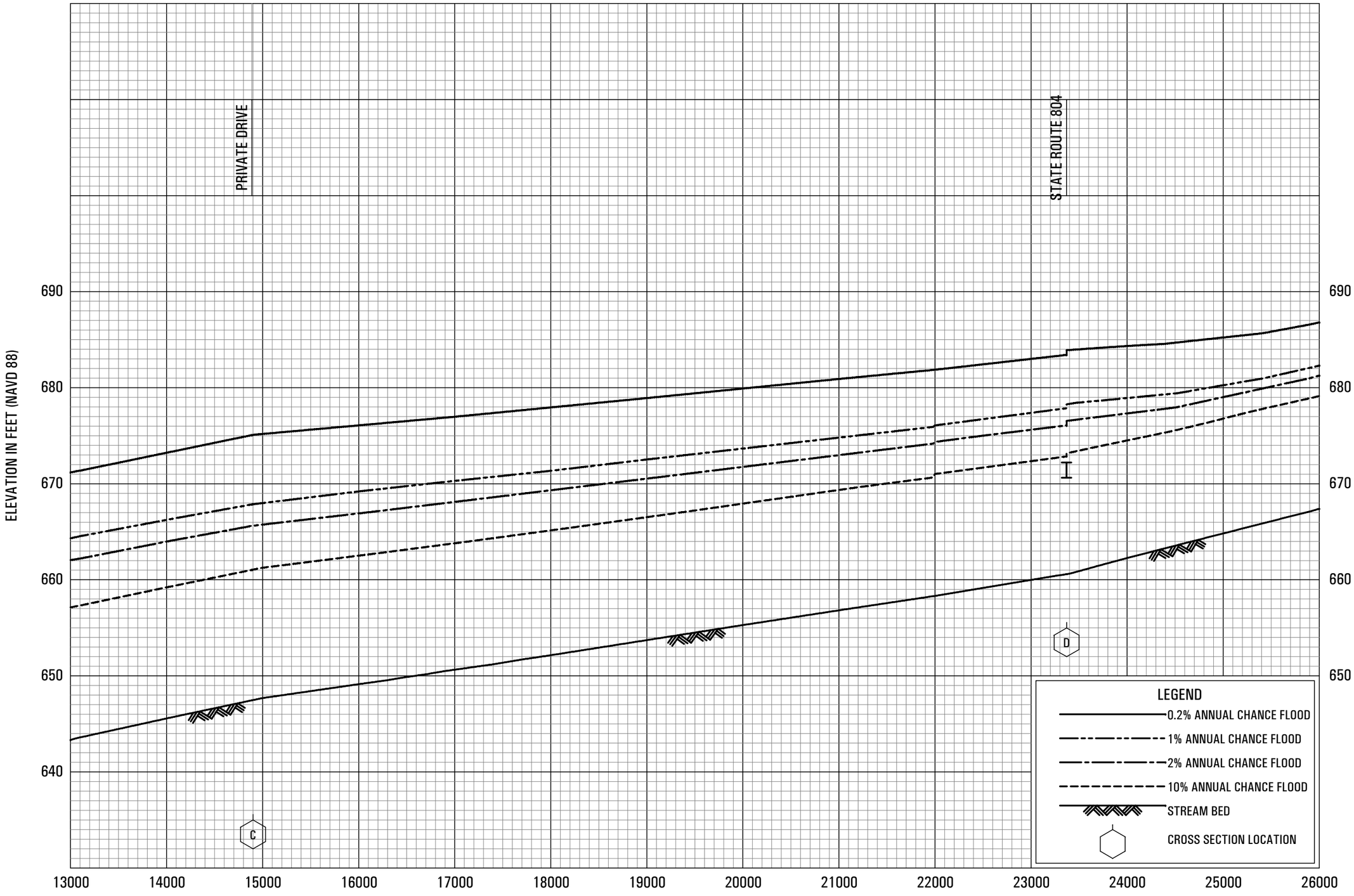
FLOOD PROFILES

MACHINE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



FLOOD PROFILES

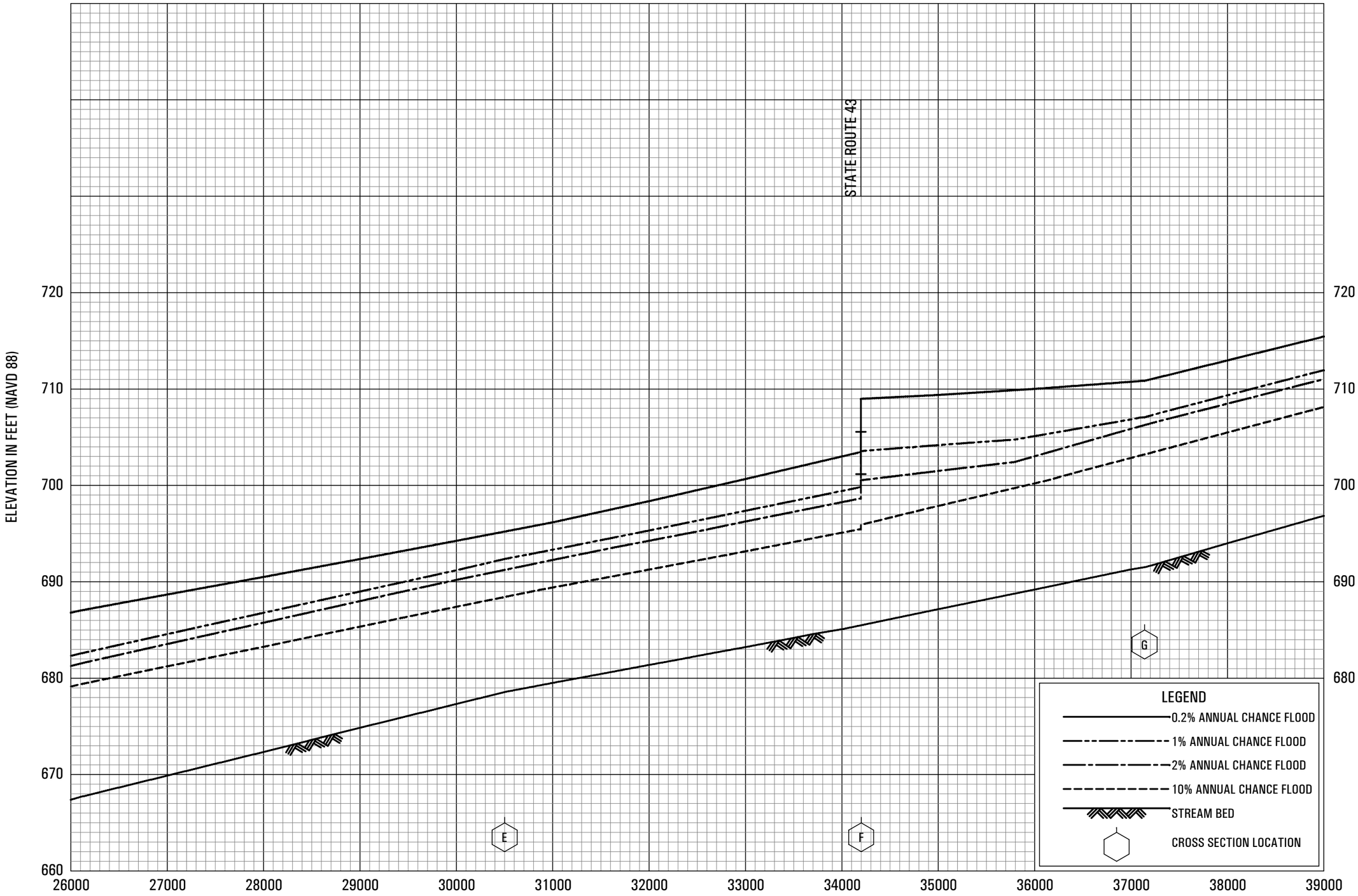
MACHINE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

41P



FLOOD PROFILES

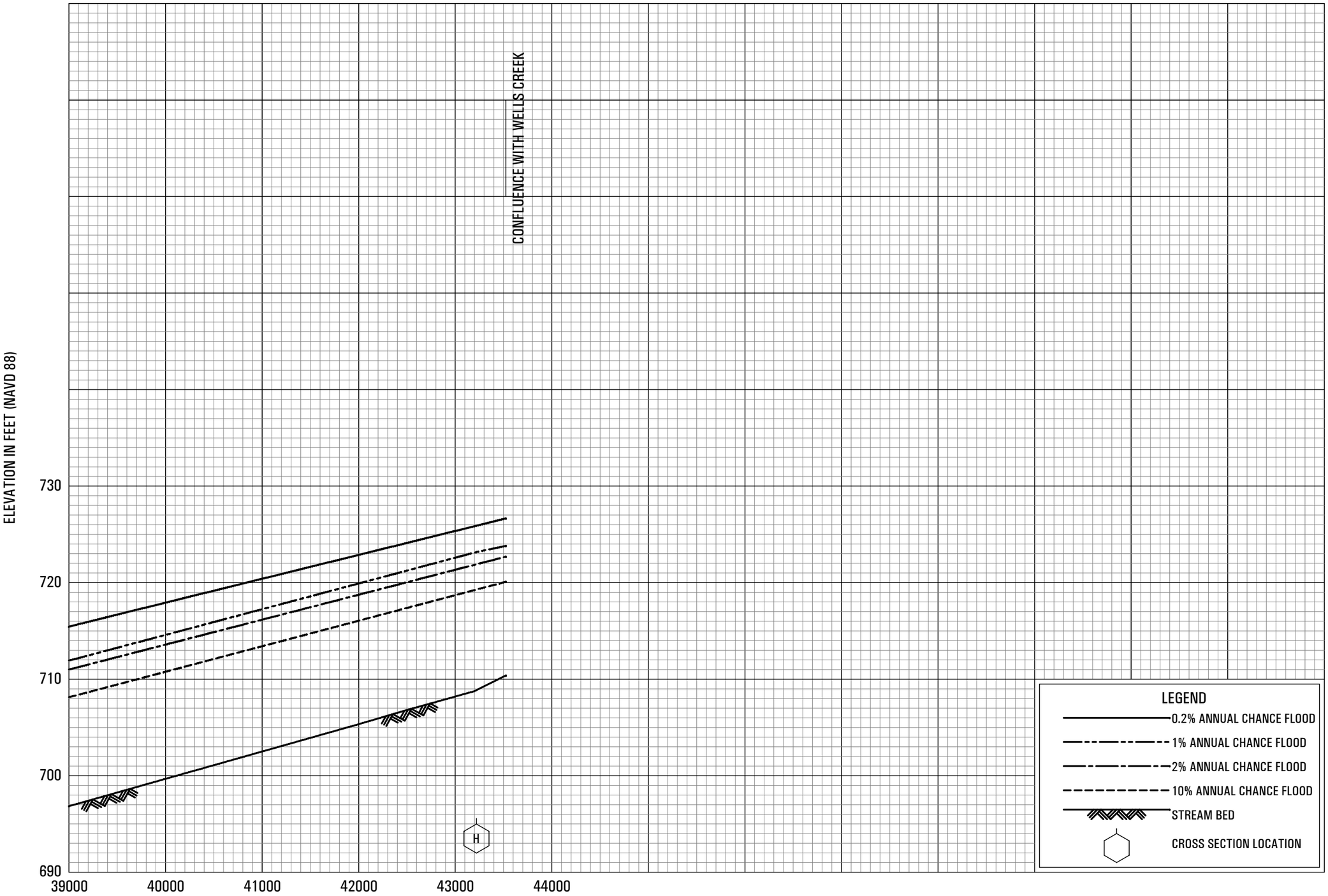
MACHINE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

42P



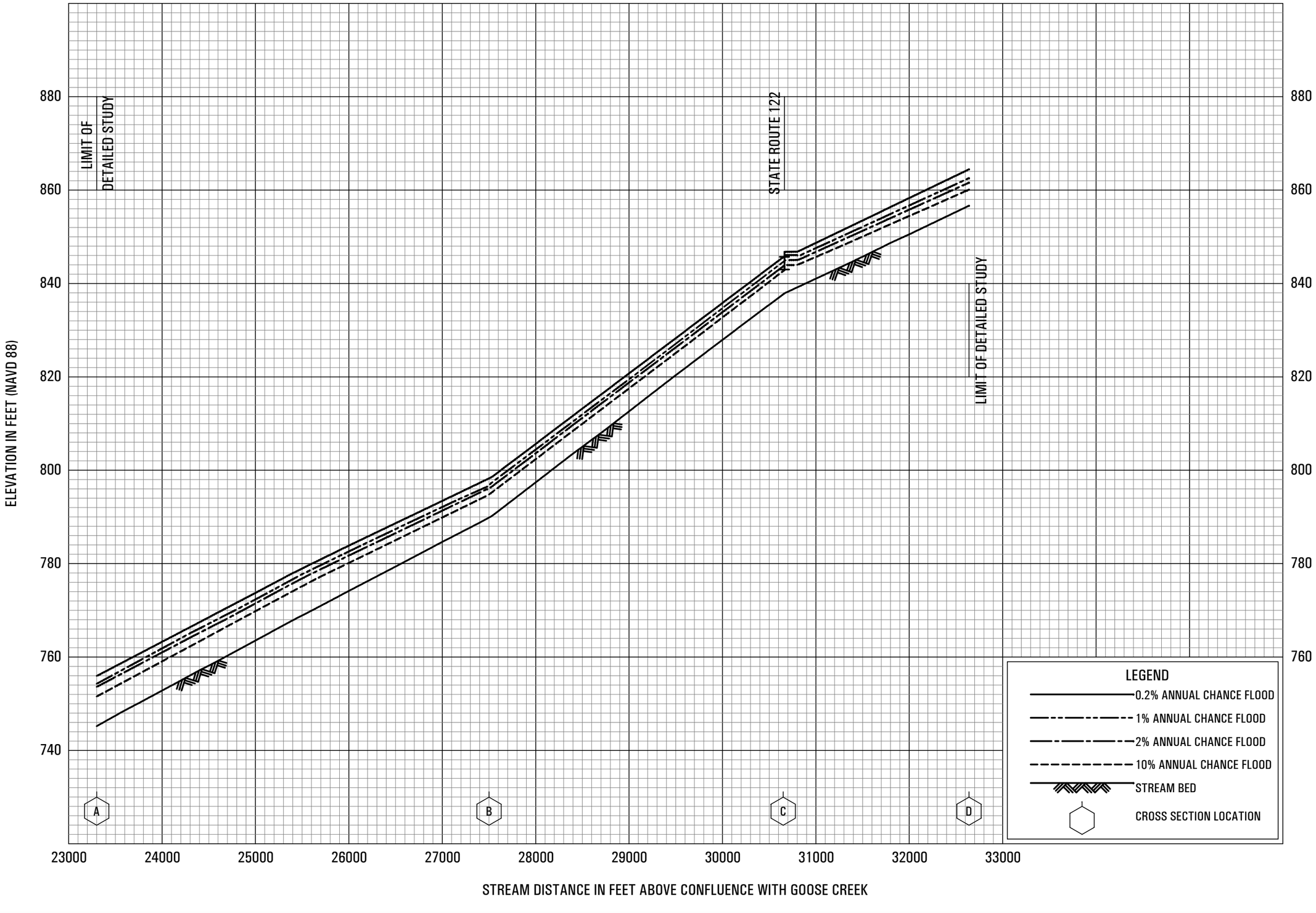
FLOOD PROFILES

MACHINE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



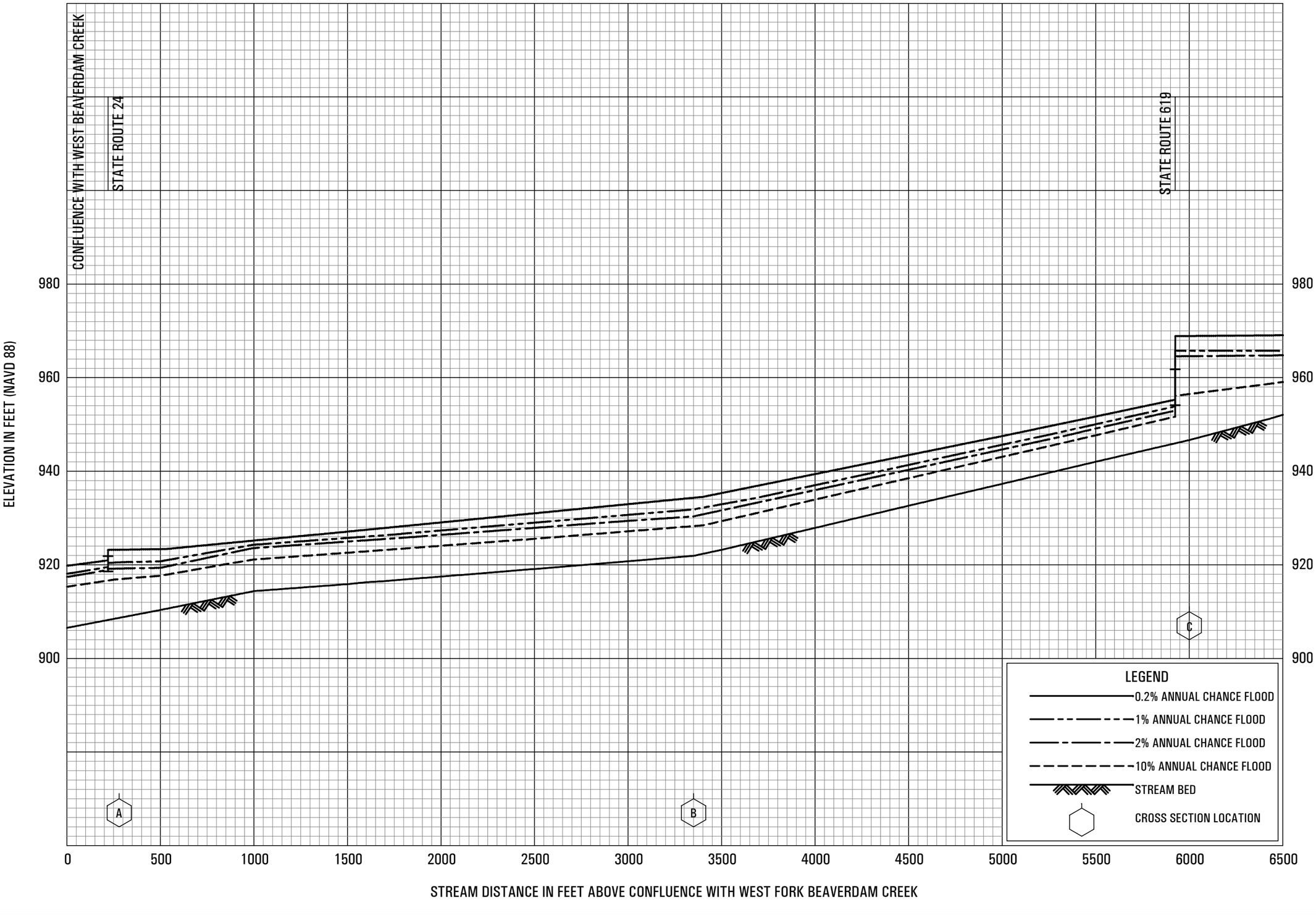
FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



FLOOD PROFILES

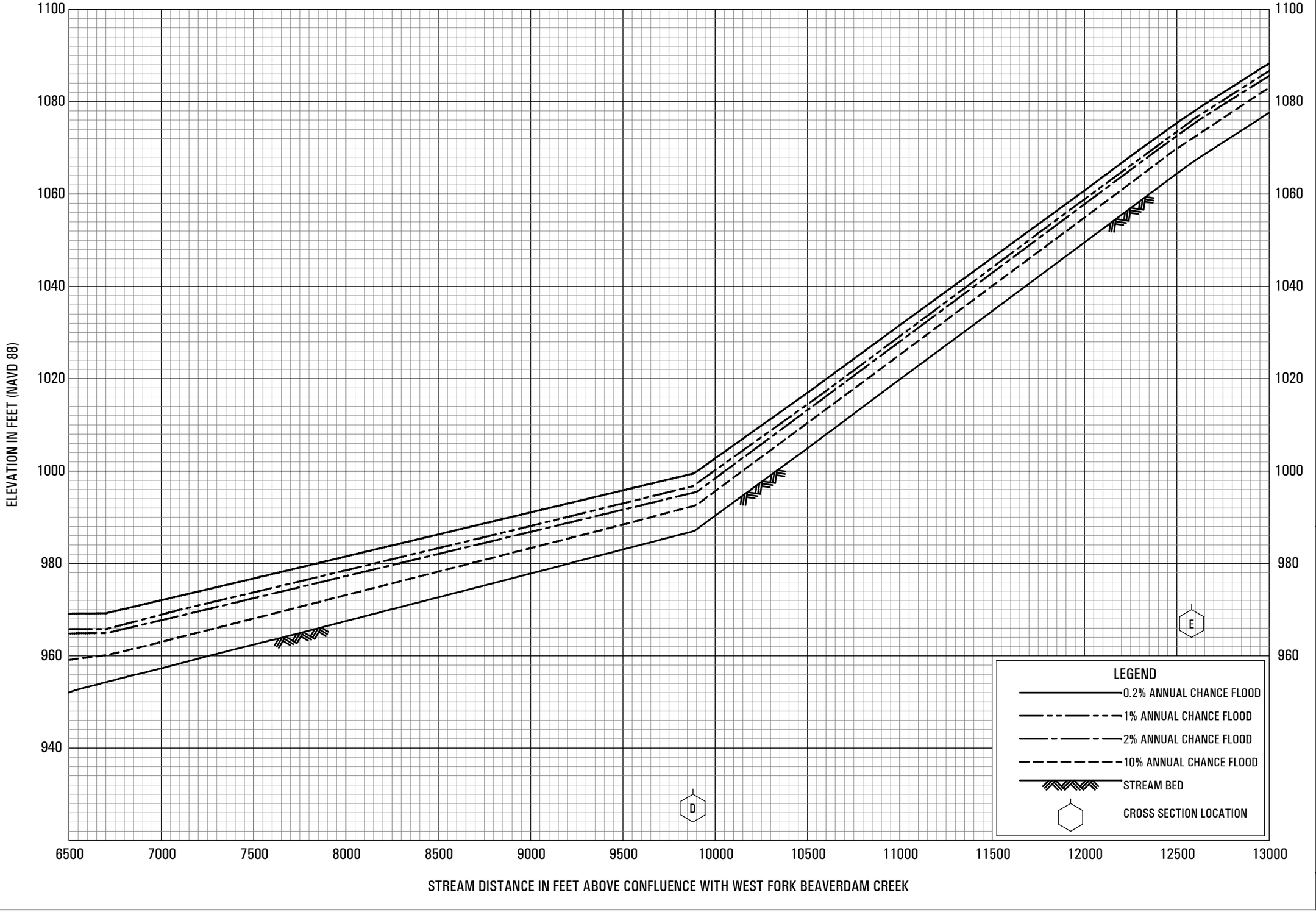
NAT BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

45P



FLOOD PROFILES

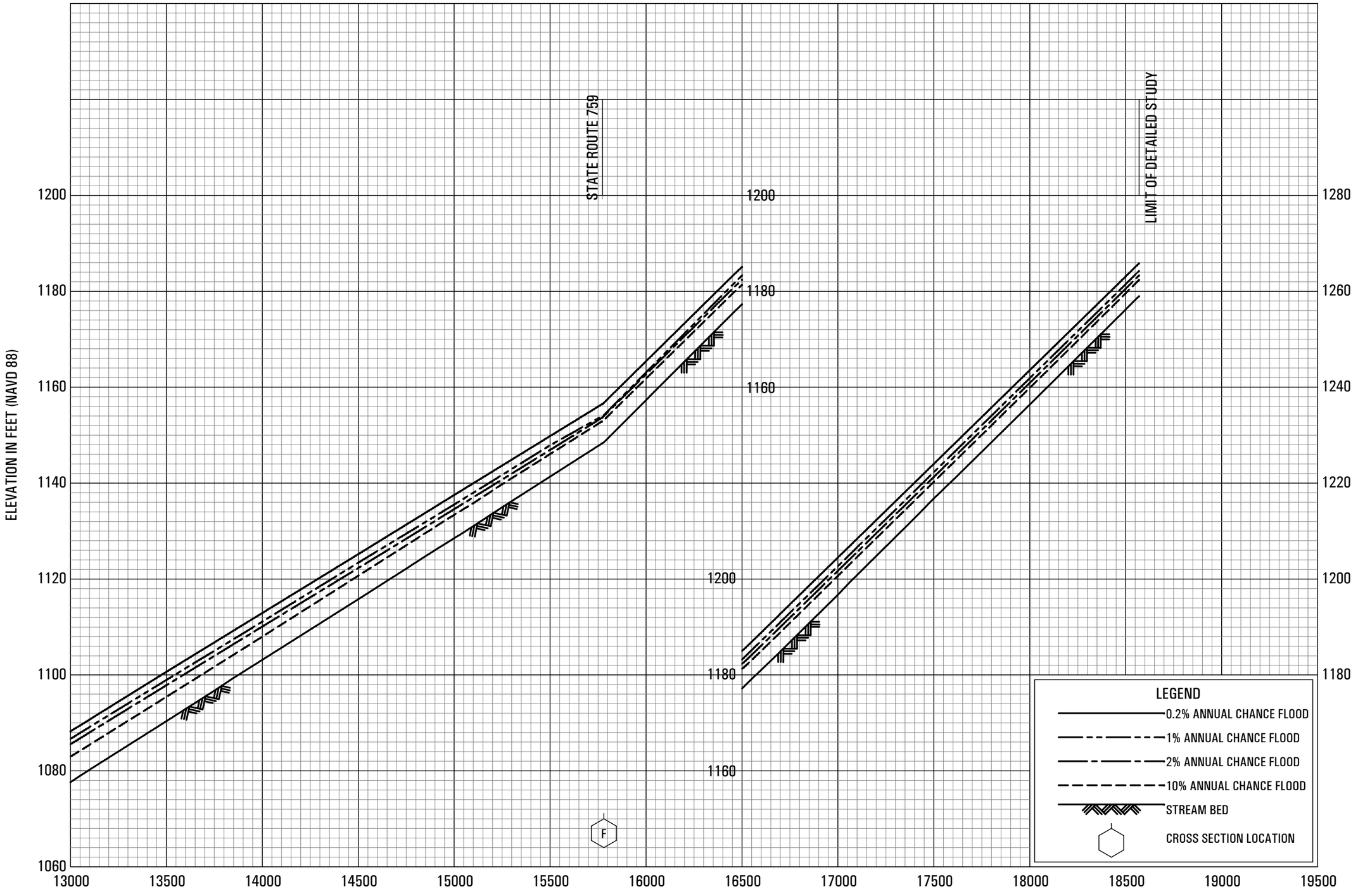
NAT BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

46P



FLOOD PROFILES

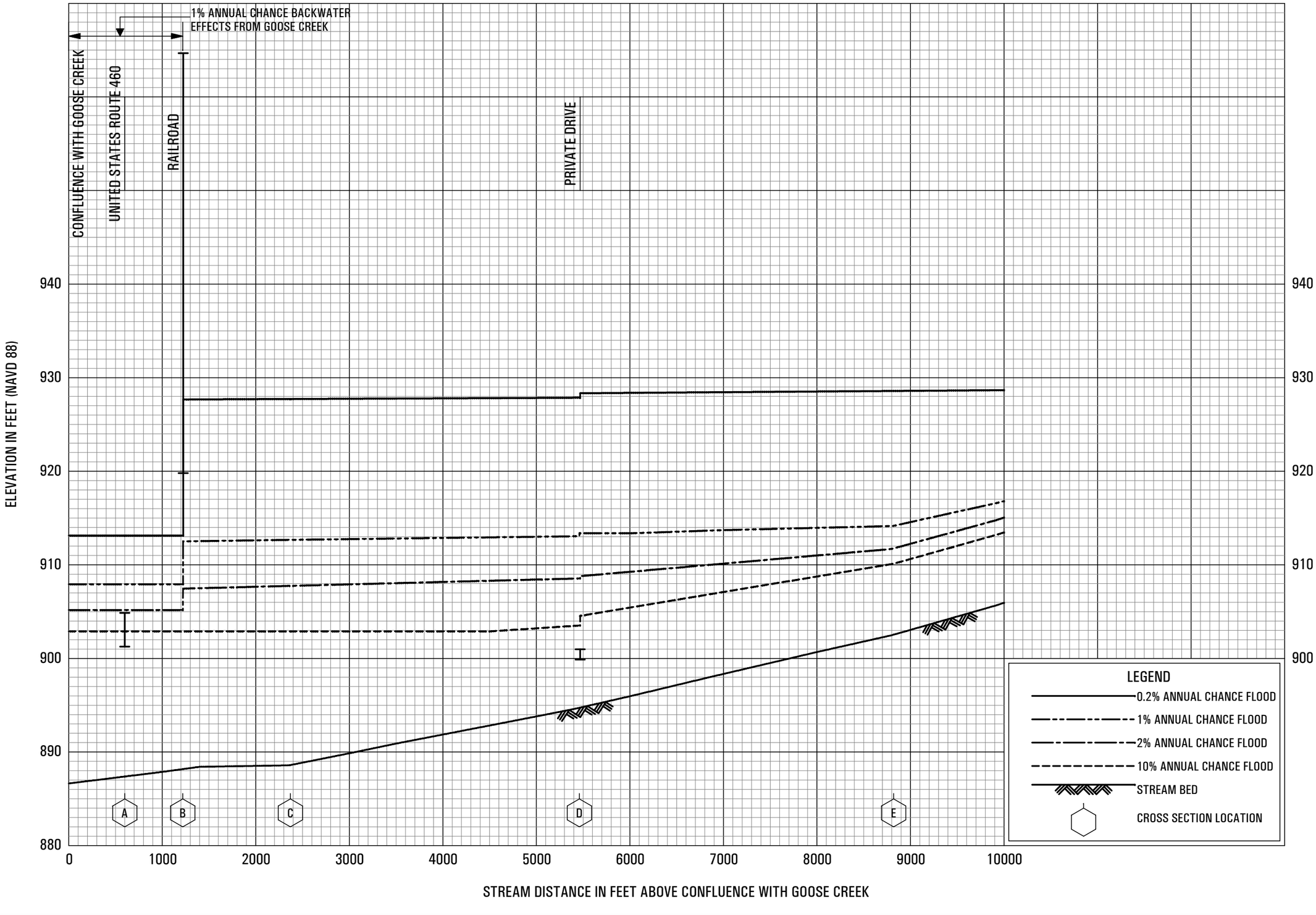
NAT BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

47P



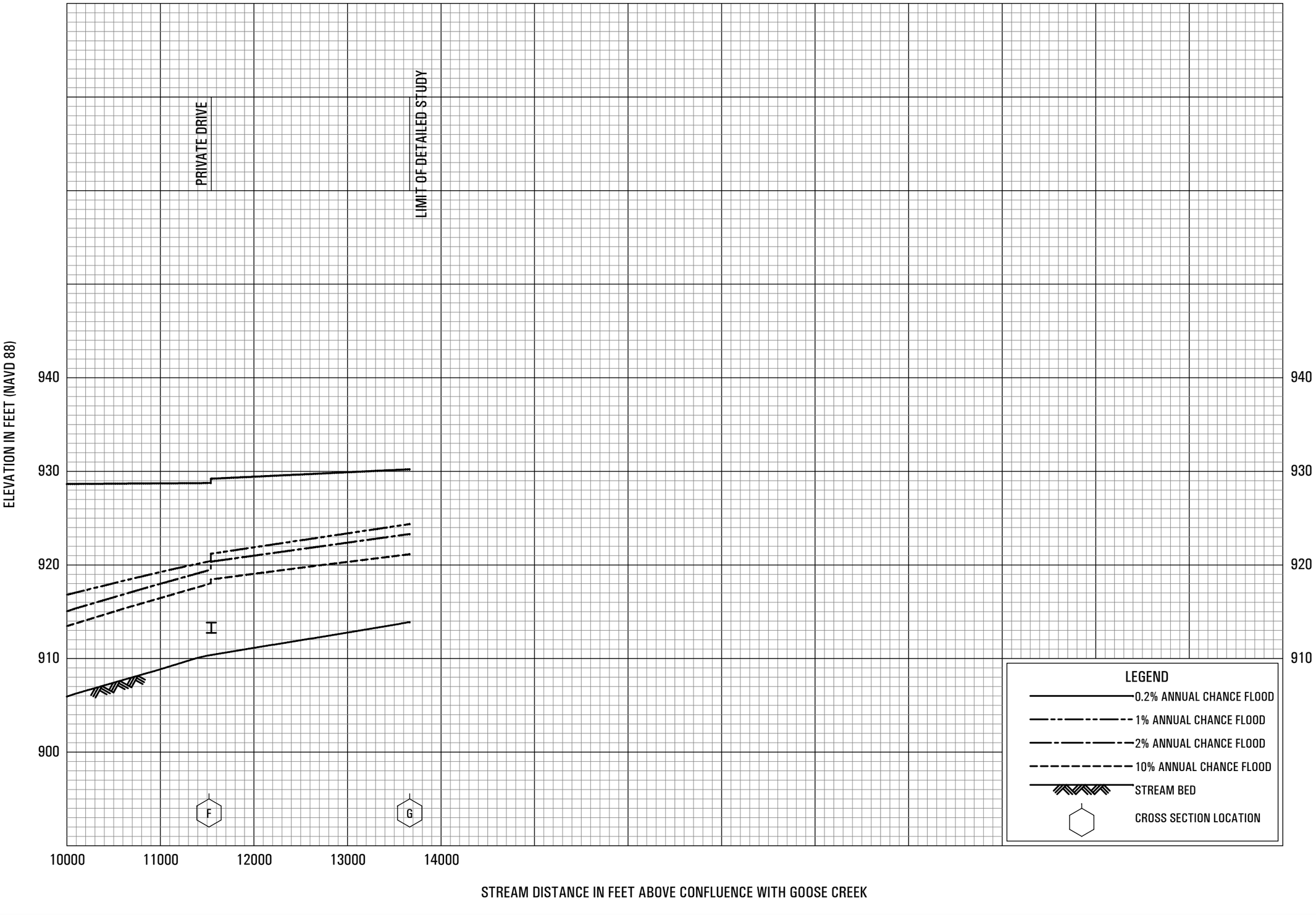
FLOOD PROFILES

NORTH FORK GOOSE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



ELEVATION IN FEET (NAVD 88)

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH GOOSE CREEK

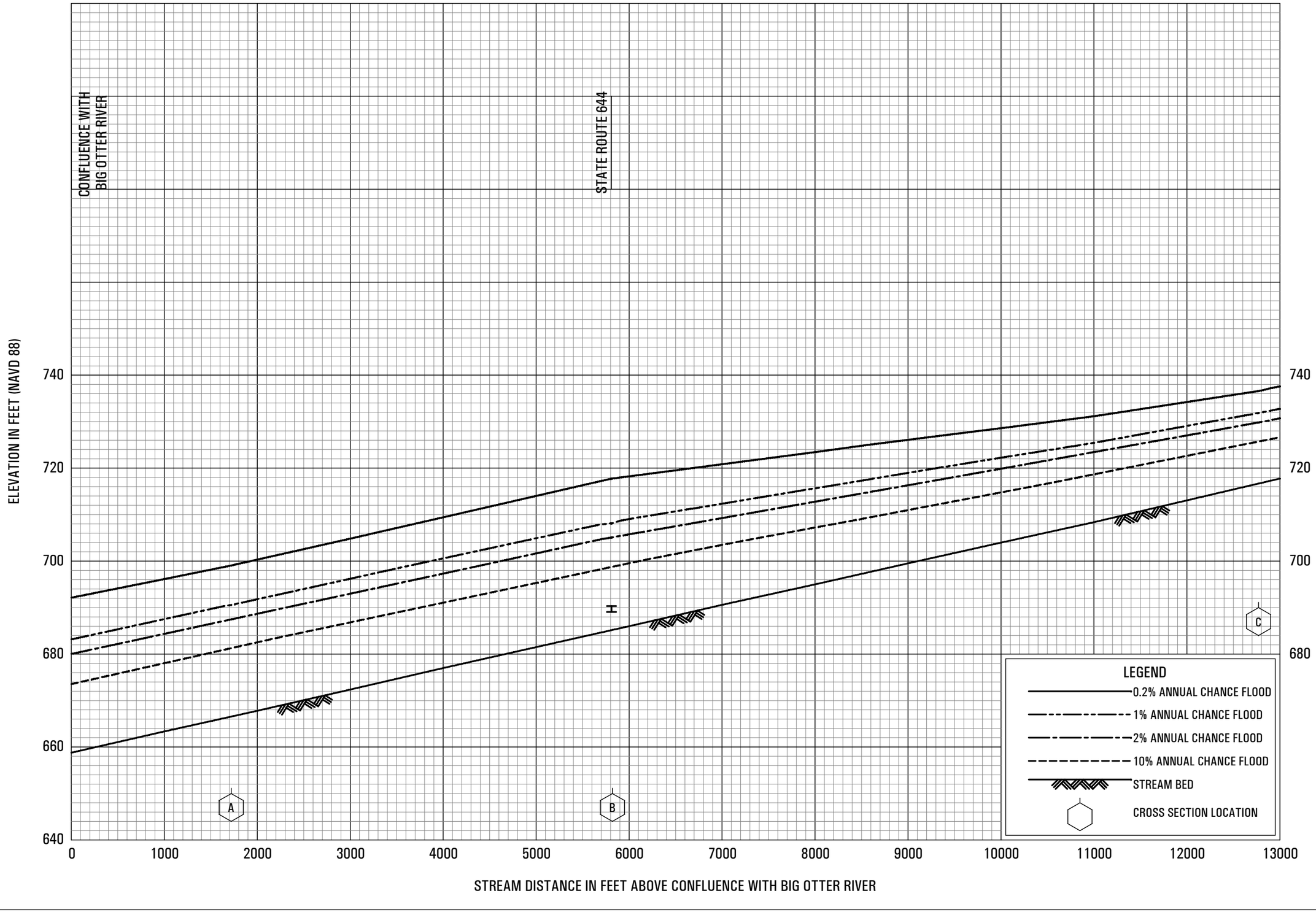
FLOOD PROFILES

NORTH FORK GOOSE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



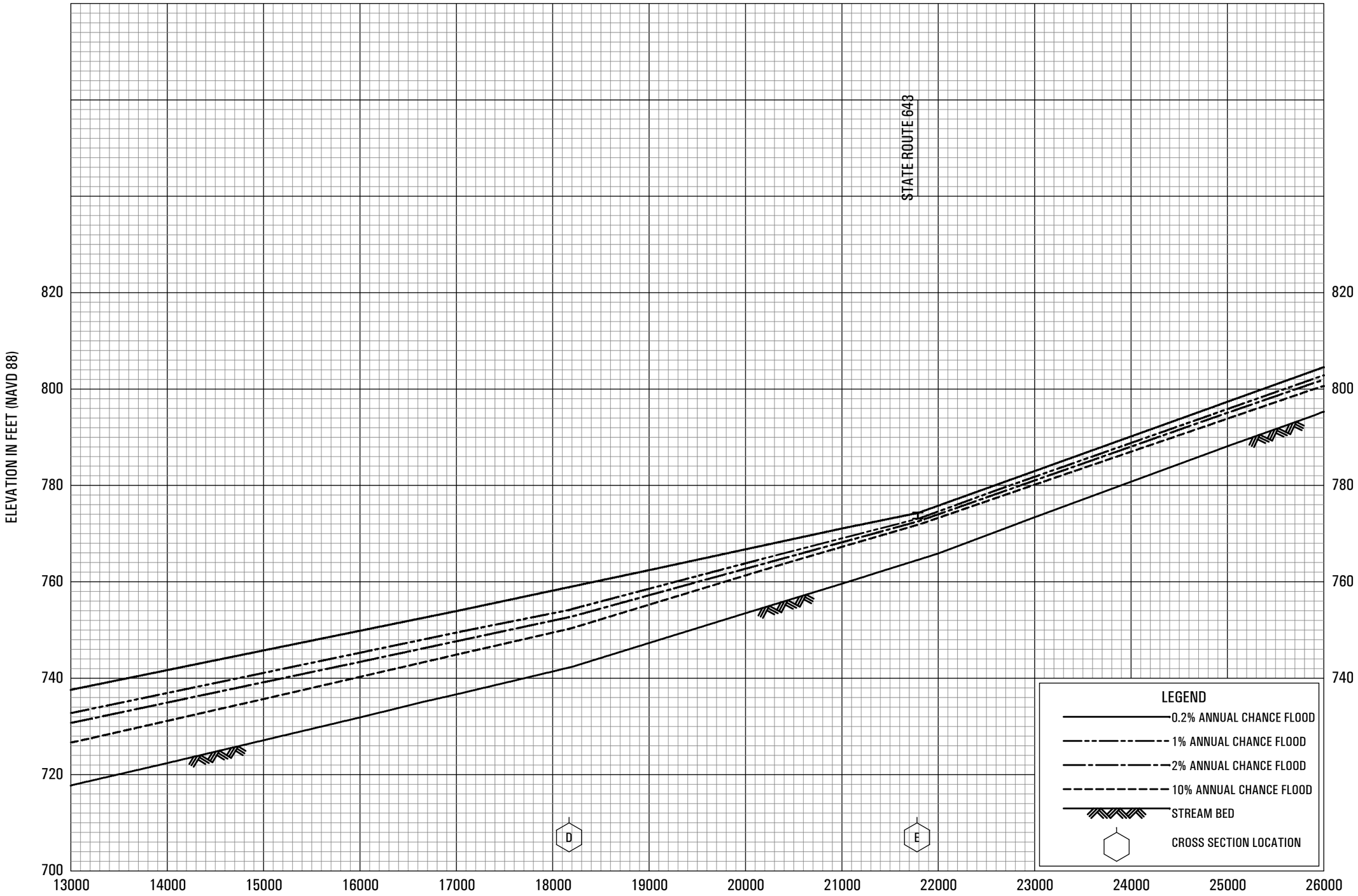
FLOOD PROFILES

NORTH OTTER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



FLOOD PROFILES

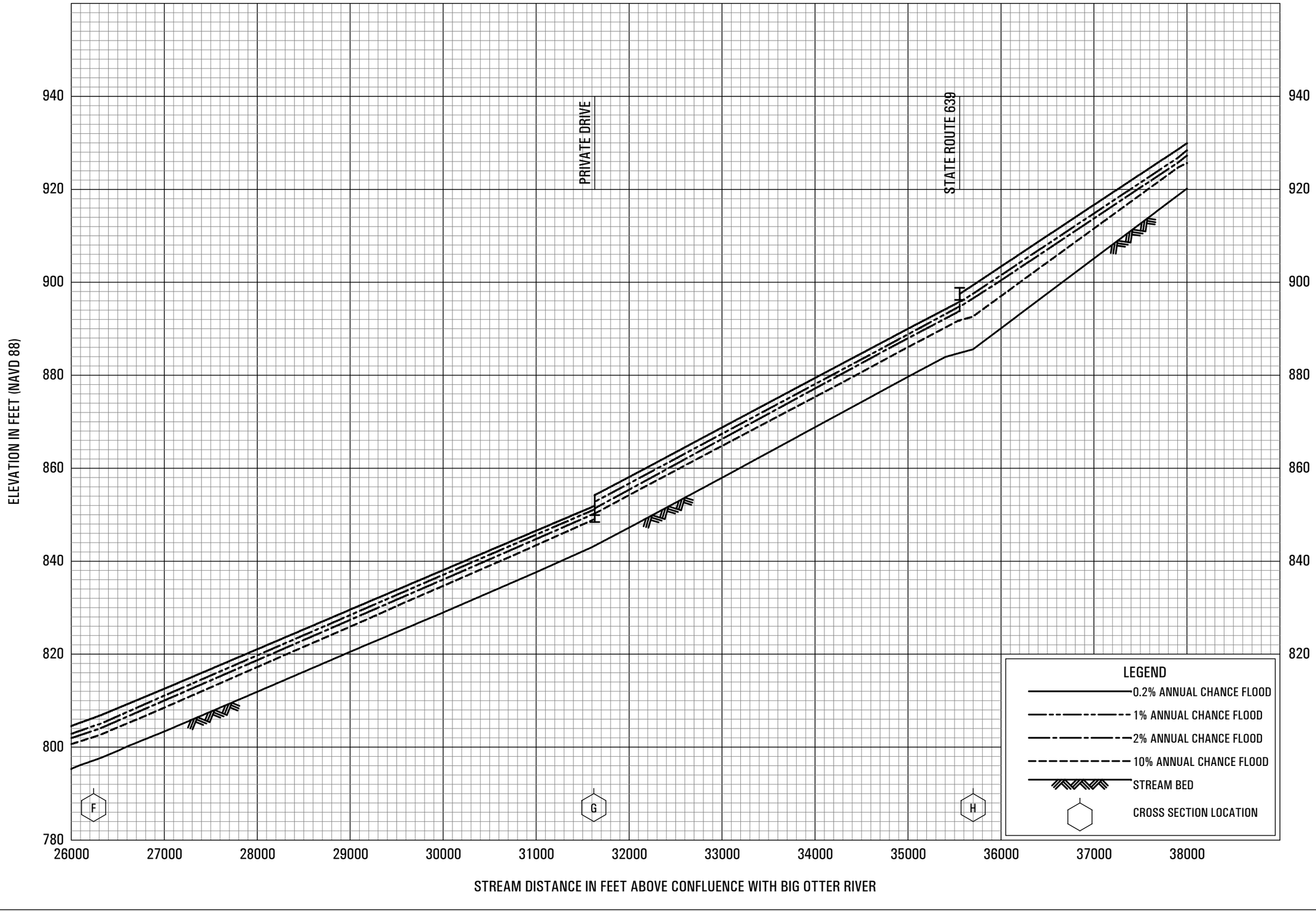
NORTH OTTER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

51P



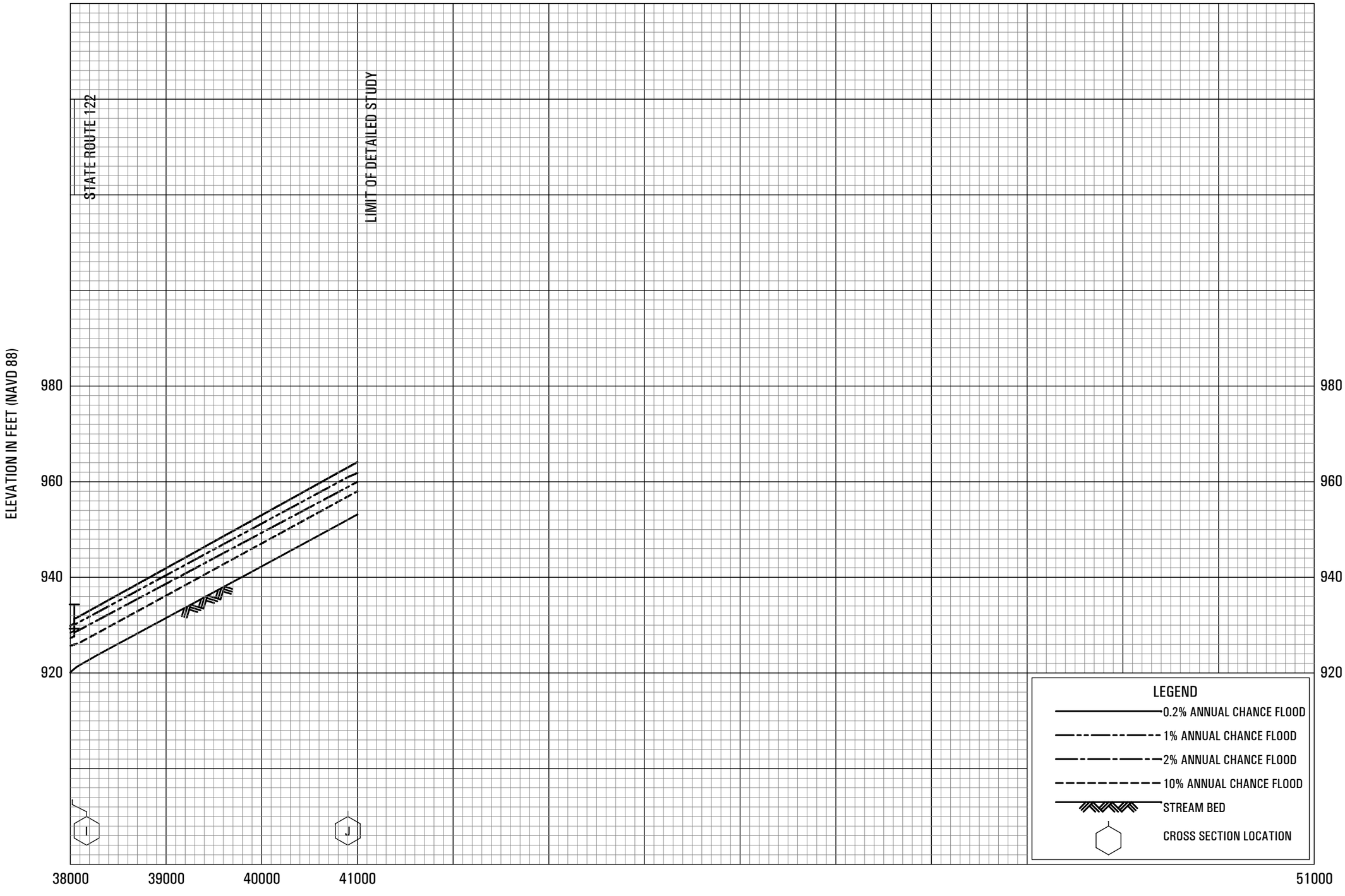
FLOOD PROFILES

NORTH OTTER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



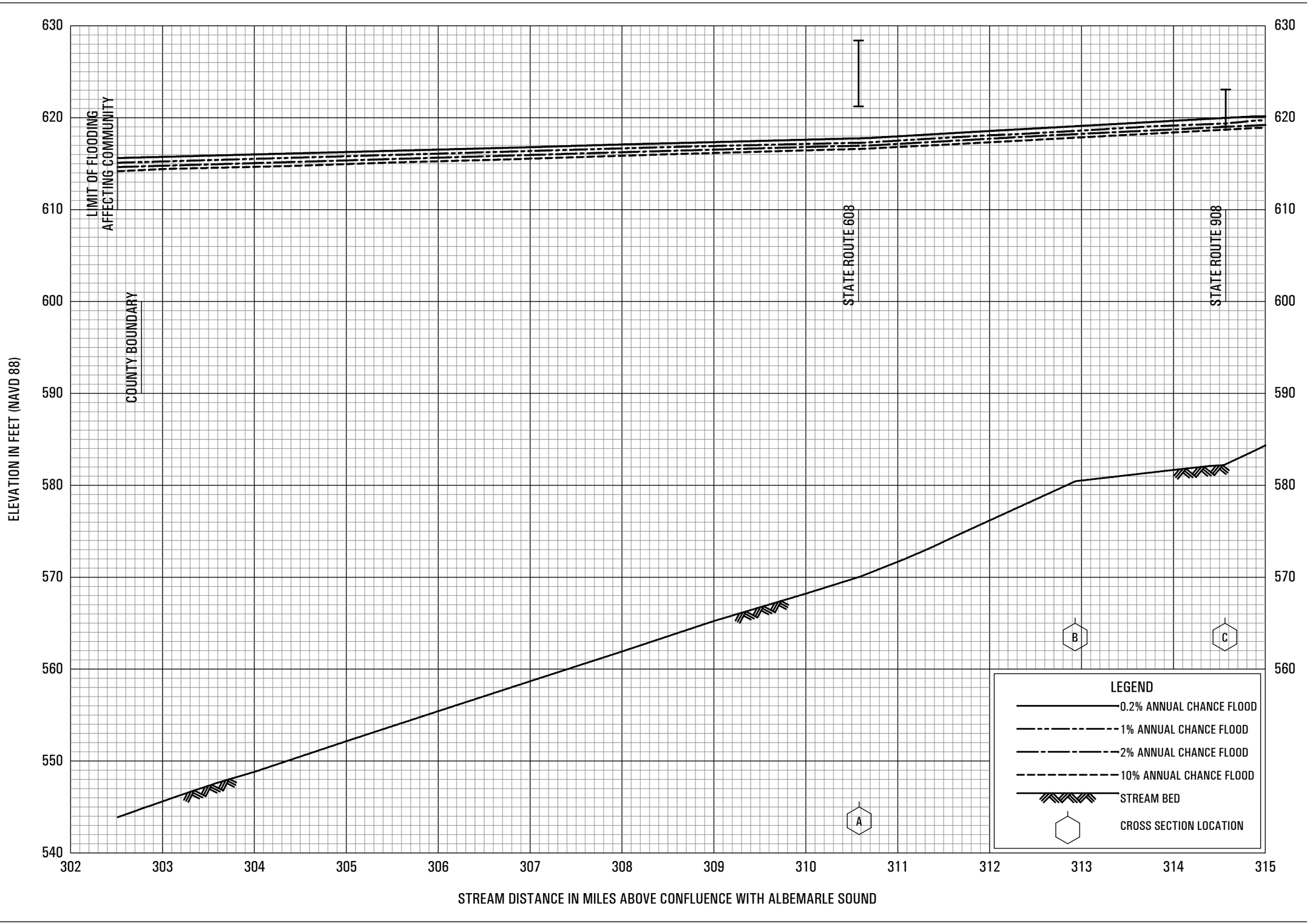
FLOOD PROFILES

NORTH OTTER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



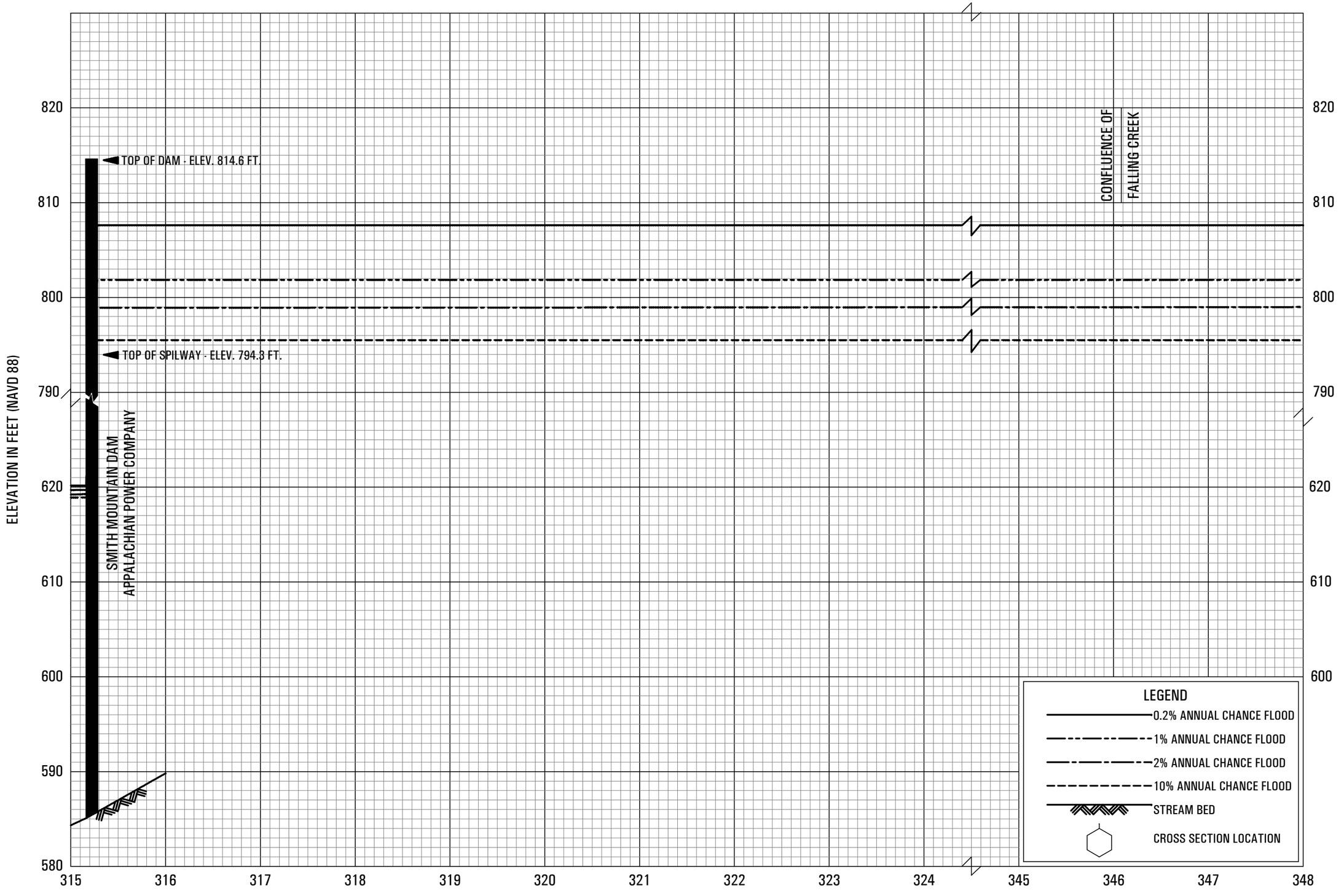
FLOOD PROFILES

ROANOKE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



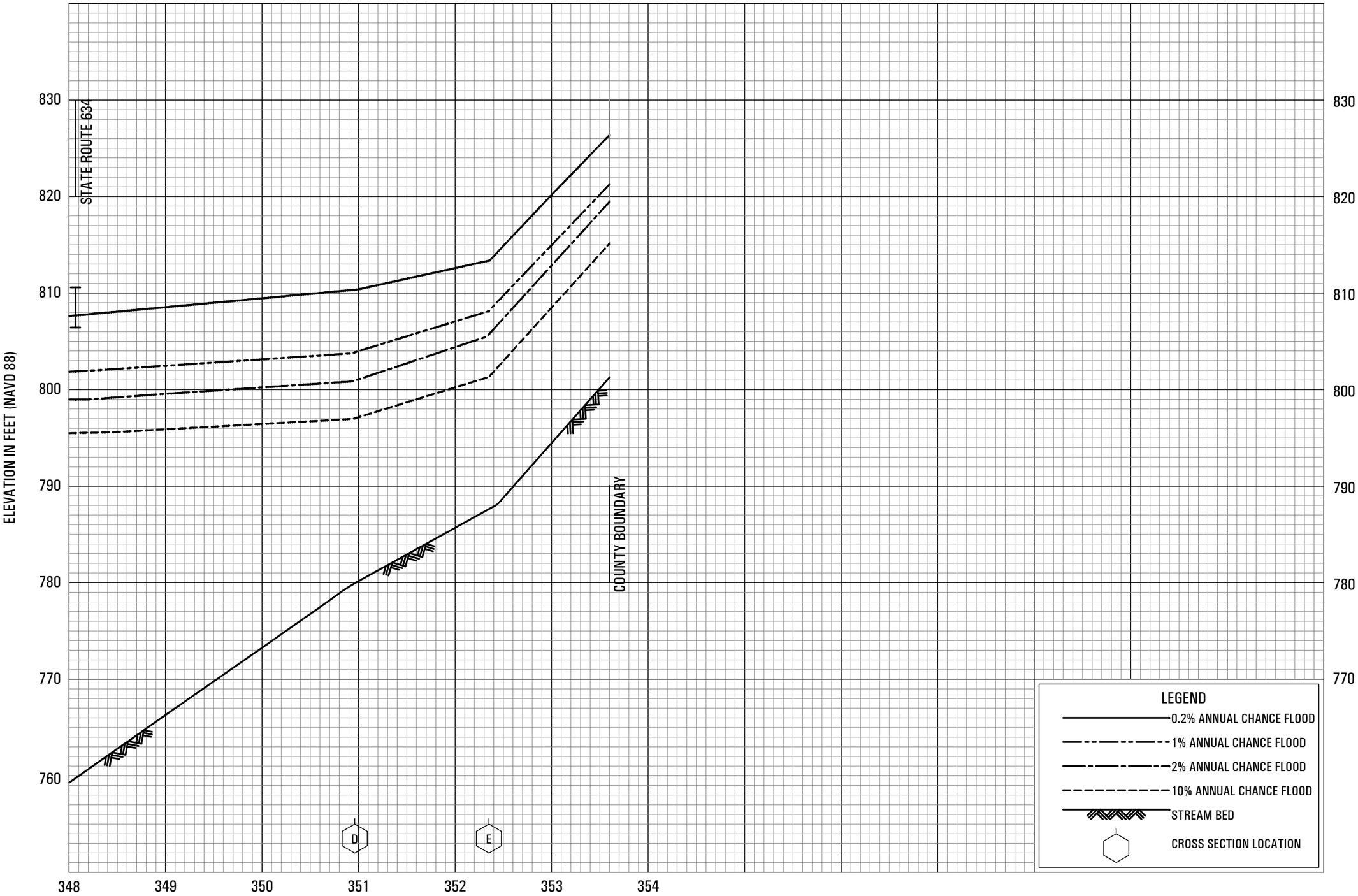
FLOOD PROFILES

ROANOKE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



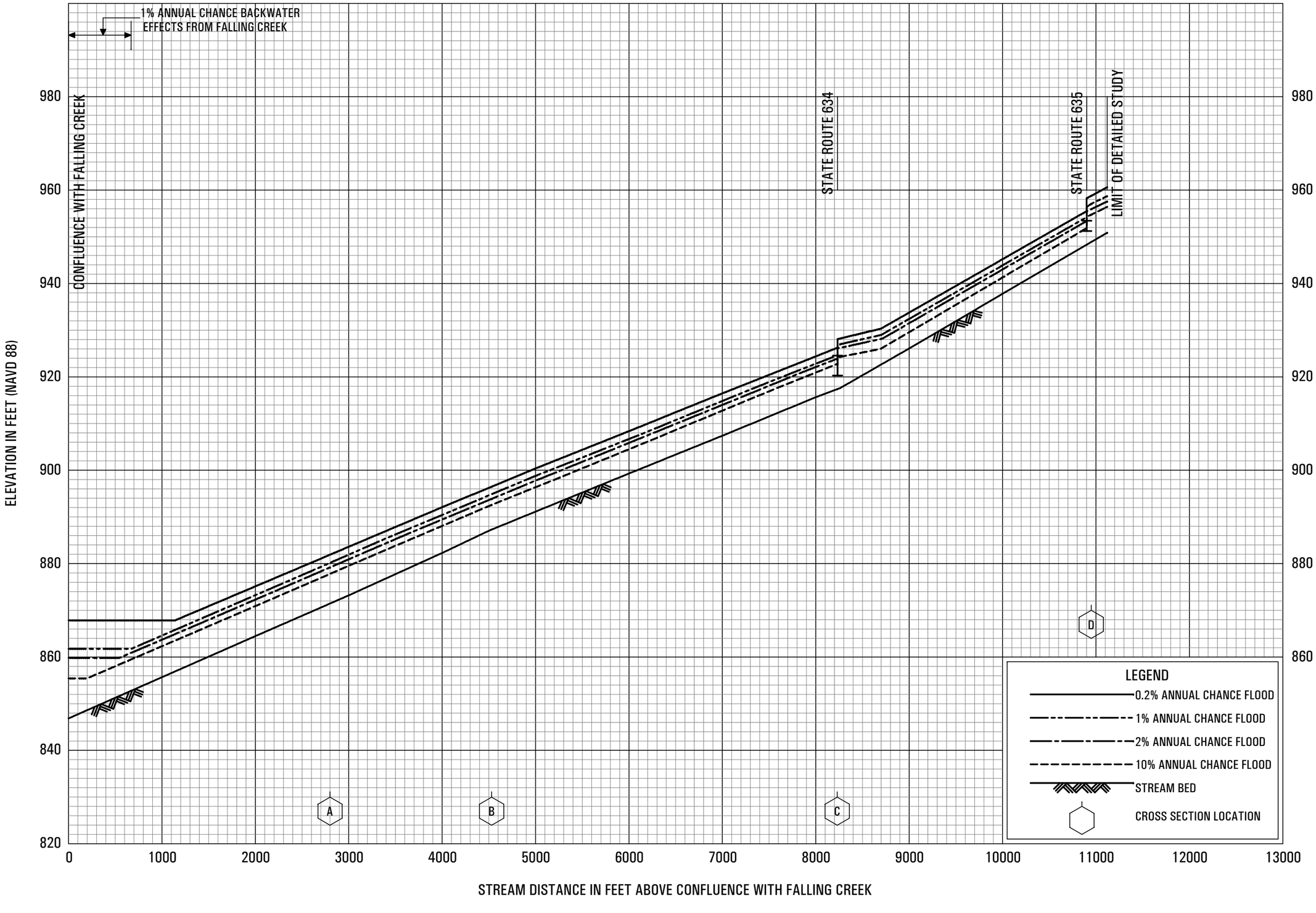
FLOOD PROFILES

ROANOKE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



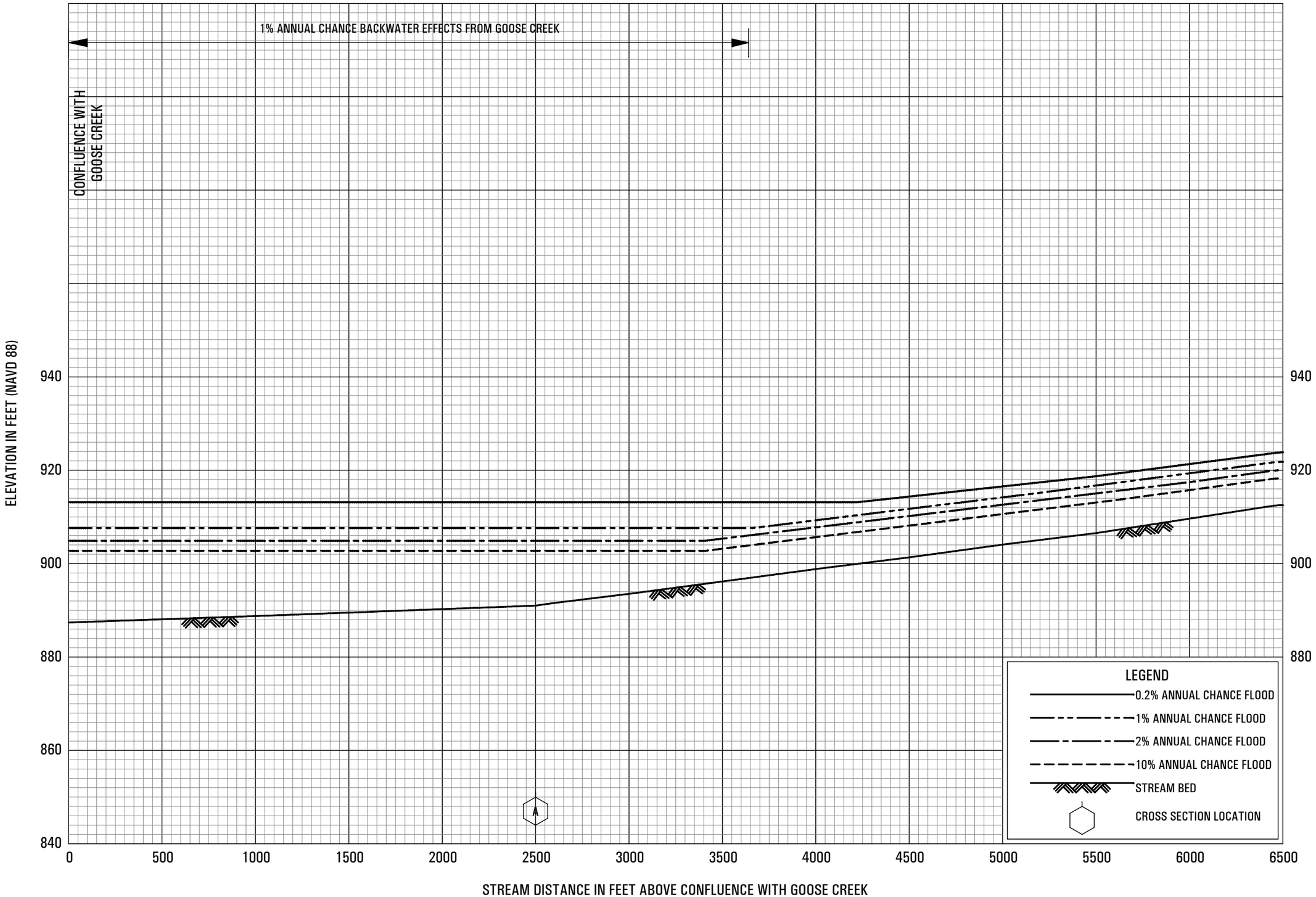
FLOOD PROFILES

SANDY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



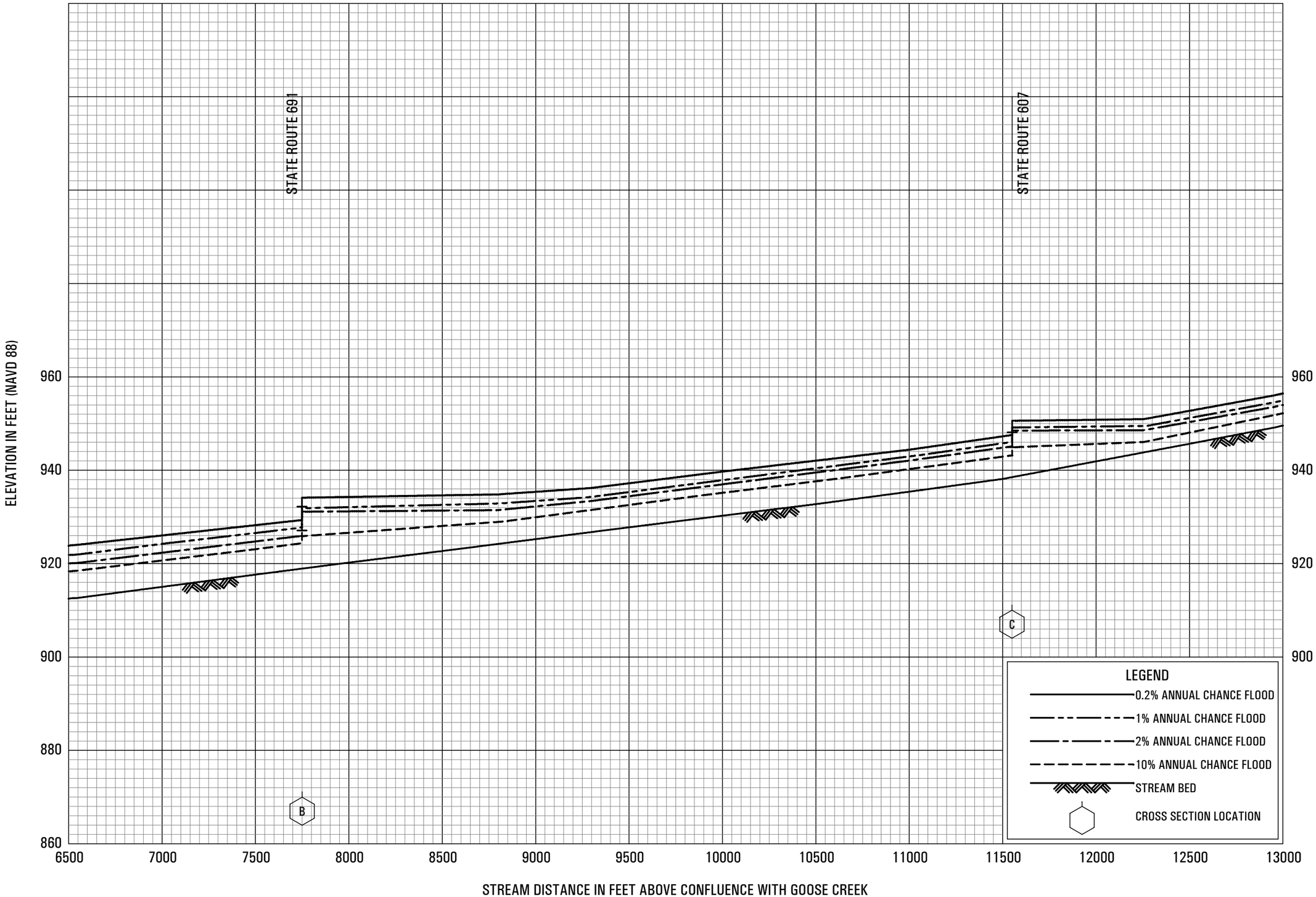
FLOOD PROFILES

SOUTH FORK GOOSE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



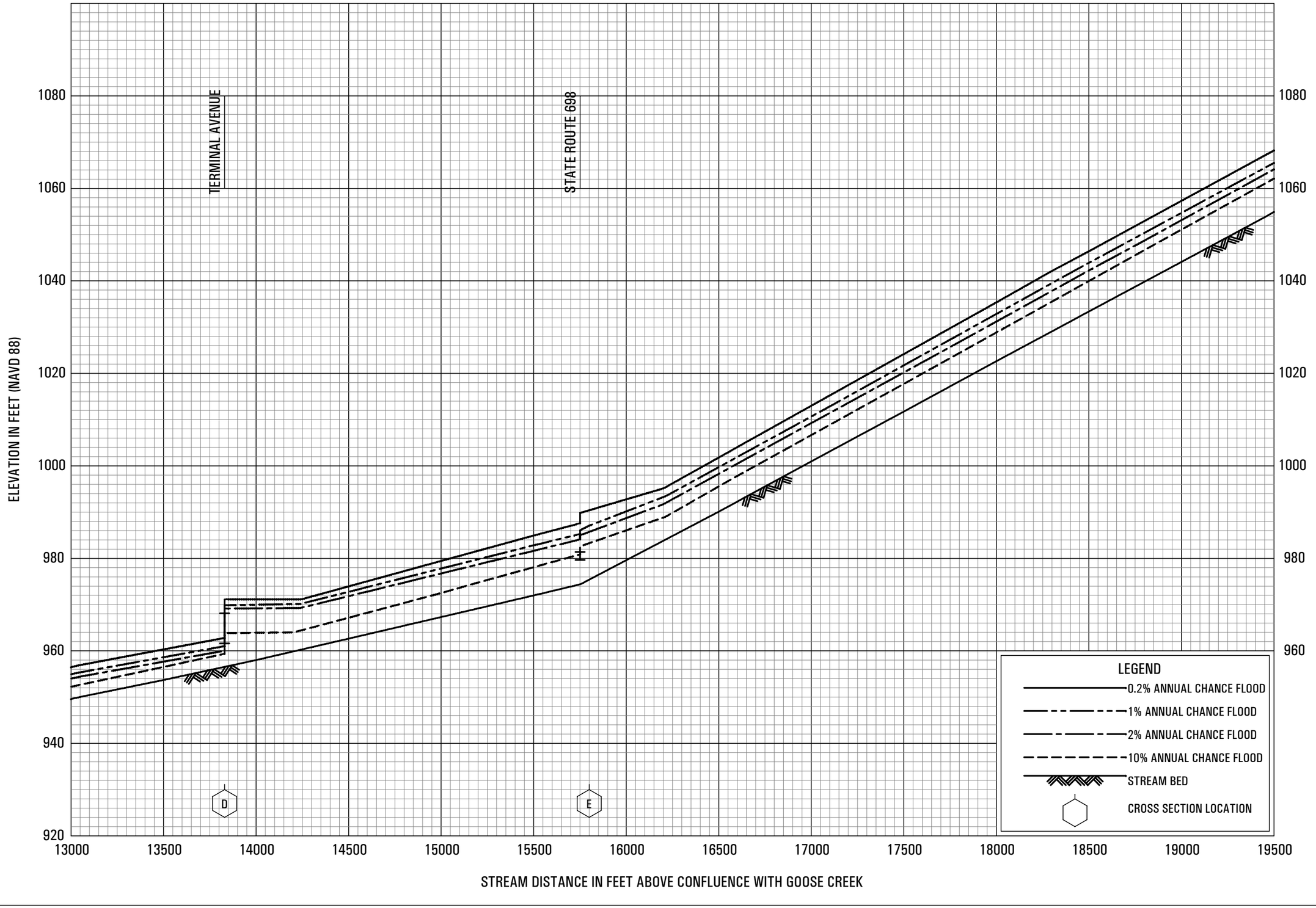
FLOOD PROFILES

SOUTH FORK GOOSE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



FLOOD PROFILES

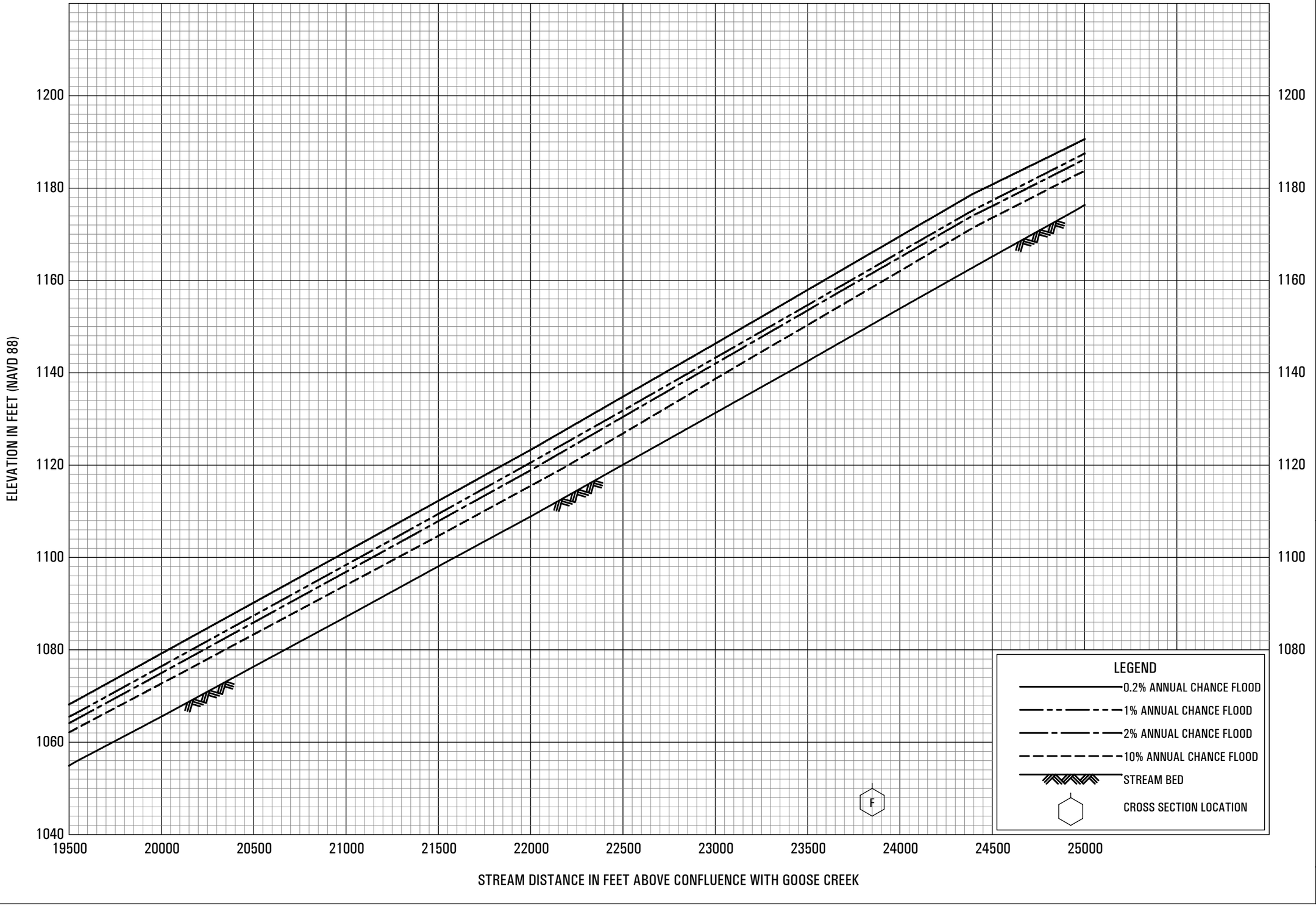
SOUTH FORK GOOSE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

60P



FLOOD PROFILES

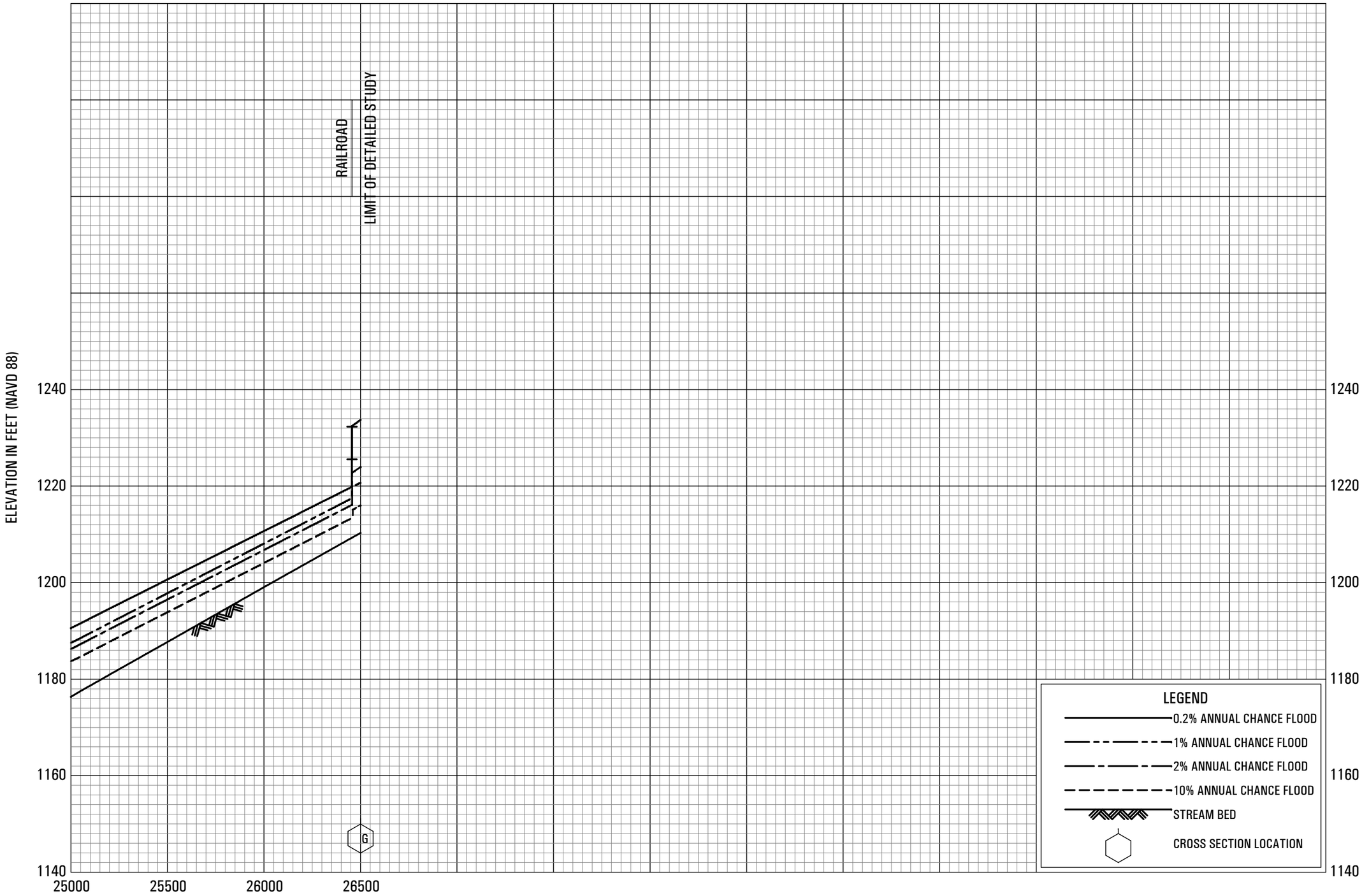
SOUTH FORK GOOSE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

61P



FLOOD PROFILES

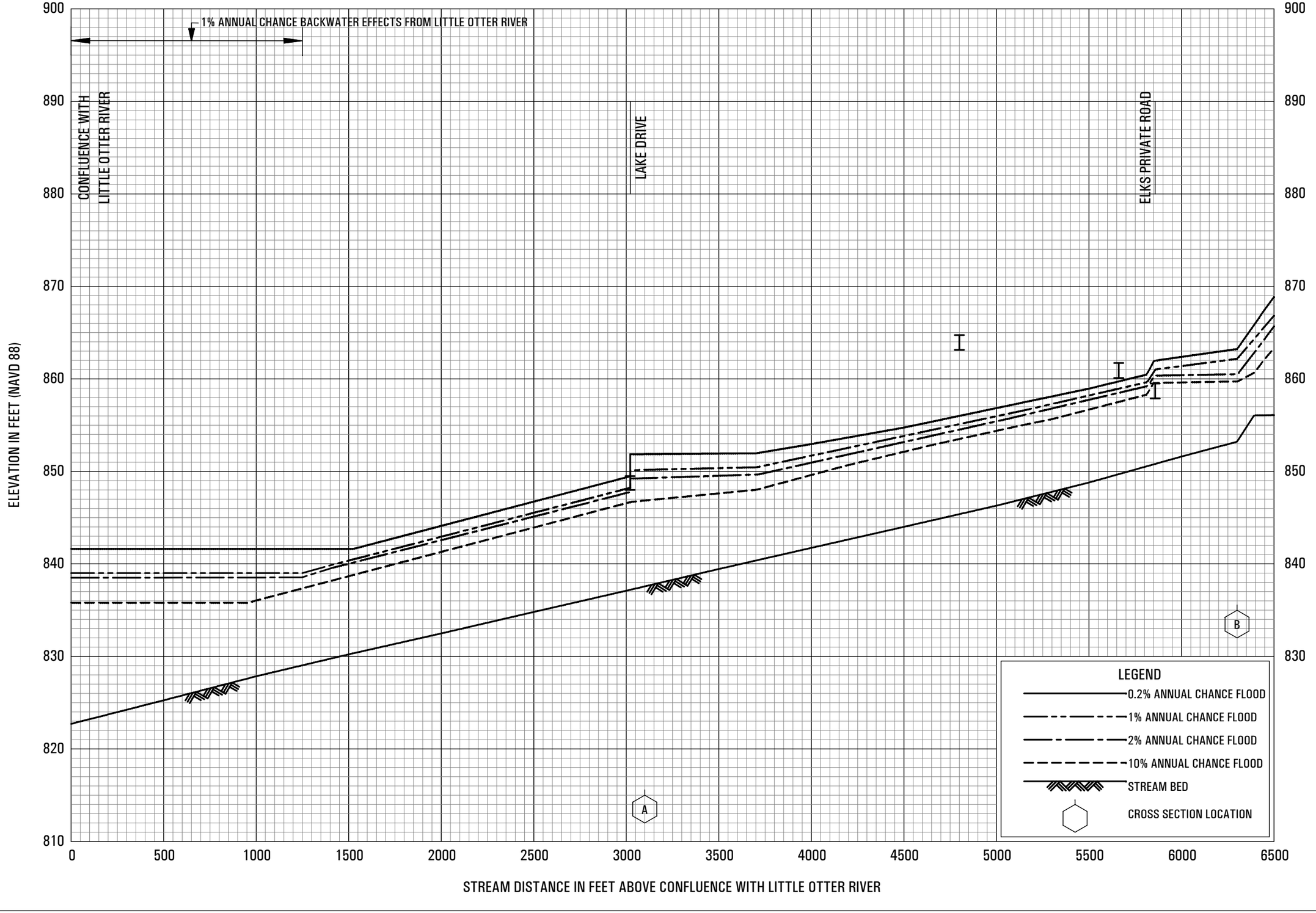
SOUTH FORK GOOSE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

62P



FLOOD PROFILES

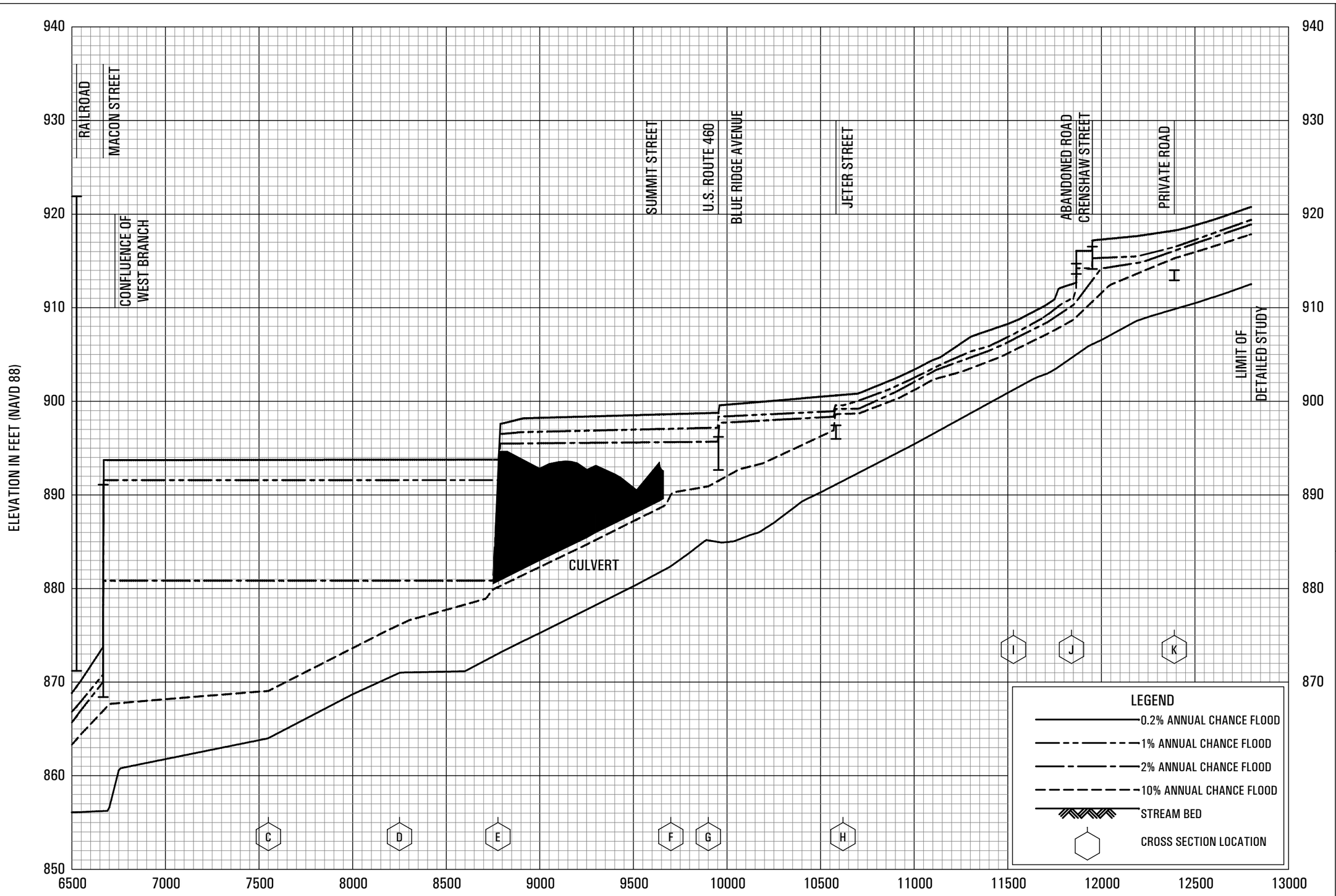
TRIBUTARY NO.1 TO LITTLE OTTER RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

63P



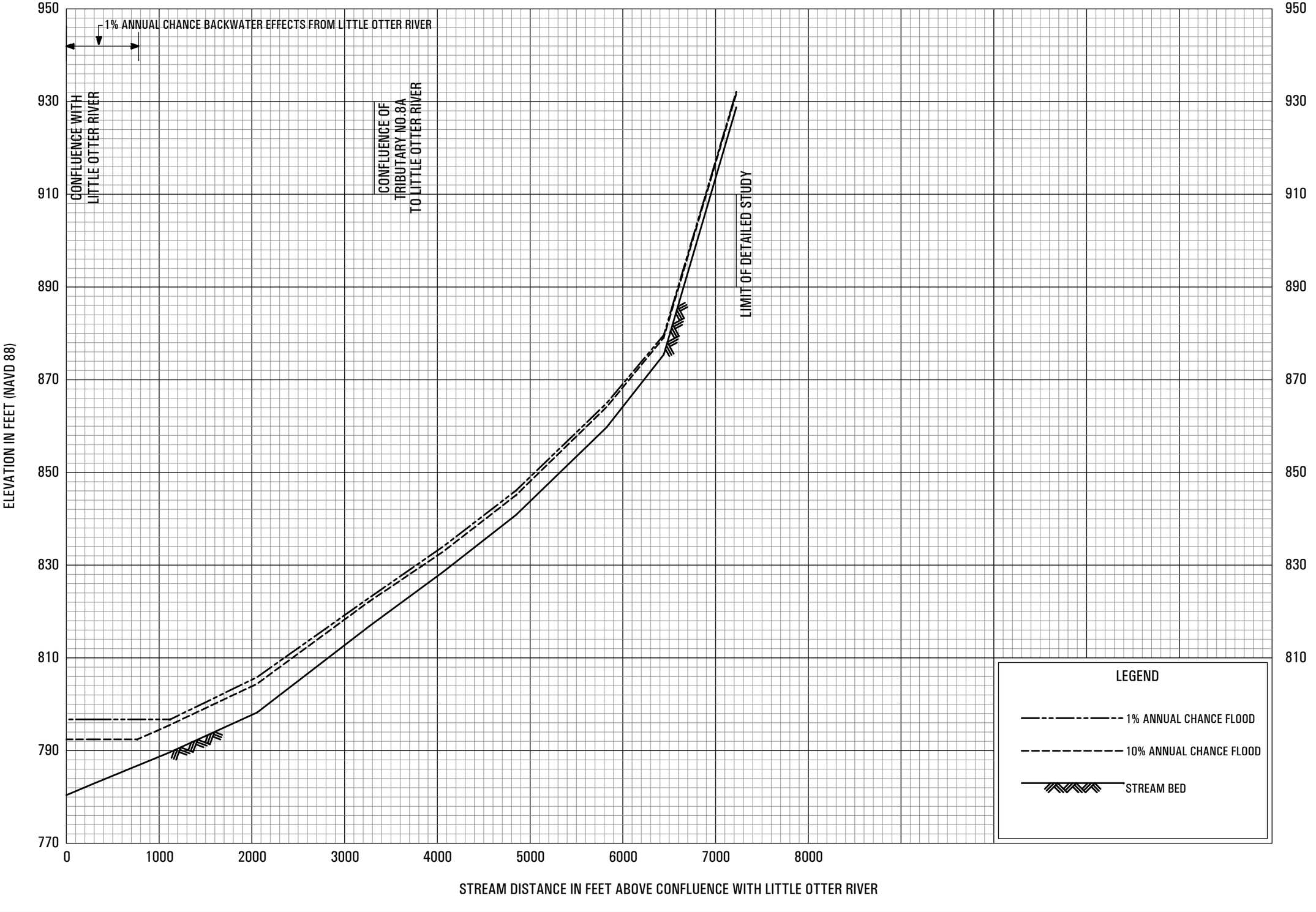
FLOOD PROFILES

TRIBUTARY NO.1 TO LITTLE OTTER RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



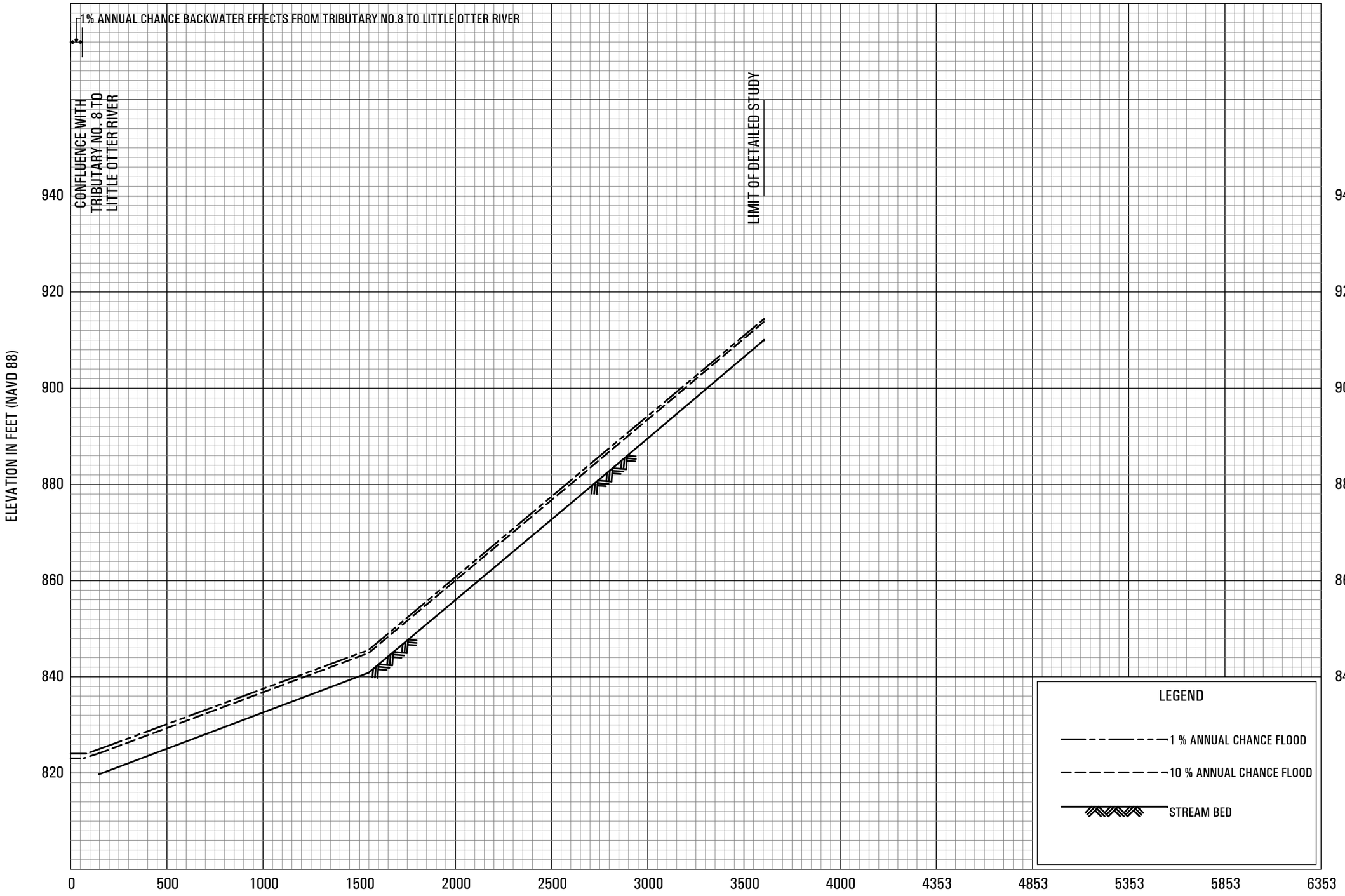
FLOOD PROFILES

TRIBUTARY NO. 8 TO LITTLE OTTER RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



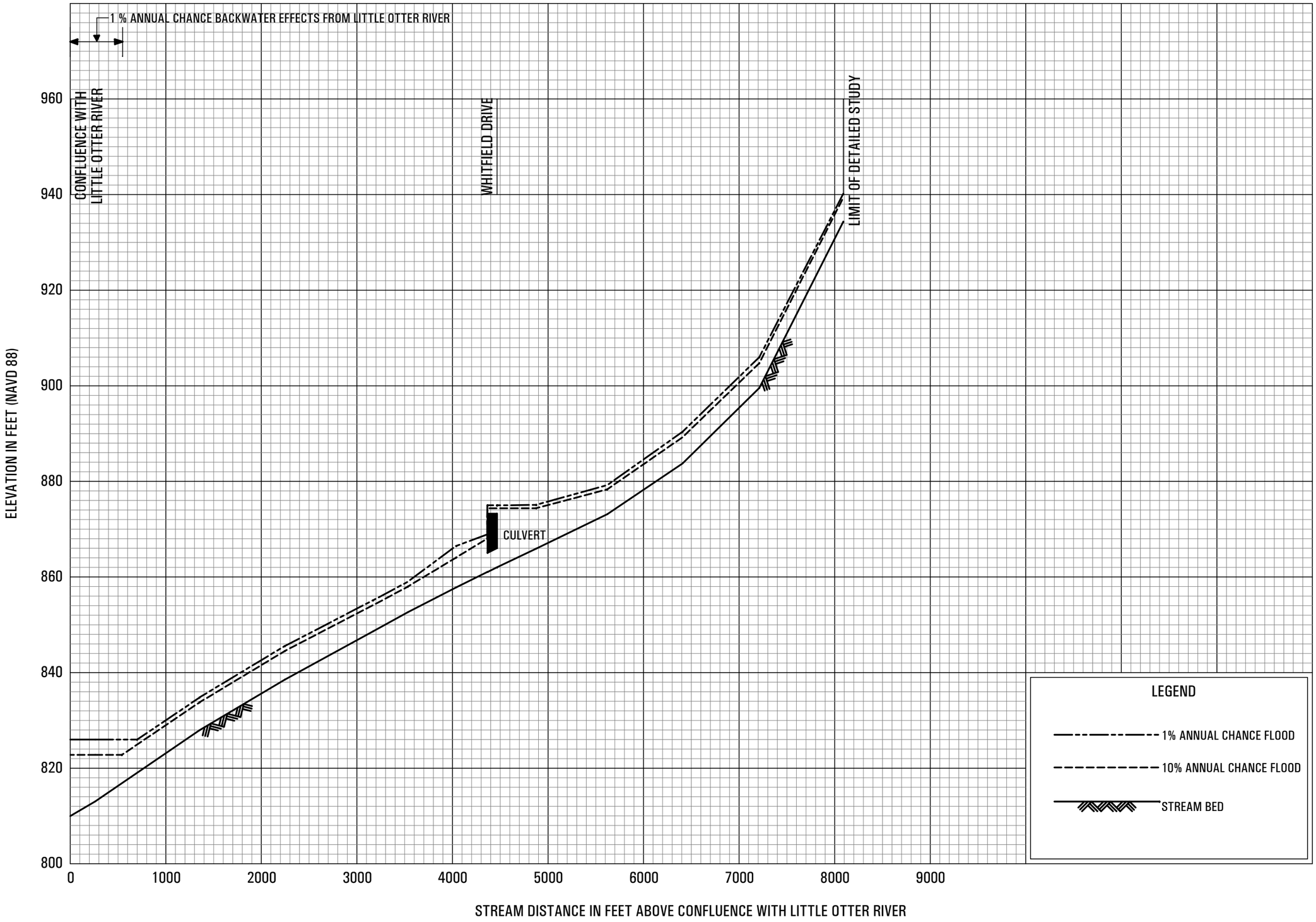
FLOOD PROFILES

TRIBUTARY NO. 8A TO LITTLE OTTER RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



FLOOD PROFILES

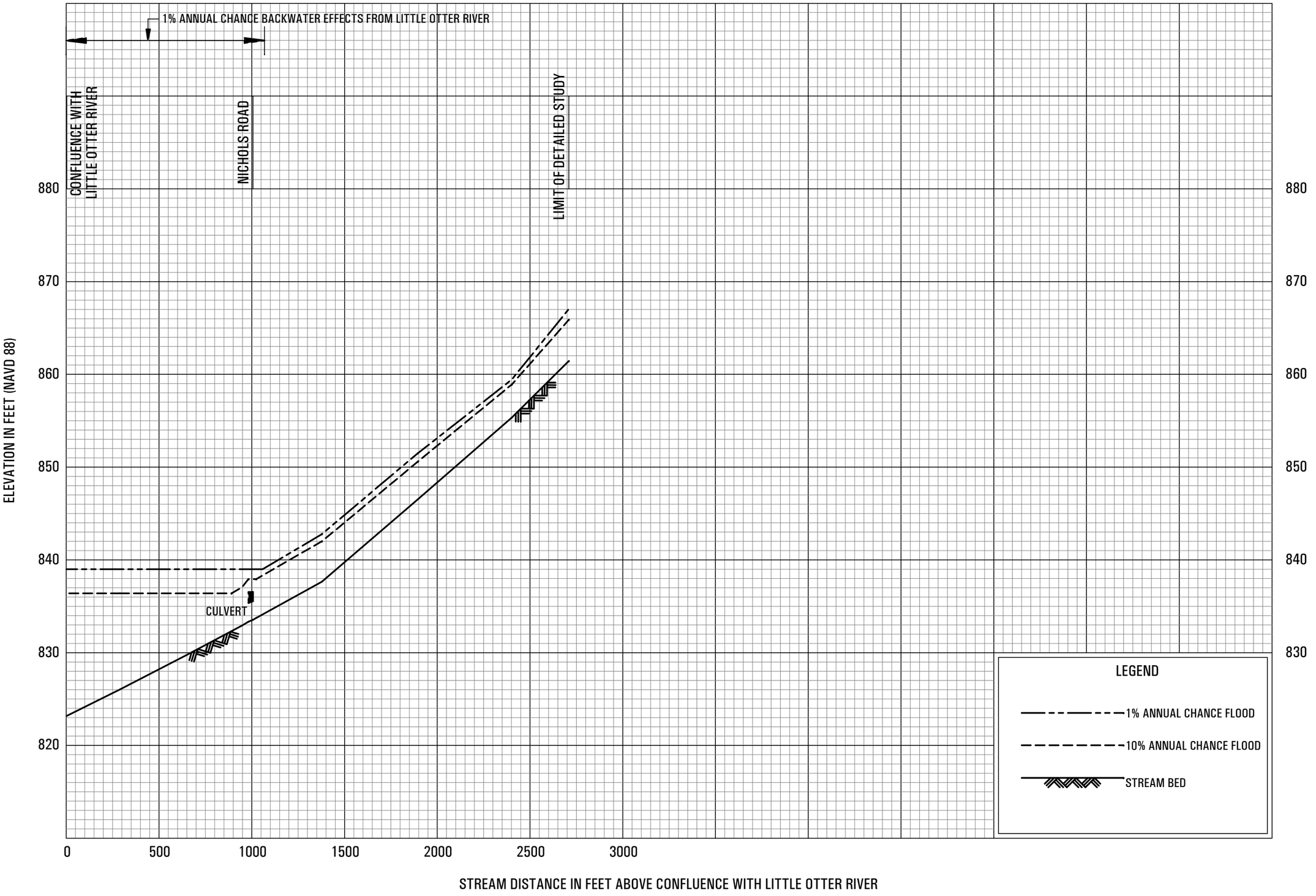
TRIBUTARY NO. 9 TO LITTLE OTTER RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

67P



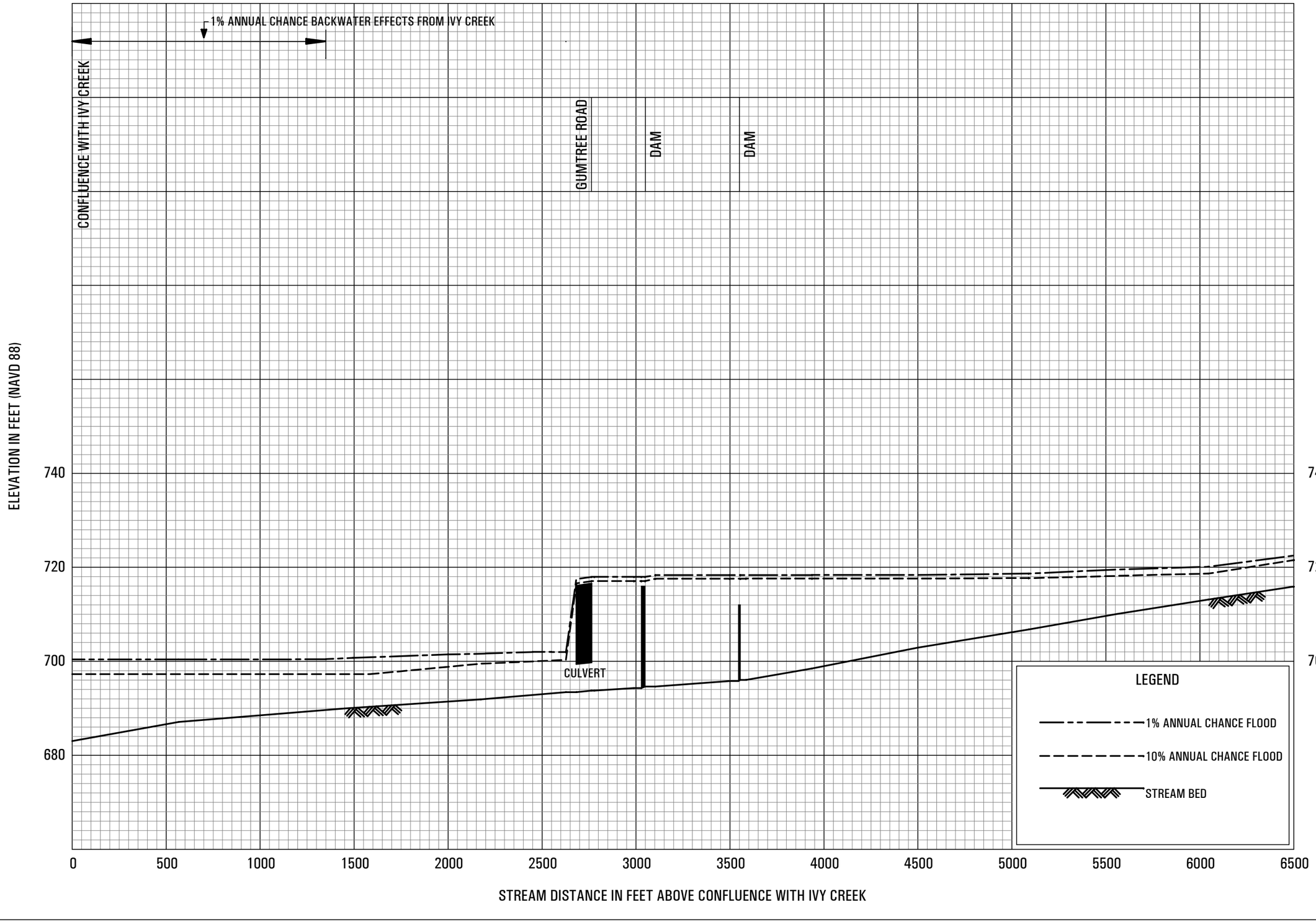
FLOOD PROFILES

TRIBUTARY NO. 10 TO LITTLE OTTER RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



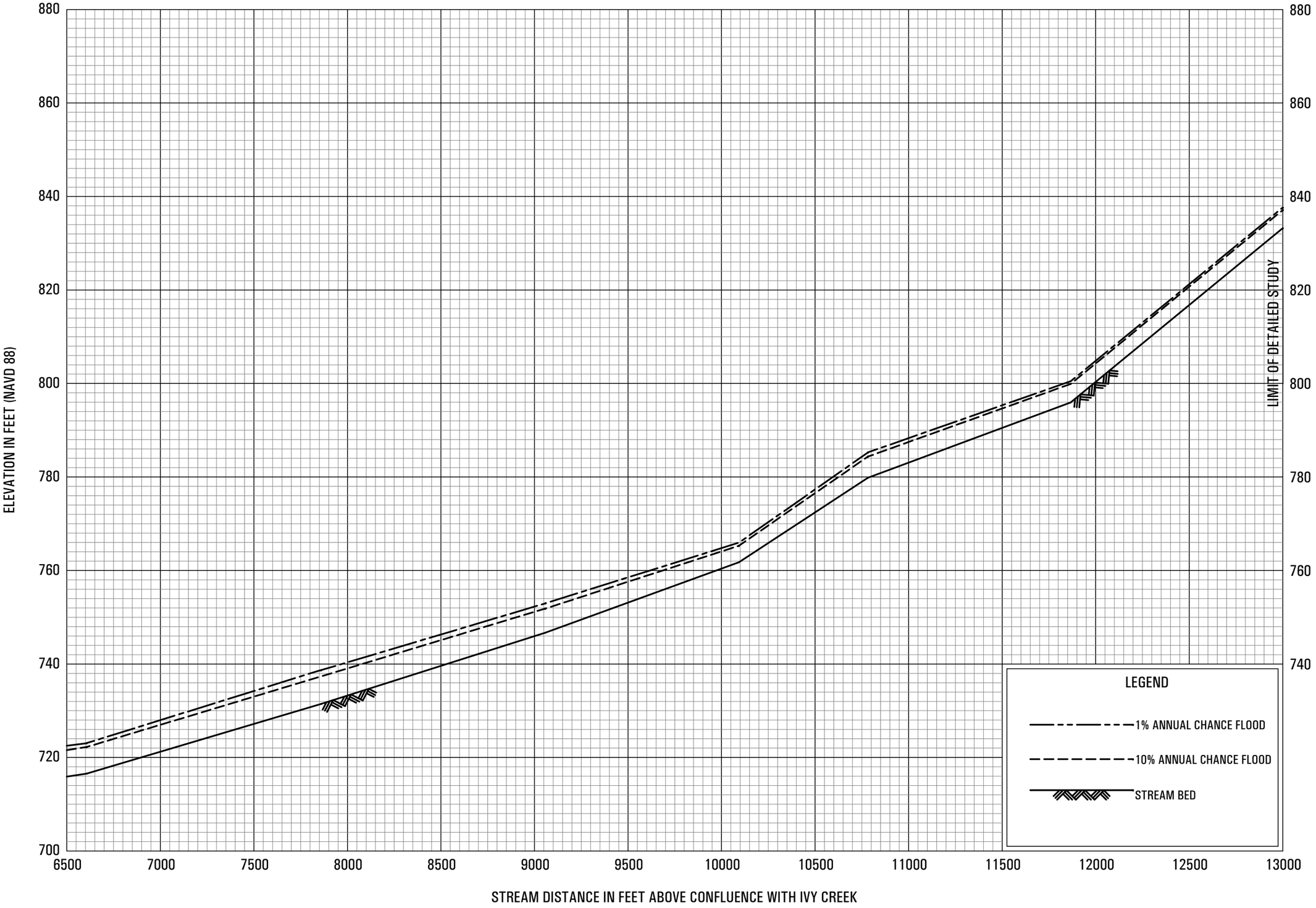
FLOOD PROFILES

TRIBUTARY NO. 10 TO IVY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



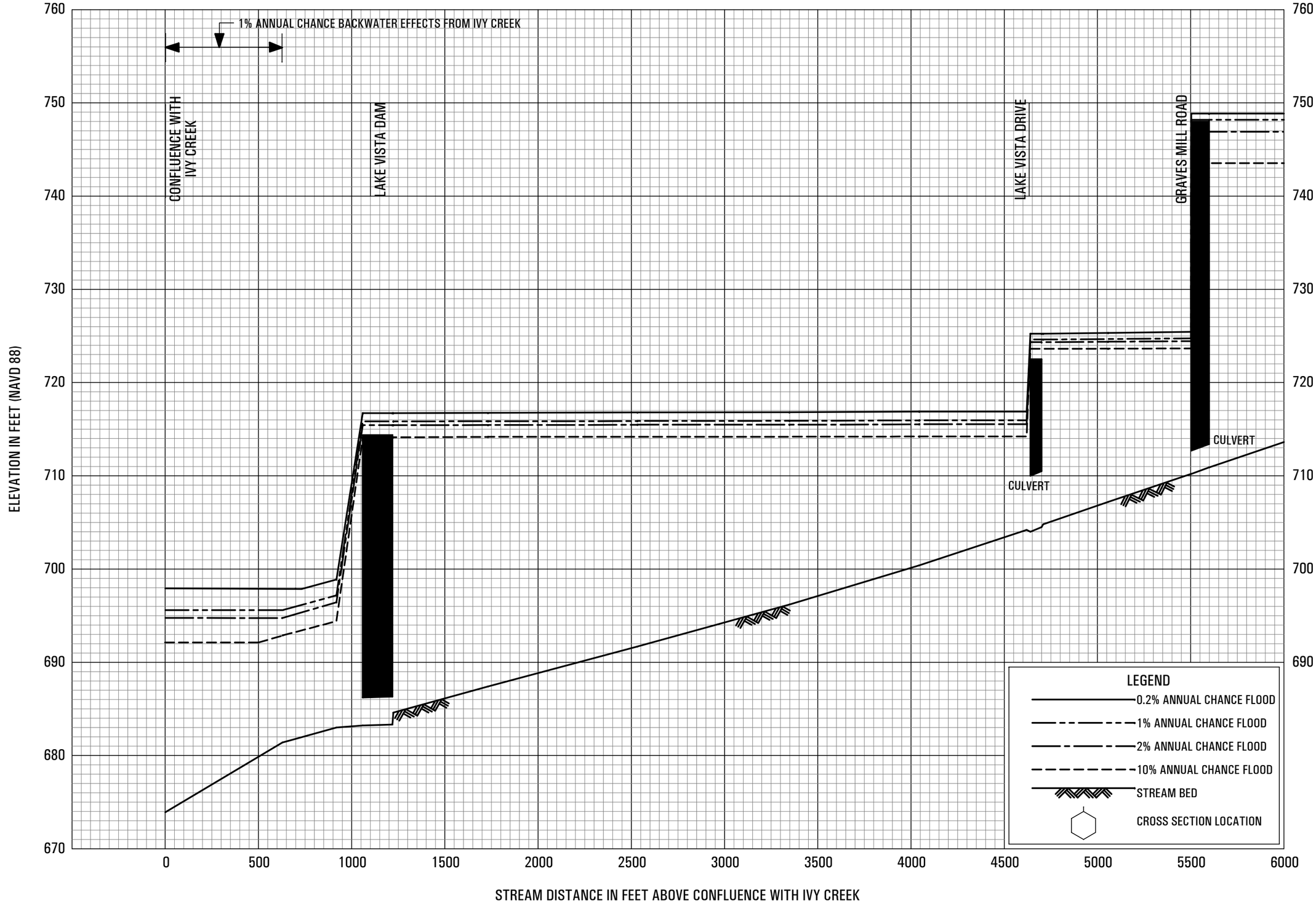
FLOOD PROFILES

TRIBUTARY NO. 10 TO IVY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



FLOOD PROFILES

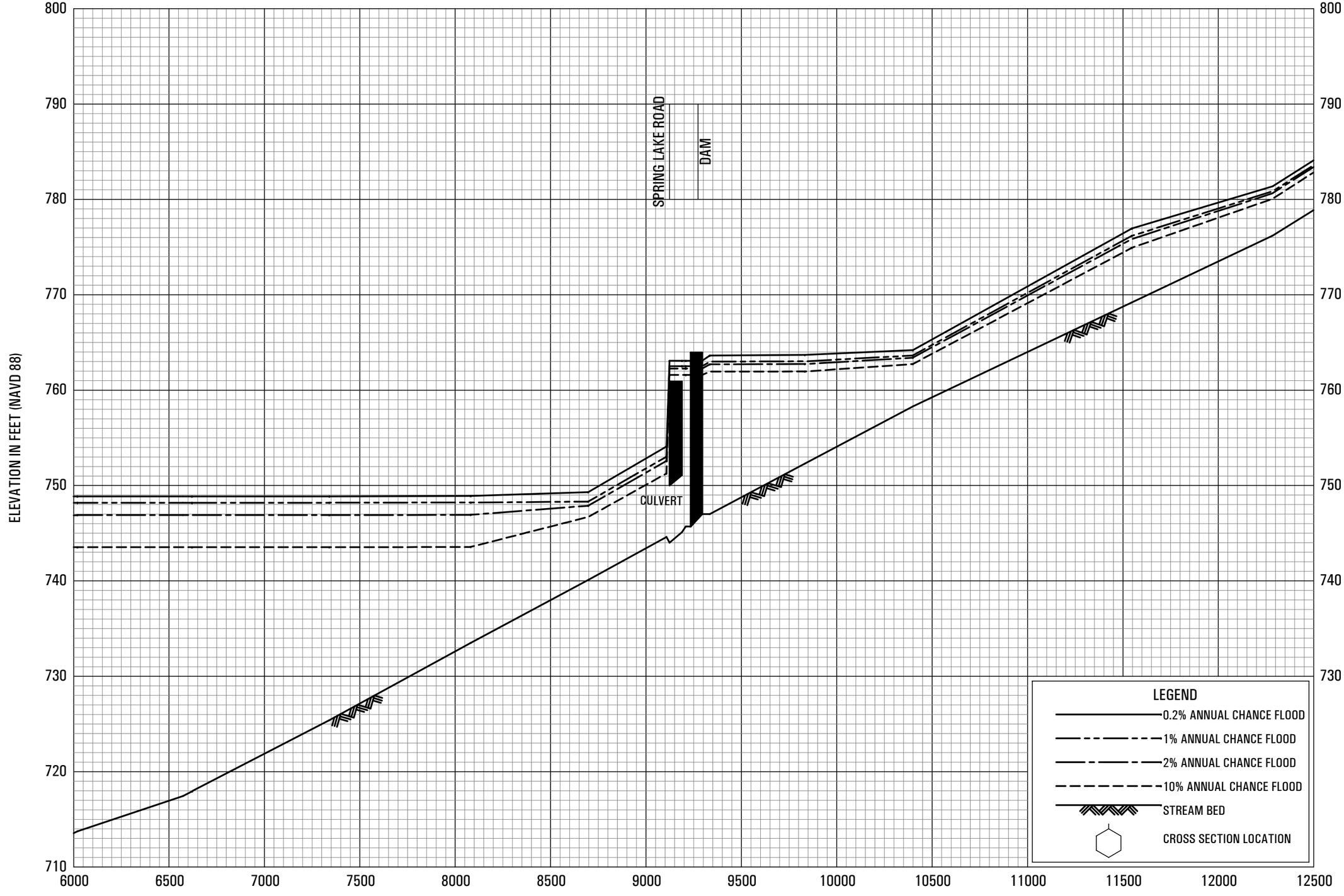
TRIBUTARY NO.11 TO IVY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

71P



FLOOD PROFILES

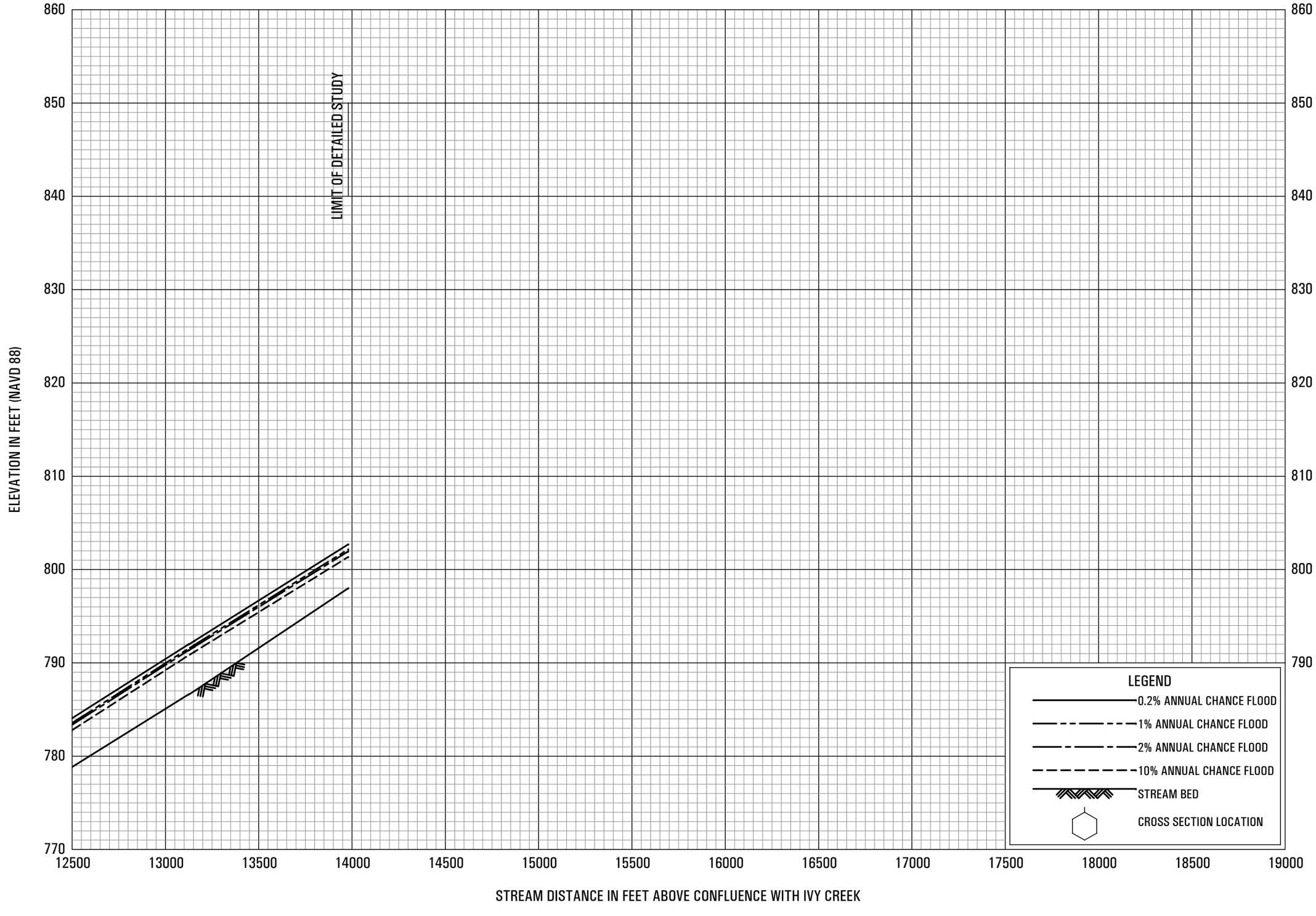
TRIBUTARY NO.11 TO IVY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

72P



FLOOD PROFILES

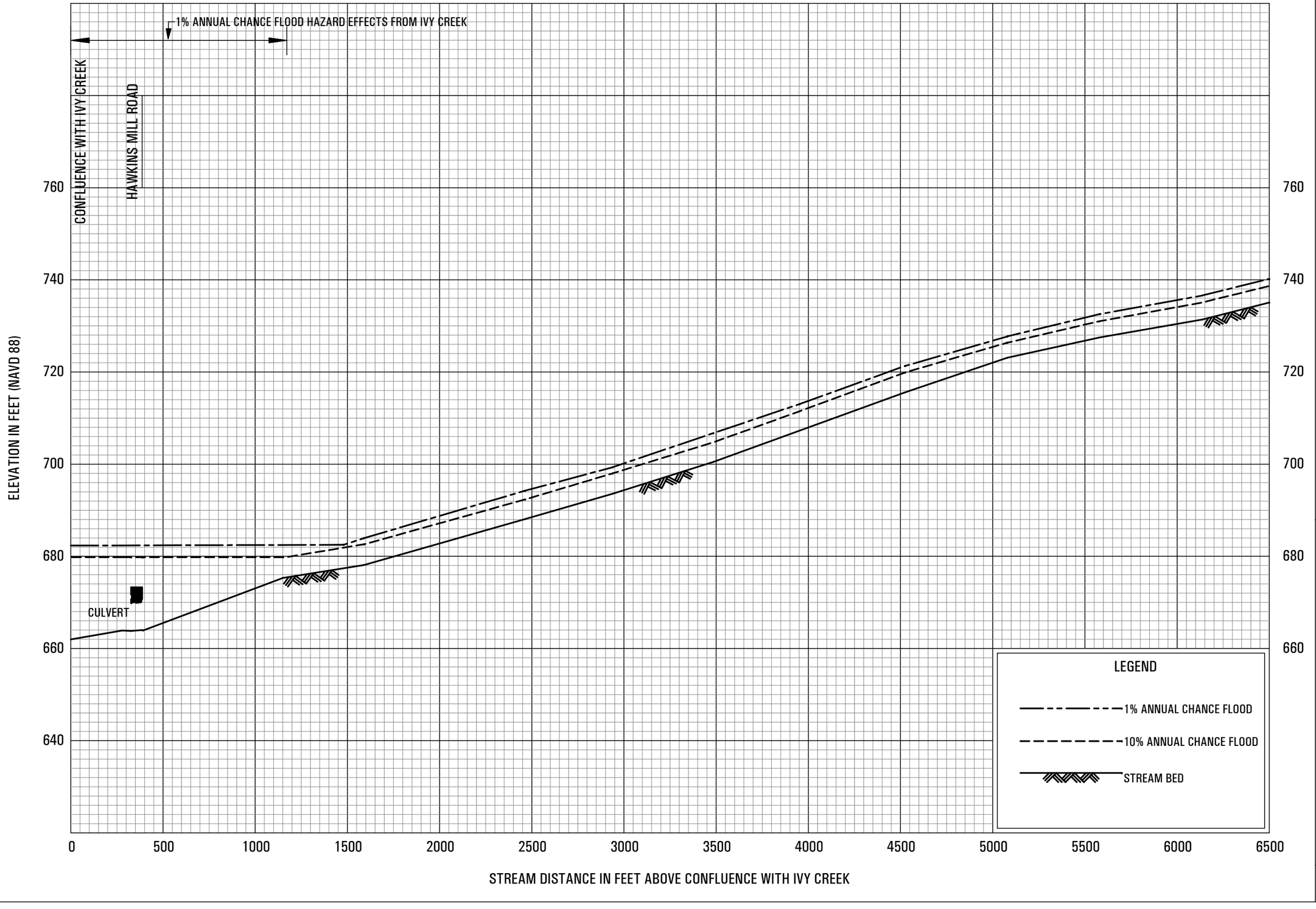
TRIBUTARY NO.11 TO IVY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

72aP



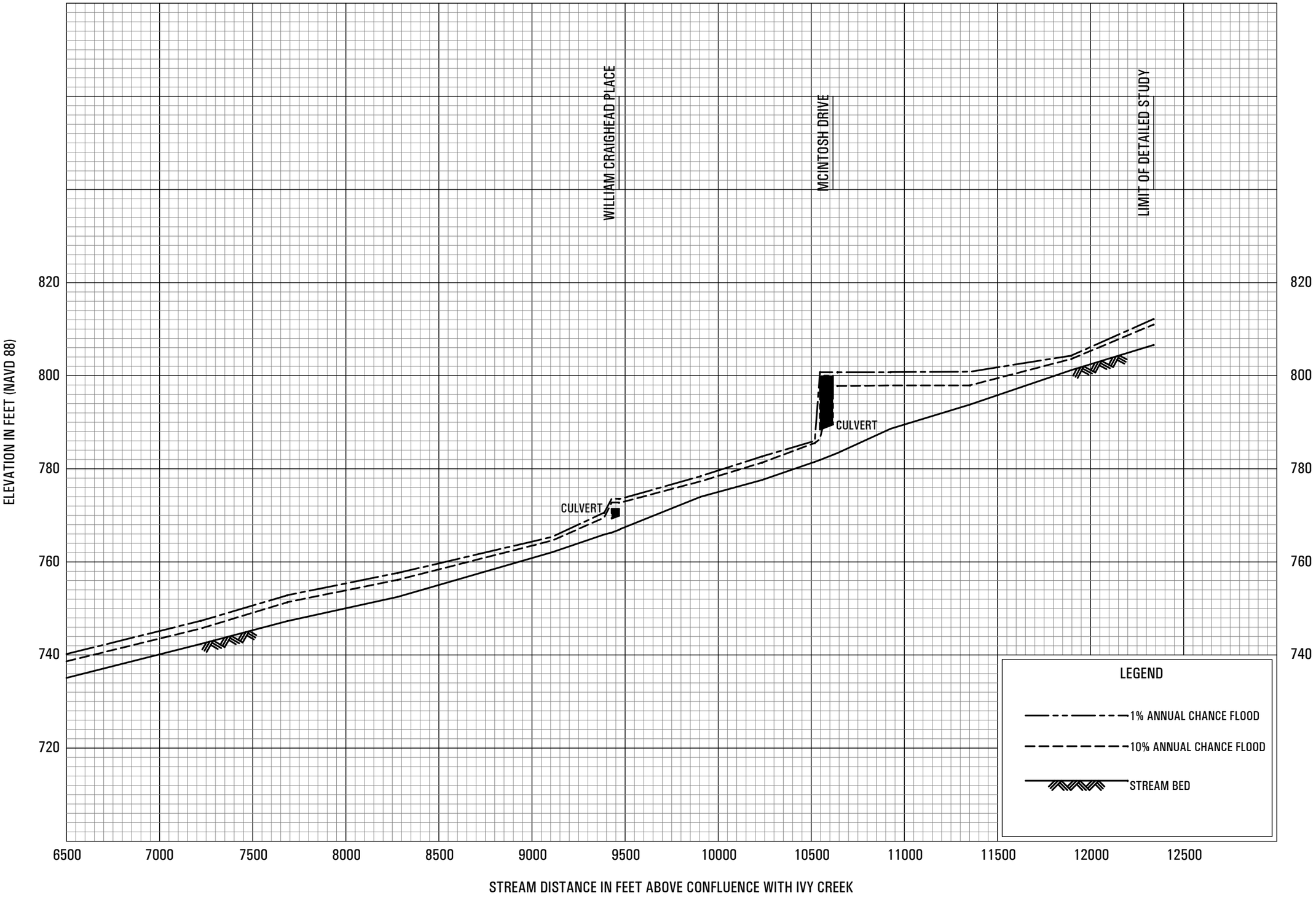
FLOOD PROFILES

TRIBUTARY NO. 14 TO IVY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



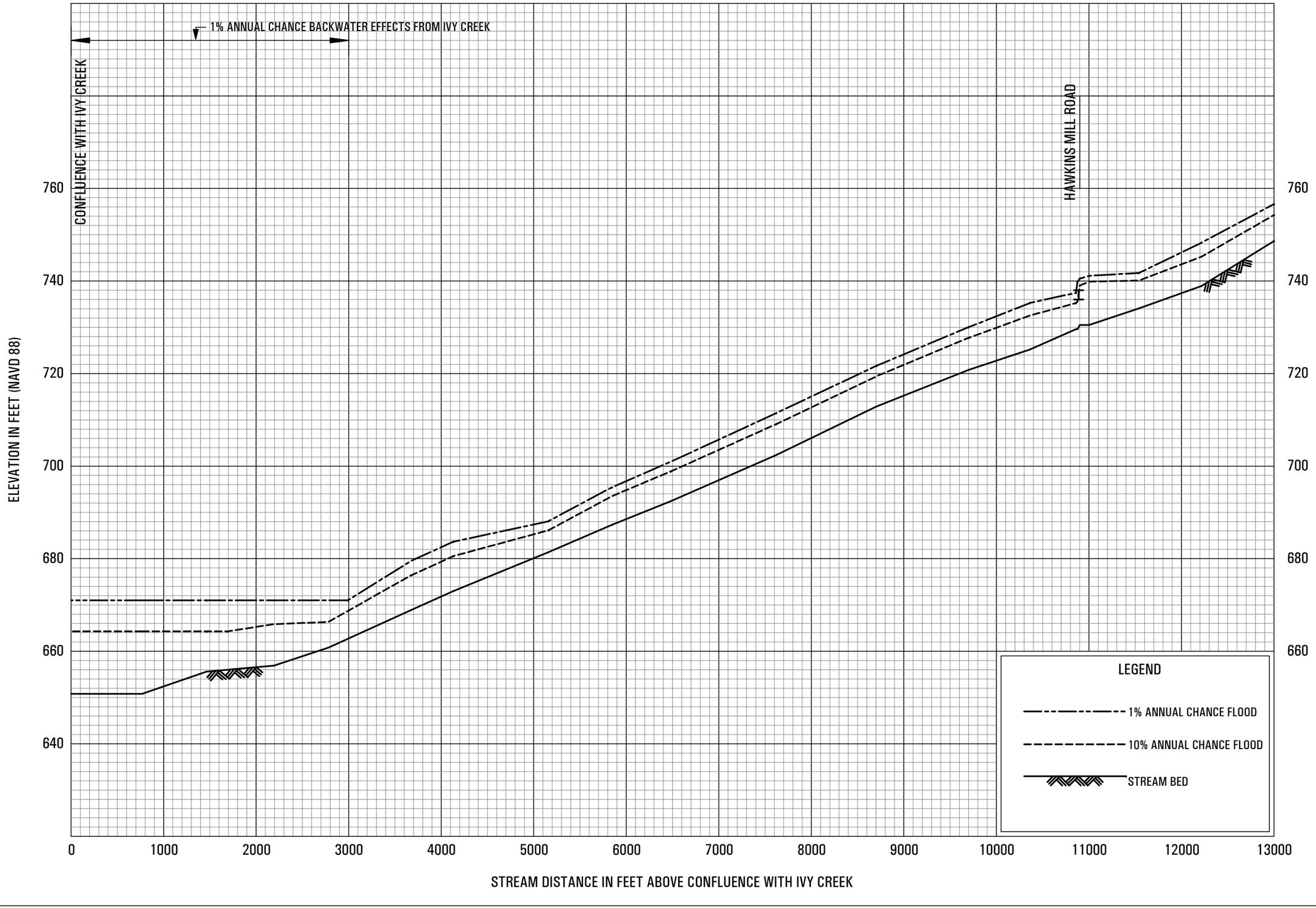
FLOOD PROFILES

TRIBUTARY NO. 14 TO IVY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



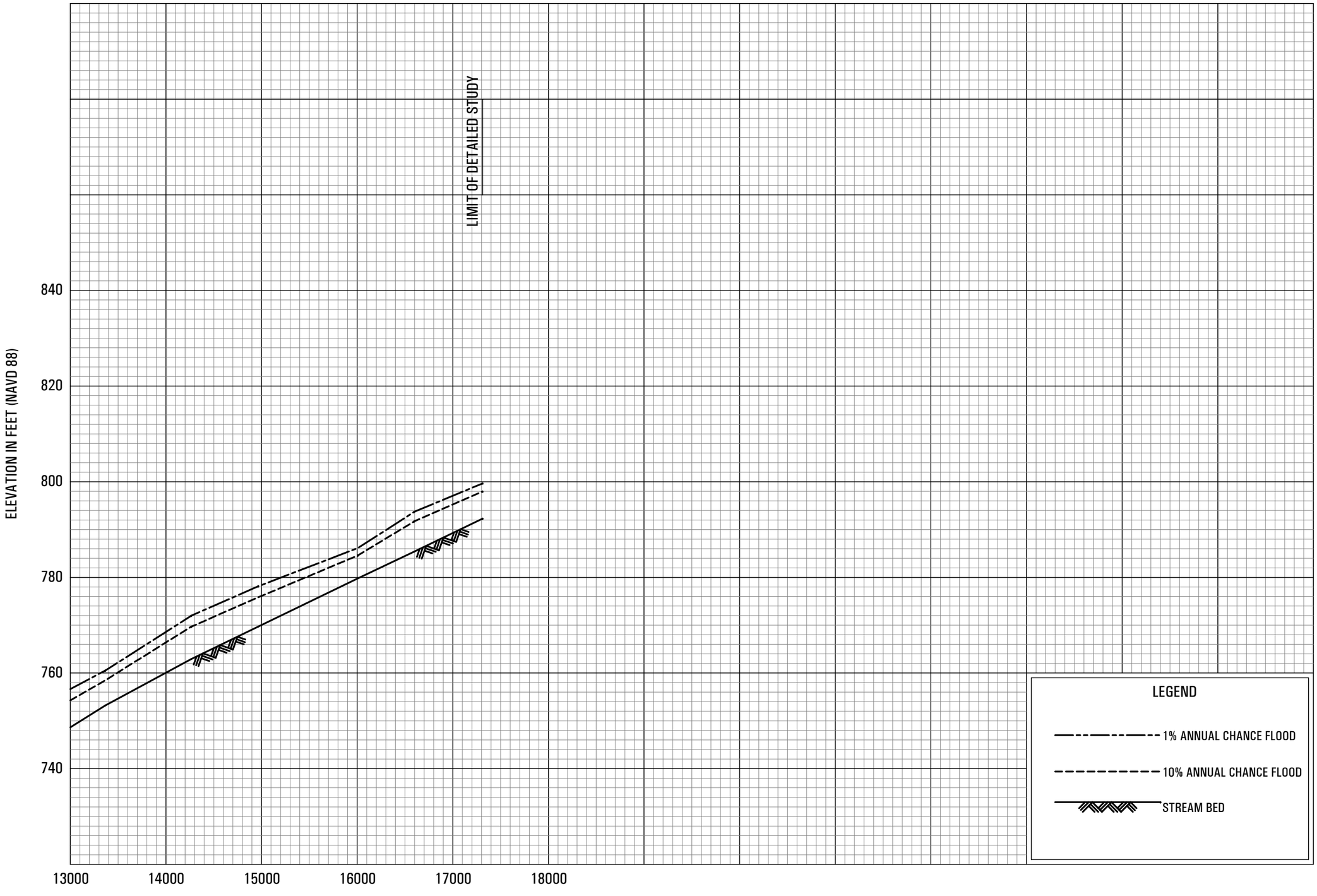
FLOOD PROFILES

TRIBUTARY NO. 15 TO IVY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



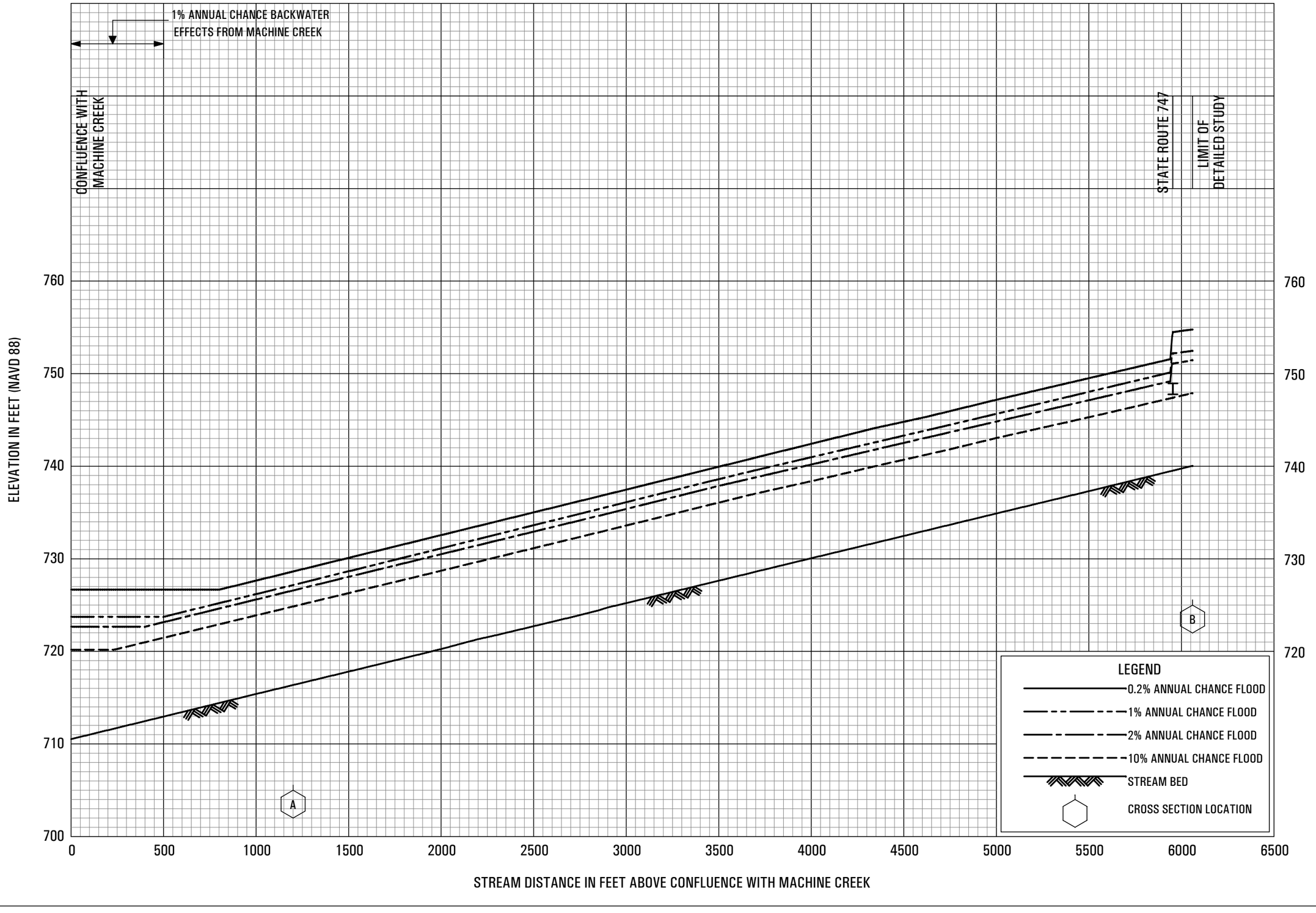
FLOOD PROFILES

TRIBUTARY NO. 15 TO IVY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS



FLOOD PROFILES

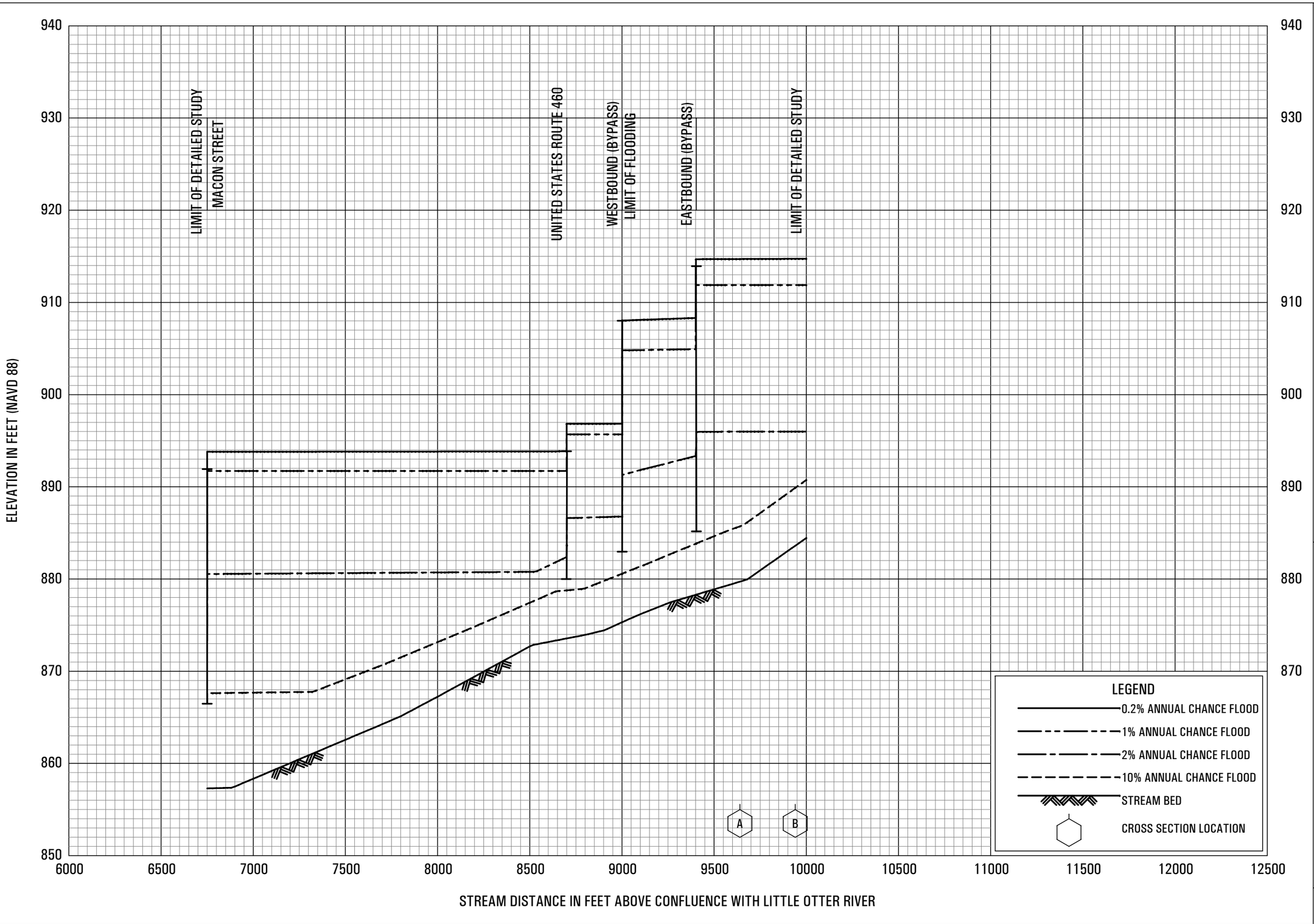
WELLS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

77P



FLOOD PROFILES

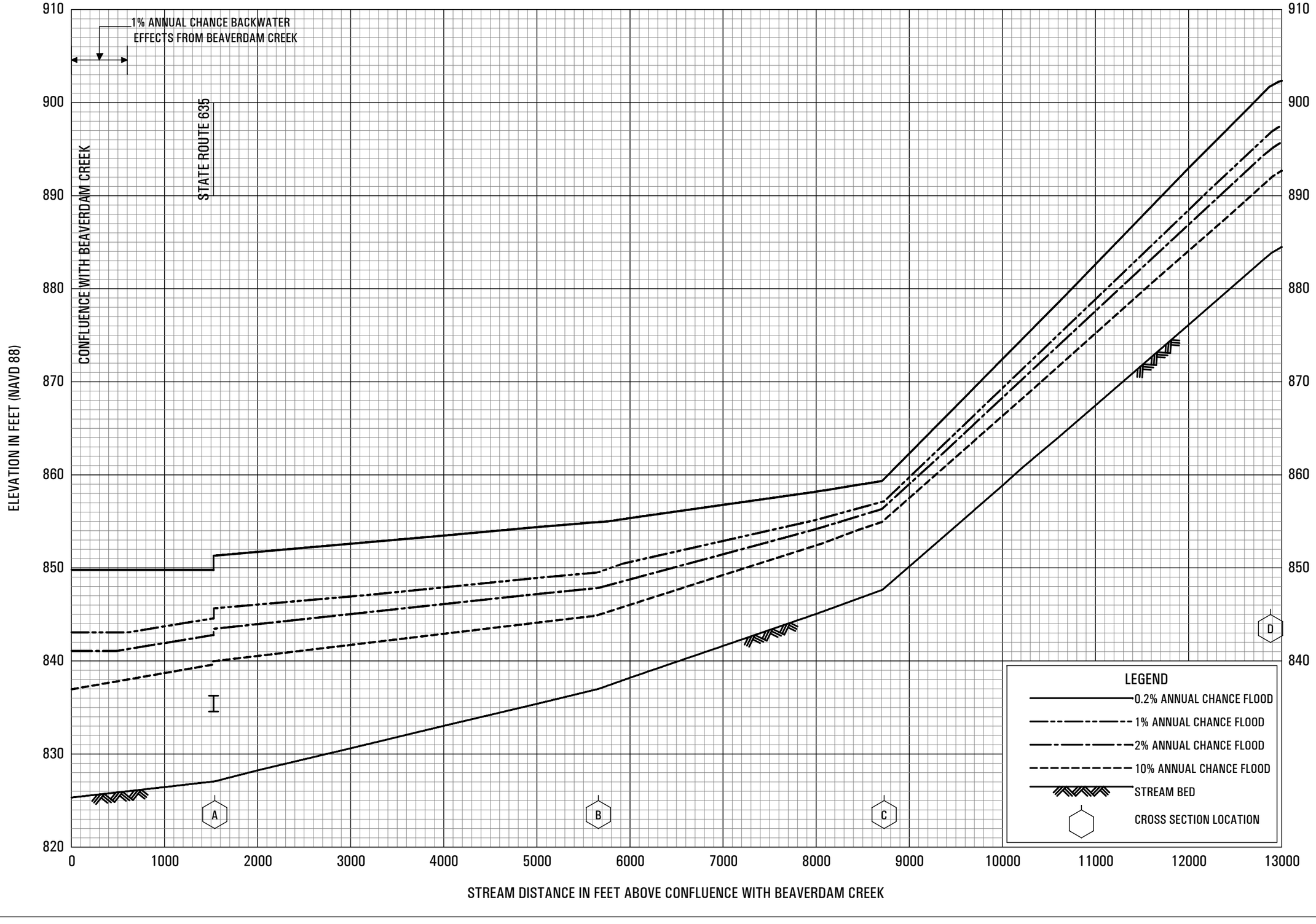
WEST BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

78P



FLOOD PROFILES

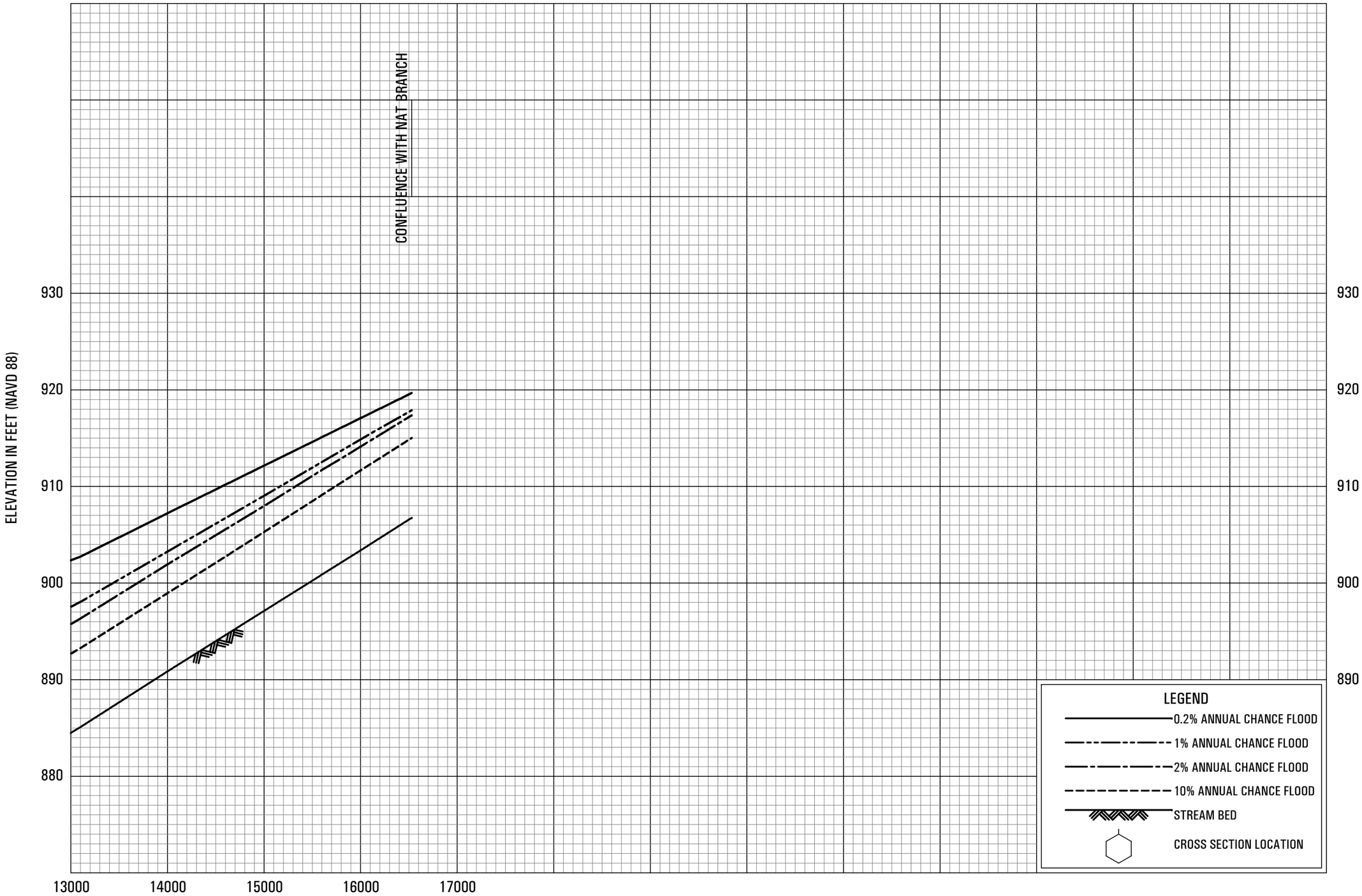
WEST FORK BEAVERDAM CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

79P



FLOOD PROFILES

WEST FORK BEAVERDAM CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BEDFORD COUNTY, VA

AND INCORPORATED AREAS

80P