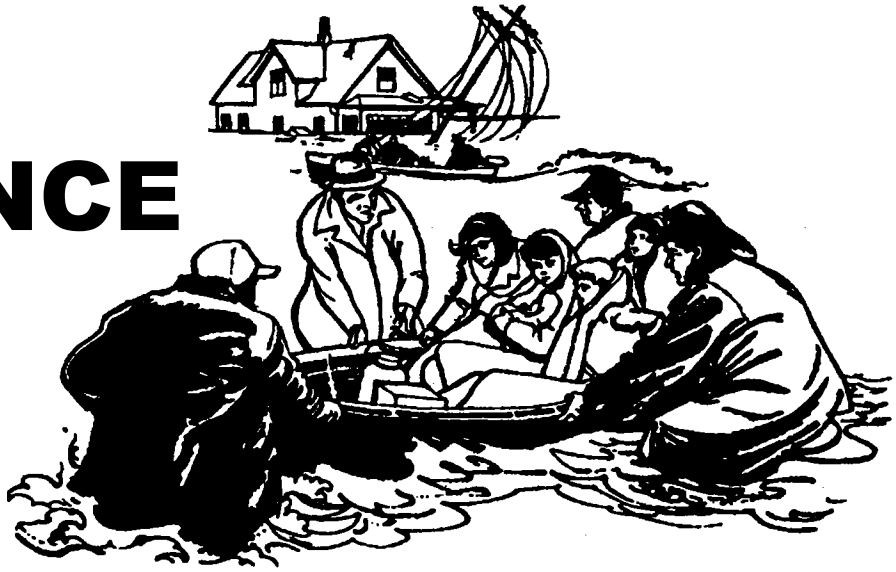
FLOOD INSURANCE STUDY



BERKELEY COUNTY, WEST VIRGINIA AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
BERKELEY COUNTY (UNINCORPORATED AREAS)	540282
*HEDGESVILLE, TOWN OF	545550
MARTINSBURG, CITY OF	540006

*Non-Floodprone

July 7, 2009

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
54003CV000A

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 (FIRM) Panels for this community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g. floodways, cross-sections).

Initial Countywide FIS Effective Date: July 7, 2009

TABLE OF CONTENTS

		Page
1.0	**INTRODUCTION**	1
	1.1 Purpose of Study	1
	1.2 Authority and Acknowledgments	1
	1.3 Coordination	3
2.0	**AREA STUDIED**	4
	2.1 Scope of Study	4
	2.2 Community Description	6
	2.3 Principal Flood Problems	7
	2.4 Flood Protection Measures	8
3.0	**ENGINEERING METHODS**	8
	3.1 Hydrologic Analyses	8
	3.2 Hydraulic Analyses	12
	3.3 Vertical Datum	15
4.0	**FLOODPLAIN MANAGEMENT APPLICATIONS**	15
	4.1 Floodplain Boundaries	16
	4.2 Floodways	17
5.0	**INSURANCE APPLICATIONS**	35
6.0	**FLOOD INSURANCE RATE MAP**	35
7.0	**OTHER STUDIES**	37
8.0	**LOCATION OF DATA**	37
9.0	**BIBLIOGRAPHY AND REFERENCES**	37

TABLE OF CONTENTS - continued

Page

FIGURES

Figure 1 - Floodway Schematic 18

TABLES

Table 1 - Studied Stream Reaches 5

Table 2 - Letters of Map Correction 6

Table 3 - Summary of Discharges 10-12

Table 4 - Floodway Data 19-34

Table 5 - Community Map History 36

EXHIBITS

Exhibit 1 - Flood Profiles

Dry Run	Panels 01P-04P
Evans Run	Panels 05P-07P
Middle Creek	Panels 08P-10P
Mill Creek	Panels 11P-13P
Opequon Creek	Panels 14P-20P
Potomac River	Panels 21P-22P
Rockymarsh Run	Panel 23P
Tributary to Rockymarsh Run	Panels 24P-25P
Tributary 1 of the Potomac River	Panel 26P
Tuscarora Creek	Panels 27P-32P

Exhibit 2 - Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY
BERKELEY COUNTY, WEST VIRGINIA AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Berkeley County, including the City of Martinsburg, the Town of Hedgesville, and the unincorporated areas of Berkeley County (referred to collectively herein as Berkeley 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 county that will be used to establish actuarial flood insurance rates. This information will also be used by Berkeley 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 NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

Please note that the Town of Hedgesville is non-floodprone.

In some States or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence, and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

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

This FIS was prepared to include the unincorporated areas of, and incorporated communities within, Berkeley County in a countywide format. 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.

Berkeley County
(Unincorporated Areas): In the original August 4, 1988, FIS, the hydrologic and hydraulic analyses were prepared by Burgess and Niple, Limited, for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-84-C-1606. That work was completed in April 1986.

In the November 20, 1998, revision, the hydrologic and hydraulic analyses for Rockymarsh Run and its tributary were prepared

by GEO-Technical Services, Inc. (GTS), for FEMA, under Contract No. EMW-93-C-4146-95-4. That work was completed in December 1995.

In the August 6, 2002, revision, the hydrologic and hydraulic analyses for Evans Run were prepared by Dewberry & Davis LLS in coordination with FEMA. This work was completed in March 2001.

Martinsburg, City of: In the original June 1979 FIS, the hydrologic and hydraulic analyses were prepared by Burgess & Niple, Limited, for the Federal Insurance Administration (FIA), under Contract No. H-4018. That work was completed in December 1977.

In the January 3, 1997, revision, the hydrologic and hydraulic analyses for Tuscarora Creek were performed by GTS for FEMA under Contract No. EMW-93-C4146-94-2 LMMP. This work was completed in December 1994. The hydrologic and hydraulic analyses for Dry Run were taken from the FIS for the unincorporated areas of Berkeley County (Reference 1).

Previously, no FIS was published and no Special Flood Hazard Areas were delineated for the Town of Hedgesville.

For this countywide FIS, no revised hydrologic and hydraulic analyses were prepared.

Planimetric base map information is provided in digital format for all FIRM panels. These files were compiled at scales of 6000 and 12000 from photography dated 2003. Additional information was derived from U.S. Census Bureau TIGER Line Data. Users of this FIRM should be aware that minor adjustments may have been made to specific base map features.

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 West Virginia University GIS Technical Center for FEMA. This work was completed in May 2008.

1.3 Coordination

Consultation Coordination Officer's (CCO) meetings may be held for each jurisdiction in this countywide FIS. An initial CCO meeting is held typically with representatives of FEMA, the community, and the study contractor to explain the nature and purpose of a FIS and to identify the streams to be studied by detailed methods. A final CCO meeting is held typically with representatives of FEMA, the community, and the study contractor to review the results of the study.

Berkeley County (Unincorporated Areas)

For the August 4, 1988, FIS, an initial CCO meeting was held on February 1, 1984, and a final CCO meeting was held on April 20, 1987. Both of these meetings were attended by representatives of the county, Burgess and Niple, Limited, and FEMA.

For the November 20, 1998, FIS, the county was notified by letter on May 11, 1994, that its FIS would be revised using the analyses prepared by GEO-Technical Services, Inc.

For the August 6, 2002, FIS, a final CCO meeting was held on March 8, 2001. In order to expedite the study process, study contractor work maps were used instead of preliminary maps. This meeting was attended by representatives of the county, Dewberry & Davis LLC, and FEMA.

Martinsburg, City of

On March 23, 1976, an initial pre-contract meeting attended by the State coordinator, representatives of Burgess & Niple, Limited, the City of Martinsburg, and the FIA, was held in the City of Martinsburg.

A search for basic data was made at all levels of government. In addition, a legal notice was published in the Martinsburg Journal requesting anyone with flood information to make it available to the city engineer. This legal notice appeared on May 10, 17, and 24, 1977. No response to this notice was received. The City of Martinsburg provided information that had been sent to them from local citizens concerning local flood problems.

The U.S. Geological Survey (USGS) provided invaluable information and assistance in the preparation of that FIS by providing discharge-frequency data for Tuscarora Creek and generalized discharge-frequency-drainage area relationships for small streams in West Virginia.

An intermediate meeting was held at Martinsburg on November 16, 1977. The purpose of this meeting was to review the flood and floodway boundaries with the city engineer. The boundaries were accepted as presented at this meeting.

On December 21, 1978, the results of the work by Burgess & Niple, Limited were reviewed at a final CCO meeting attended by representatives of Burgess & Niple, Limited, the city, and the FIA.

FEMA notified the city by letter on May 5, 1995, that a revision to its FIS would be performed using the analyses prepared by GTS. A final CCO meeting was held on November 26, 1995, and was attended by representatives of GTS, the City of Martinsburg, and FEMA.

Countywide Revision

A final meeting was held on July 28, 2008 and was attended by representatives of FEMA, Berkeley County, the City of Martinsburg and the West Virginia University GIS Technical Center (the study contractor).

2.0 AREA STUDIED

2.1 Scope of Study

This FIS report covers the geographic area of Berkeley County, West Virginia, including the incorporated communities listed in Section 1.1.

The streams studied by detailed methods are listed in Table 1, "Studied Stream Reaches." Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRM.

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

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

TABLE 1 - STUDIED STREAM REACHES

Stream	Limits of Detailed Study
Dry Run	From a point approximately 2,280 feet downstream of the county boundary to a point approximately 150 feet upstream of County Route 6
Evans Run*	From a point approximately 1.4 miles downstream of U.S. Route 11 to a point approximately 1.0 mile upstream of Interstate Route 81
Middle Creek	From a point approximately 1.6 miles downstream of the CONRAIL bridge to a point approximately 100 feet upstream of County Route 37
Mill Creek	From a point approximately 0.4 mile downstream of County Route 26 to a point approximately 1.7 miles upstream of County Route 24
Opequon Creek	From its confluence with the Potomac River to a point approximately 890 feet upstream of County Route 28-5
Potomac River	For its entire length within the county
Rockymarsh Run	From a point approximately 430 feet downstream of Billmyer Mill Road to a point approximately 71 feet upstream of State Route 45
Tributary to Rockymarsh Run	From its mouth, upstream to a point approximately 735 feet upstream of State Route 45
Tributary 1 of the Potomac River	From its confluence with the Potomac River to a point approximately 0.7 mile upstream of County Route 11-5
Tuscarora Creek	From a point approximately 1,350 feet downstream of the CSX Transportation to a point approximately 1.40 miles upstream of the CSX Transportation and from a point approximately 1,550 feet downstream of the upstream county boundary to a point approximately 1.6 miles upstream of the most upstream crossing of County Route 15

* For the August 6, 2002, revision, Evans Run was restudied by detailed methods from U.S. Route 11 to a point approximately 1.0 mile upstream of Interstate Route 81.

This FIS also incorporates the determinations of letters issued by FEMA resulting in map changes. These include Letters of Map Revision (LOMR), Letters of Map Revision - based on Fill (LOMR-F), and Letters of Map Amendment (LOMA), as shown in Table 2, "Letters of Map Correction."

TABLE 2 - LETTERS OF MAP CORRECTION

Community	Flooding Source(s)/Project Identifier	Date Issued	Type
Berkeley County (Unincorporated Areas)	Evans Run	9/4/2002	102
City of Martinsburg	Corporate Limit Changes	10/2/2002	102A

2.2 Community Description

Berkeley County is located in the eastern panhandle of West Virginia between Jefferson and Morgan Counties. It is bordered by the unincorporated areas of Morgan County to the west; the unincorporated areas of Jefferson County to the east; the unincorporated areas of Washington County, Maryland, to the north; and the unincorporated areas of Frederick County, Virginia, to the south. The Potomac River forms the northern boundary of Berkeley County. Martinsburg, the county seat, is situated approximately 215 miles northeast of the City of Charleston, 100 miles southeast of the City of Morgantown, and 155 miles southeast of the City of Wheeling. The 1996 population of the county was estimated to be 68,197. The 2004 population estimate was 89,362 (Reference 34).

Most of the land in the county is used for residential and agricultural purposes. Approximately two-thirds of the county is made up of farms. Apple, peach, and cherry orchards produce high yields of good quality fruit, part of which is processed locally. Sheep, and dairy and beef cattle are also important; livestock feed, such as corn, wheat, oats, and barley are the major crops in the area. Although the county is mainly agricultural, it has several manufacturing plants and a high quality limestone quarry. Approximately 40 percent of the land area in Berkeley County is woodland. Most of the woodland is located in the western third of the county, including large continuous tracts on North Mountain. There are several forest types in the county, but upland oaks and associated hardwoods are dominant.

The climate of Berkeley County is classified as humid temperate, but the Atlantic Ocean is close enough for eastern winds to bring maritime weather. The county is in the normal path of storms that move across the nation from west to east during the colder part of the year and is close enough to the coast to be affected by coastal storms. Summer temperatures average 75 degrees Fahrenheit (°F), while winter temperatures average 34°F. The annual precipitation averages 37.6 inches.

Berkeley County lies within the Ridge and Valley province. The terrain can be classified into two distinct regions: the eastern three-fifths of the county is part of the Great Valley; and the western two-fifths consist of a series of roughly parallel, low mountains and narrow valleys. The Great Valley is smoothly rolling and is generally at an elevation of 500 to 600 feet. Opequon Creek drains much of the eastern part of the county, forming a trellis like drainage pattern with the many small tributaries.

The Potomac River flows southeast through the county and forms the northern boundary.

2.3 Principal Flood Problems

Floods caused by overflow of the streams within the county occur periodically. Approximate discharges for floods of note on Opequon Creek near Martinsburg are as follows (Reference 35):

Date	Discharge (cfs)
October 10, 1976	10,900
February 15, 1984	11,600
April 22, 1992	12,300
March 5, 1993	12,600
November 13, 1970	14,000
May 19, 1988	15,500
June 22, 1972	19,000
March 1936	19,100
January 20, 1996	23,400

Flooding on the downstream reaches of Opequon Creek is generally influenced by Potomac River backwater. Approximate discharges for floods of note on the Potomac River at Shepherdstown are as follows (Reference 35):

Date	Discharge (cfs)
March 5, 1993	99,100
March 21, 1975	99,400
May 14, 1932	119,000
April 17, 1929	126,000
October 29, 1937	138,000
May 13, 1924	168,000
October 16, 1942	201,000
April 27, 1937	207,000
June 1, 1889	290,000
March 19, 1936	335,000

Floods caused by the overflow of Tuscarora creek and Dry Run occur periodically in Martinsburg. Flooding usually occurs during the winter or early spring as a result of heavy rainfall and may be complicated by snowmelt. Approximate discharges for floods of note on Tuscarora Creek above Martinsburg are as follows (References 3 and 35):

Date	Discharge (cfs)
June 15, 1960	234
February 13, 1971	308
October 29, 1973	334
June 23, 1972	450
October 9, 1976	500
June 27, 1975	610

Flooding also occurs along Tributaries 1 and 2. Because of their small drainage areas, flooding along these streams has not been a serious problem.

No historical flooding data are available for the remaining streams studied by detailed methods.

2.4 Flood Protection Measures

There are no existing local flood protection measures in the unincorporated areas of Berkeley County. Bloomington Dam, located on the North Branch of the Potomac River above Berkeley County, appears to have no significant effect on major Potomac River flooding in Berkeley County.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this FIS. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1- and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this FIS. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

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

Pre-countywide Analyses

For each community within Berkeley County that has a previously printed FIS report, the hydrologic analyses described in those reports are listed below.

The streams studied by detailed methods within Berkeley County fall within the Potomac River watershed. Flood discharges for the Potomac River were determined using stage-discharge-frequency data provided by the USGS for gages at Shepardstown, West Virginia, and Hancock, Maryland.

Discharge-frequency data for the Opequon Creek gage near Martinsburg (in

operation since 1948) and the Tuscarora Creek gage above Martinsburg (in operation since 1949, with a short interruption in the 1960's) were provided by the USGS (References 15 and 16). Discharge-frequency data for the Opequon Creek gage near Berryville, Virginia (in operation since 1944), were found in the report, Technique for Estimating Magnitude and Frequency of Floods in Virginia (Reference 17). These gages were maintained by the USGS. Flood discharges for Opequon Creek at various locations in the county were determined by developing relationships between corresponding flood discharges at the upstream and downstream gage sites. These relationships were extended for use downstream from the gage near Martinsburg. Flood discharges for Opequon Creek from approximately 3,100 feet downstream of County Route 19 to approximately 900 feet upstream of County Route 28-5 were taken from the FIS for the unincorporated areas of Jefferson County (Reference 18).

Since no stream flow records are available for Tributary 1 of the Potomac River, Mill Creek, Middle Creek, and Evans Run, discharge-frequency equations developed by the USGS were used to establish the peak flows (Reference 8). These equations were developed through analysis of gaging station records using procedures recommended in Bulletin 17 and a regression analysis to obtain the equations recommended for application to ungaged watersheds (Reference 19).

For Rockymarsh Run and its tributary, the HEC-1 flood hydrograph package was utilized in the analysis (Reference 20). Time of concentrations were calculated using the SCS TR-55 segmental approach contained in the Penn State Urban Hydrology Model (PSUHM) (Reference 21). Curve number weighing for each sub-watershed was performed using the SCS soil cover complex contained in PSUHM. The soil cover complex is a combination of Hagerstown-Frederick-Huntington and Duffield-Frankstown associations having hydrologic soil group B (Reference 22). Twenty-four hour rain depths were obtained from the TR-55 manual (Reference 23). Twenty-four hour rainfall distribution was generated from SCS TP-149 (Reference 8).

Discharge-frequency data for Tuscarora Creek at its mouth were provided by the USGS (Reference 3). The 1- and 0.2-percent annual chance frequency peak discharges were determined by extrapolation of the USGS data. Peak discharges for Tuscarora Creek were extended for use in the study area using a generalized discharge frequency-drainage area relationships obtained from a USGS report (Reference 4). Data from the Tuscarora gage above the City of Martinsburg, with 25 years of record, indicated that the flood of June 1975 had a peak discharge of approximately 520 cubic feet per second (cfs) less than the 1-percent annual chance flood analyzed in the June 15, 1984, FIS. The discharges for Tuscarora Creek near the confluence of Dry Run were modified to account for the transfer of discharge into the old Tuscarora Creek streambed.

Hydrology was verified for Tuscarora Creek using the HEC-l Flood Hydrographic Package (Reference 6). The hydrologic verification was carried out at the discontinued gaging station No. 01617000 above Martinsburg having a drainage area of 11.3 square miles. The aforementioned analyses were considered appropriate and included in this FIS.

Dry Run has no streamflow records and is in the Tuscarora Creek watershed; therefore, the discharge-frequency-drainage area curves developed for Tuscarora Creek were applied to establish the 10-, 2-, 1-, and 0.2-percent annual chance peak discharges for Dry Run. In addition, the hydrologic analysis from the June 1979 FIS was used to prepare the revised analysis for Dry Run (Reference 5).

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 3, "Summary of Discharges."

Countywide Revision

No new hydrologic analyses were developed for this FIS.

TABLE 3 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) PERCENT ANNUAL CHANCE 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
DRY RUN					
At mouth	6.51	340	580	700	1,080
At Berkeley County boundary	7.02	320	550	670	1,020
EVANS RUN					
Approximately 1.0 mile downstream of County Route 9-13	7.41	920	1,780	2,250	2,940
At U.S. Route 11	5.95	202	353	434	669
At CONRAIL bridge	5.50	27	146	336	387
At Interstate Route 81	4.89	166	290	356	550
MIDDLE CREEK					
Approximately 0.1 mile downstream of County Route 34-20	12.67	1,380	2,660	3,350	4,590
At confluence of Tributary 1	11.74	1,300	2,510	3,160	4,300
At confluence of Tributary 2	7.78	950	1,850	2,330	3,060
At confluence of Tributary 3	5.83	770	1,490	1,880	2,410
At confluence of Tributary 4	5.04	690	1,330	1,690	2,130
At confluence of Tributary 5	3.89	570	1,100	1,400	1,720
At County Route 37	3.86	560	1,090	1,390	1,710
MILL CREEK					
Approximately 1.4 miles downstream of upstream crossing of County Route 26	31.40	2,730	5,250	6,550	9,750
At confluence of Sylvan Run	23.55	2,200	4,230	5,290	7,680
At confluence of Tributary 1	19.03	1,870	3,610	4,520	6,430

TABLE 3 – SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) PERCENT ANNUAL CHANCE 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
MILL CREEK (continued)					
At confluence of Torytown Run	15.21	1,580	3,050	3,830	5,340
At confluence of Tributary 2	11.48	1,280	2,470	3,110	4,230
At confluence of Tributary 3	6.65	850	1,640	2,080	2,680
Approximately 1.7 miles upstream of County Route 24	6.59	840	1,630	2,060	2,660
OPEQUON CREEK					
At confluence with Potomac River	337.61	10,390	19,340	24,420	40,100
At confluence of Spring Hoke Run	326.89	10,250	19,090	24,100	29,580
At confluence of Tributary 1	319.49	10,150	18,910	23,880	39,220
At confluence of Eagle Run	314.92	10,090	18,800	23,740	38,990
At confluence of Tuscarora Creek	279.24	9,600	17,880	22,590	37,120
At gaging station in Martinsburg WV	272.00	9,500	17,690	22,350	36,730
At confluence of Shaw Run	256.55	9,220	17,180	21,720	35,690
At confluence of Sulfer Spring Branch	253.55	9,220	17,180	21,720	35,690
At confluence of Buzzard Run	248.04	9,130	17,030	21,520	35,380
At Jefferson County boundary	247.57	9,130	17,020	21,500	35,350
Upstream of confluence of Mill Creek	167.00	7,600	14,200	18,300	30,400
POTOMAC RIVER					
At gaging station in Shepardstown, West Virginia	*	142,200	219,900	258,100	360,800
At gaging station in Hancock, Maryland	*	123,000	202,900	244,400	361,500
ROCKYMARSH RUN					
At downstream study limit approximately 400 feet downstream of Billmyer Mill Road	14.23	940	1,508	2,000	5,000
Above confluence with unnamed tributary approximately 2,600 feet upstream of Billmyer Mill Road	8.18	481	758	996	2,000
TRIBUTARY 1 OF THE POTOMAC RIVER					
At confluence with Potomac River	4.98	680	1,320	1,680	2,100
Just above confluence of Tributary 1	4.50	630	1,220	1,560	1,940
TRIBUTARY TO ROCKYMARSH RUN					
At confluence with Rockymarsh Run	5.48	466	757	1,450	2,300

* Data not available

TABLE 3 – SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) PERCENT ANNUAL CHANCE 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
TUSCARORA CREEK					
At downstream limit of detailed study	22.2	960	1,670	2,000	3,100
At confluence of Tributary 2	18.1	830	1,440	1,750	2,670
At confluence of old streambed	11.8	**240	**525	**560	**600
At confluence of old streambed	11.8	560	970	1,180	1,800
At Baltimore Street	11.3	540	930	1,130	1,730
At upstream corporate limits	9.5	480	820	1,000	1,530
At confluence of Tributary 1B	9.25	440	750	910	1,380
At confluence of Tributary 1A	7.26	370	620	760	1,130
At confluence of Tributary 1	5.41	290	500	610	880
At confluence of Tributary 2	4.29	250	420	520	730
At confluence of Tributary 3	3.95	230	390	490	680
At confluence of Tributary 4	3.52	210	360	450	620
At confluence of Tributary 5	2.81	180	310	380	510
Approximately 1.6 miles upstream of County Route 15	1.65	120	210	250	330

** Discharges resulting from diversion of flooding through old streambed

3.2 Hydraulic Analyses

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

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and the FIRM, where applicable. For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the FIRM.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Pre-countywide Analyses

For each community within Berkeley County that has a previously printed FIS report, the hydraulic analyses described in those reports are listed below.

Cross sections for Rockymarsh Run and its unnamed tributary were obtained from digital terrain models using aerial mapping surveys flown in April 1995 (Reference 24).

Cross sections for the remaining flooding sources studied by detailed methods were obtained from aerial photographs at a scale of 1:14,400 (Reference 12). Below-water sections for these streams were obtained by field measurement. All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry.

Stream and floodplain cross sections for Tuscarora Creek were obtained from aerial surveys flown in April 1994 (Reference 11). All bridges and culverts were field surveyed to obtain elevation data and structural geometry.

For Rockymarsh Run and its tributary, water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-2 step-backwater computer program (Reference 10). Starting water-surface elevations were obtained by normal depth method.

For Evans Run, water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-2 and HEC-RAS step-backwater programs (References 10 and 37). The starting water-surface elevation was obtained by the slope/area method.

For the Potomac River, water-surface elevations were obtained from interpolation of historic flood profiles; gage data for these computations were obtained from the Shepardstown, West Virginia, and Hancock, Maryland, gages. Water-surface elevations of floods of the selected recurrence intervals for the remaining streams studied by detailed methods were computed using the HEC-2 step-backwater program (Reference 10). The water-surface elevations for Opequon Creek, from approximately 3,100 feet downstream of County Route 19 to approximately 900 feet upstream of County Route 28-5 were taken from the FIS for the unincorporated areas of Jefferson County (Reference 25).

Starting-water surface elevations for the Potomac River were obtained from gage data at the Shepardstown, West Virginia, and Hancock, Maryland gages. For Dry Run and Tuscarora Creek, the starting-water surface elevations were obtained from the June 15, 1984, FIS for the City of Martinsburg (Reference 7). Starting-water surface elevations for the remaining streams studied by detailed methods were determined by the slope/area method.

Roughness factors (Manning's "n") used in the hydraulic computations for Rockymarsh Run and its tributary were based on field observations and aerial photographs of the stream channels and floodplain conditions. For the remaining streams studied by detailed methods, roughness factors were chosen by engineering judgment based on field observations of the channel and floodplain areas. The following tabulation shows the channel and overbank "n" values for the streams studied by detailed methods:

Stream	Channel "n"	Overbank "n"
Dry Run	0.025-0.060	0.040-0.120
Evans Run	0.040-0.060	0.040-0.100
Middle Creek	0.045	0.045-0.120
Mill Creek	0.040-0.055	0.045-0.120
Opequon Creek	0.033-0.043	0.038-0.095
Potomac River	*	*
Rockymarsh Run	0.040	0.035-0.050
Tributary of Rockymarsh Run	0.040	0.030-0.050
Tributary 1 of the Potomac River	0.045-0.070	0.050-0.090
Tuscarora Creek	0.029-0.055	0.040-0.120

*Data not available

The analysis of the streams studied by approximate methods was based on the stage-frequency curves that were developed through a regional network of stream gages.

Countywide Revision

No new hydraulic analyses were performed for this revision. However, this entire study was updated to the North American Vertical Datum of 1988 (NAVD 88).

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 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 0.58 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:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

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- 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, Floodway Data tables, and Summary of Stillwater Elevation 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 flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance flood is employed to indicate additional areas of flood risk in the county. For the streams studied in detail, the 1- and 0.2-percent annual chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. The delineations are based on the best available topographic information.

Pre-countywide Analyses

Berkeley County (Unincorporated Areas) November 20, 1998, FIS

Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:4,800 with a contour interval of 4 feet (Reference 14). The boundaries for Opequon Creek from approximately 3,100 feet downstream of County Route 19 to approximately 900 feet upstream of County Route 28-5 were delineated using topographic maps at a scale of 1:24,000 with a contour interval of 20 feet (Reference 26). For Rockymarsh Run and its tributary the boundaries were mapped using digital terrain mapping techniques (Reference 27).

For the streams studied by approximate methods, the 1-percent annual chance floodplain boundaries were taken from the previously printed FIS/FIRM for Berkeley County (Reference 1).

Berkeley County (Unincorporated Areas) August 6, 2002, FIS

The boundaries for Evans Run from its confluence with Opequon Creek to Interstate Route 81 were delineated using topographic maps at a scale of 1:4,800 with a contour interval of 4 feet (Reference 14). Upstream of Interstate Route 81, the floodplain boundaries for Evans Run were delineated using digital topographic information printed at a scale of 1:2,400 with a contour interval of 2 feet (Reference 38).

Martinsburg, City of, June 15, 1984, FIS

The boundaries were interpolated between cross sections using aerial photographs at a scale of 1:4,800 (Reference 9).

Martinsburg, City of, January 3, 1997, FIS

The boundaries for Tuscarora Creek were interpolated between cross sections using a stereoscopic digitizing technique (Reference 13). For Dry Run, the boundaries were interpolated between cross sections using topographic maps at a scale of 1:4,800, with a contour interval of 4 feet (Reference 14).

Countywide Revision

No new floodplain boundaries were delineated as part of this revision. However, floodplains have been spatially adjusted to fit the best available stream centerline data. Also, floodplain boundaries from the jurisdictions outlined in section 1.1 have been combined in this countywide revision.

The 1- 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- 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 base flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this FIS were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. For this revision, the floodway boundaries were digitized from the current floodway maps and superimposed on the newly revised floodplain boundaries. All floodway widths, section areas, flows, and elevations were taken directly from the current floodway tables, with a datum adjustment of 0.58 foot downward applied to the elevation values.

The floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 4). The computed floodways are shown on the

FIRM. In cases where the boundaries of the floodway and the 1-percent annual chance flood are either close together or collinear, only the floodway boundary has been shown. Portions of the floodway widths for Opequon Creek, Tuscarora Creek, Rockymarsh Run and its tributary extend beyond the county boundary. No floodway was delineated for the Potomac River because this information was not available.

Near the mouths of streams studied in detail, floodway computations are made without regard to flood elevations on the receiving water body. Therefore, "Without Floodway" elevations presented in Table 4 for certain downstream cross sections of Opequon Creek and Tributary 1 of the Potomac River are lower than the regulatory flood elevations in that area, which must take into account the 1-percent annual chance flooding due to backwater from other sources.

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage, and heightens potential flood hazards by further increasing velocities. A listing of stream velocities at selected cross sections is provided in Table 4, “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 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, “Floodway Schematic.”

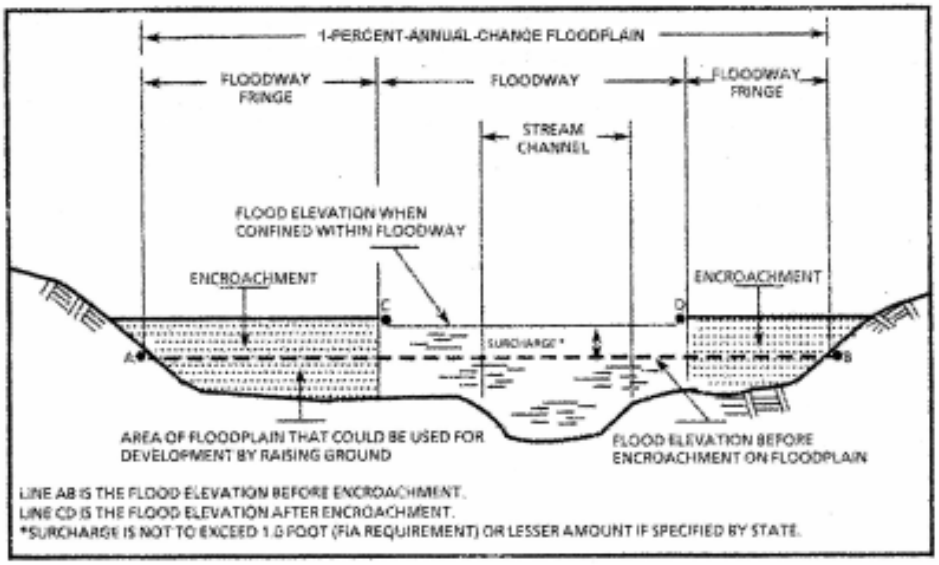


Figure 1: Floodway Schematic

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
Dry Run								
A	53	25	146	4.8	445.7	445.7	446.7	1.0
B	422	74	434	1.6	447.0	447.0	448.0	1.0
C	739	190	1,071	0.7	447.0	447.0	448.0	1.0
D	898	164	879	0.8	447.1	447.1	447.1	1.0
E	1,162	180	1,162	0.6	447.1	447.1	448.1	1.0
F	1,320	173	1,055	0.7	447.6	447.6	448.6	1.0
G	1,531	135	720	1.0	447.6	447.6	448.6	1.0
H	1,637	141	709	1.0	447.7	447.7	448.7	1.0
I	2,323	78	344	2.0	447.9	447.9	448.9	1.0
J	2,614	17	71	9.9	448.1	448.1	448.8	0.7
K	2,994	100	460	1.5	451.6	451.6	452.0	0.4
L	3,686	101	484	1.4	451.8	451.8	452.8	1.0
M	4,800	46	152	4.4	455.3	455.3	455.7	0.4
N	5,602	125	357	1.9	458.3	458.3	459.1	0.8
O	6,226	56	178	3.8	461.0	461.0	461.1	0.1
P	6,876	94	259	2.6	462.1	462.1	463.0	0.9
Q	7,306	100	265	2.5	463.3	463.3	464.3	1.0
R	8,096	101	254	2.6	465.8	465.8	466.4	0.6
S	9,256	63	146	4.6	471.4	471.4	472.2	0.8
T	9,976	48	203	3.3	475.2	475.2	476.0	0.8
U	10,876	40	138	4.9	483.9	483.9	484.4	0.5
V	11,056	40	119	5.6	487.7	487.7	487.7	0.0
W	11,426	40	214	3.1	490.7	490.7	491.0	0.3
X	12,466	21	89	7.5	496.1	496.1	496.1	0.0
Y	12,816	57	225	3.0	500.8	500.8	501.7	0.9
Z	13,526	36	121	5.5	503.2	503.2	503.9	0.7

[1]Feet above confluence with Tuscarora Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

DRY 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
Dry Run (continued)								
AA	13,826	92	237	2.8	504.9	504.9	505.9	1.0
AB	14,886	57	131	5.1	511.1	511.1	511.3	0.2
AC	16,026	100	247	2.7	517.9	517.9	518.9	1.0
AD	17,126	68	134	5.0	526.5	526.5	527.1	0.6
AE	17,476	55	211	3.2	529.7	529.7	530.7	1.0
AF	18,016	50	127	5.3	532.8	532.8	533.4	0.6
AG	18,896	62	132	5.1	539.9	539.9	540.3	0.4
AH	19,326	47	140	4.8	543.8	543.8	544.1	0.3
AI	20,016	50	90	7.4	549.7	549.7	549.7	0.0
AJ	20,506	40	116	5.8	556.0	556.0	556.9	0.9
AK	21,086	45	138	4.9	561.5	561.5	561.9	0.4
AL	21,316	55	134	5.0	565.0	565.0	565.2	0.2
AM	21,986	55	138	4.9	571.3	571.3	572.1	0.8
AN	22,356	15	71	9.4	574.3	574.3	574.7	0.4

[1]Feet above confluence with Tuscarora Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

DRY 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
Evans Run								
A	-7,160	90	796	2.6	453.8	453.8	454.8	1.0
B	-6,145	90	516	4.0	455.4	455.4	456.2	0.8
C	-5,025	130	388	5.3	462.6	462.6	463.0	0.4
D	-4,365	120	425	4.8	468.9	468.9	469.7	0.8
E	-3,945	70	356	5.8	474.5	474.5	474.7	0.2
F	-3,135	29	194	10.6	483.2	483.2	483.3	0.1
G	-2,535	80	698	2.6	487.0	487.0	487.7	0.7
H	-2,345	140	957	1.9	487.1	487.1	488.0	0.9
I	-1,765	200	1,135	1.6	487.3	487.3	488.2	0.9
J	-1,145	270	2,130	0.8	487.4	487.4	488.4	1.0
K	-385	240	2,171	0.8	487.5	487.5	488.5	1.0
L	650	30	93	4.7	489.5	489.5	490.1	0.6
M	1,080	28	88	4.9	496.3	496.3	497.2	0.9
N	1,270	84	230	2.4	497.9	497.9	498.0	0.1
O	1,510	43	122	3.9	498.6	498.6	498.8	0.2
P	1,680	26	137	3.2	500.8	500.8	501.6	0.8
Q	1,850	35	137	2.7	501.3	501.3	501.9	0.6
R	2,240	240	515	1.1	505.6	505.6	505.6	0.0
S	3,100	150	72	5.9	507.1	507.1	507.1	0.0
T	3,880	25	47	8.2	511.8	511.8	511.8	0.0
U	4,310	36	107	4.6	516.0	516.0	517.0	1.0
V	4,810	41	135	3.1	518.0	518.0	518.8	0.8
W	5,260	40	60	7.4	520.6	520.6	520.8	0.2
X	6,180	40	97	4.3	532.6	532.6	533.4	0.8

[1]Feet from U.S. Route 11

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

EVANS 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
Evans Run (continued)								
Y	6,610	35	109	3.9	533.7	533.7	534.6	0.9
Z	7,300	26	70	5.8	537.9	537.9	538.4	0.5
AA	8,060	26	60	6.6	548.3	548.3	549.0	0.7
AB	8,780	26	90	4.0	555.4	555.4	556.0	0.6

[1]Feet from U.S. Route 11

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

EVANS 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
Middle Creek								
A	-8,640	70	516	6.5	485.1	485.1	486.0	0.9
B	-7,520	110	633	5.3	489.5	489.5	490.5	1.0
C	-6,320	65	282	11.9	507.1	507.1	507.1	0.0
D	-5,000	90	500	6.3	518.3	518.3	519.2	0.9
E	-3,550	60	349	9.0	525.9	525.9	526.8	0.9
F	-2,100	75	462	6.8	534.5	534.5	535.1	0.6
G	-1,540	95	693	4.6	538.8	538.8	539.6	0.8
H	-1,150	90	660	4.8	539.3	539.3	540.3	1.0
I	-370	80	312	10.1	542.4	542.4	542.7	0.3
J	340	170	845	3.7	550.3	550.3	550.5	0.2
K	1,550	260	1,335	2.4	552.7	552.7	553.7	1.0
L	2,350	140	977	3.2	557.8	557.8	558.4	0.6
M	2,770	125	823	3.8	558.2	558.2	558.9	0.7
N	3,330	160	791	4.0	559.2	559.2	560.0	0.8
O	3,560	170	934	3.4	559.7	559.7	560.4	0.7
P	4,000	170	641	4.9	561.3	561.3	562.1	0.8
Q	4,730	190	946	3.3	563.2	563.2	563.7	0.5
R	5,270	170	838	3.8	563.7	563.7	564.4	0.7
S	5,920	250	824	2.8	565.2	565.2	566.2	1.0
T	6,150	140	750	3.1	565.7	565.7	566.7	1.0
U	7,280	120	286	8.1	569.7	569.7	569.7	0.0
V	8,390	130	773	3.0	572.9	572.9	573.9	1.0
W	9,570	130	268	8.7	576.9	576.9	576.9	0.0
X	10,700	110	366	6.4	584.6	584.6	585.2	0.6
Y	11,070	100	474	4.9	587.9	587.9	588.5	0.6
Z	11,530	100	509	4.6	592.5	592.5	593.3	0.8

[1]Feet from CONRAIL bridge

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

MIDDLE 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
Middle Creek (continued)								
AA	12,530[1]	90	382	6.1	595.2	595.2	596.2	1.0
AB	13,420[1]	80	301	6.2	600.3	600.3	600.4	0.1
AC	13,690[1]	90	590	3.2	602.0	602.0	602.1	0.1
AD	15,100[1]	90	233	8.1	605.7	605.7	606.0	0.3
AE	16,330[1]	100	468	3.6	613.5	613.5	614.3	0.8
AF	16,890[1]	120	605	2.8	616.6	616.6	617.5	0.9
AG	17,630[1]	100	321	5.3	617.5	617.5	618.5	1.0
AH	18,770[1]	100	336	4.2	622.4	622.4	623.0	0.6
AI	19,060[1]	100	454	3.1	624.6	624.6	625.3	0.7
Mill Creek								
A	-1,130[2]	150	1,121	4.7	476.7	476.7	477.5	0.8
B	-370[2]	144	1,048	5.0	478.9	478.9	479.8	0.9
C	360[2]	165	1,352	3.9	480.9	480.9	481.8	0.9
D	1,700[2]	69	466	11.4	486.6	486.6	486.6	0.0
E	1,950[2]	70	423	10.7	493.8	493.8	493.8	0.0
F	3,150[2]	56	387	11.7	511.7	511.7	512.5	0.8
G	4,110[2]	50	373	12.1	528.8	528.8	528.8	0.0
H	5,070[2]	68	454	9.9	539.3	539.3	539.9	0.6
I	5,520[2]	76	565	9.7	543.9	543.9	543.9	0.0
J	6,160[2]	95	629	7.2	551.3	551.3	552.2	0.9
K	6,600[2]	110	842	4.5	553.4	553.4	554.4	1.0
L	7,800[2]	115	571	6.7	557.3	557.3	558.3	1.0
M	8,130[2]	120	697	5.5	559.8	559.8	560.4	0.6
N	9,480[2]	126	691	5.5	563.6	563.6	564.5	0.9

[1]Feet from CONRAIL bridge
[2]Feet from County Route 26

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

MIDDLE CREEK – MILL 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
Mill Creek (continued)								
O	10,210	60	499	7.8	569.1	569.1	569.1	0.0
P	10,600	68	576	6.6	570.1	570.1	570.6	0.5
Q	11,530	59	356	10.7	575.4	575.4	575.4	0.0
R	12,860	100	609	6.3	583.2	583.2	584.1	0.9
S	13,205	100	622	6.2	584.5	584.5	585.2	0.7
T	14,040	100	361	10.6	590.8	590.8	590.8	0.0
U	14,273	130	739	5.2	595.1	595.1	595.7	0.6
V	14,328	133	627	6.1	599.6	599.6	600.3	0.7
W	15,440	117	615	6.2	601.3	601.3	602.1	0.8
X	16,680	200	863	3.6	604.7	604.7	605.1	0.4
Y	17,960	300	1,045	3.0	606.8	606.8	607.7	0.9
Z	19,360	150	591	5.3	612.3	612.3	612.3	0.0
AA	20,600	150	737	4.2	616.3	616.3	617.0	0.7
AB	21,320	140	768	4.0	618.2	618.2	618.6	0.4
AC	21,740	150	816	3.8	619.5	619.5	619.9	0.4
AD	22,140	100	572	5.4	620.4	620.4	620.9	0.5
AE	22,585	100	593	5.2	622.0	622.0	622.7	0.7
AF	23,385	115	428	7.3	625.4	625.4	625.5	0.1
AG	24,115	100	706	4.4	635.7	635.7	636.7	1.0
AH	24,800	90	468	6.6	637.1	637.1	637.8	0.7
AI	25,200	90	568	5.5	639.0	639.0	639.4	0.4
AJ	26,250	90	537	5.6	642.0	642.0	642.4	0.4
AK	27,450	90	487	6.4	646.9	646.9	647.2	0.3
AL	28,780	130	715	4.3	651.1	651.1	651.6	0.5
AM	29,180	140	894	3.5	652.0	652.0	652.5	0.5

[1]Feet from County Route 26

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

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
Mill Creek (continued)								
AN	30,195[1]	140	759	4.1	653.7	653.7	654.5	0.8
AO	30,995[1]	140	678	4.6	655.9	655.9	656.1	0.2
AP	31,650[1]	100	640	3.2	657.7	657.7	658.2	0.5
AQ	32,640[1]	50	241	8.6	660.5	660.5	661.5	1.0
Opequon Creek								
A	160[2]	113	1,336	18.3	357.1	327.6[3]	327.6	0.0
B	730[2]	128	1,939	12.6	357.1	333.2[3]	333.2	0.0
C	1,770[2]	180	2,177	11.2	357.1	335.7[3]	335.8	0.1
D	3,150[2]	200	2,909	8.4	357.1	338.7[3]	338.8	0.1
E	4,350[2]	223	2,940	8.3	357.1	339.7[3]	340.1	0.4
F	5,490[2]	299	3,625	6.7	357.1	340.8[3]	341.6	0.8
G	6,460[2]	400	4,480	5.5	357.1	341.8[3]	342.7	0.9
H	7,470[2]	450	5,326	4.6	357.1	342.6[3]	343.3	0.7
I	8,510[2]	424	5,040	4.8	357.1	343.1[3]	343.7	0.6
J	9,490[2]	501	5,675	4.3	357.1	343.5[3]	344.2	0.7
K	10,660[2]	500	6,343	3.9	357.1	344.0[3]	344.7	0.7
L	11,080[2]	600	7,268	3.4	357.1	344.2[3]	345.1	0.9
M	12,130[2]	600	6,275	3.9	357.1	344.4[3]	345.4	1.0
N	13,460[2]	524	5,654	4.3	357.1	344.8[3]	345.8	1.0
O	14,570[2]	600	5,833	4.2	357.1	345.4[3]	346.3	0.9
P	15,960[2]	600	6,200	3.9	357.1	346.3[3]	347.0	0.7
Q	17,060[2]	395	3,572	6.8	357.1	346.2[3]	347.1	0.9
R	17,590[2]	300	3,735	6.5	357.1	348.4[3]	349.0	0.6
S	18,730[2]	399	5,134	4.8	357.1	349.6[3]	350.2	0.6

[1]Feet from County Route 26
[2]Feet above confluence with Potomac River
[3]Elevation computed without consideration of backwater effects from Potomac River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

MILL CREEK – OPEQUON 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
Opequon Creek (continued)								
T	19,810	399	5,165	4.7	357.1	350.0[2]	350.7	0.7
U	20,980	400	5,255	4.6	357.1	350.5[2]	351.2	0.7
V	22,100	400	5,188	4.7	357.1	351.0[2]	351.6	0.6
W	23,270	420	3,752	6.5	357.1	351.0[2]	352.0	1.0
X	24,470	402	4,866	5.0	357.1	353.1[2]	353.8	0.7
Y	25,900	400	4,913	5.0	357.1	354.5[2]	354.9	0.4
Z	26,830	400	5,320	4.6	357.1	355.1[2]	355.8	0.7
AA	27,880	386	4,992	4.9	357.1	355.5[2]	356.4	0.9
AB	29,280	400	5,450	4.5	357.1	356.8[2]	357.5	0.7
AC	30,410	399	5,219	4.7	357.2	357.2	358.2	1.0
AD	31,530	425	5,469	4.5	357.9	357.9	358.7	0.8
AE	32,540	475	5,852	4.2	358.2	358.2	359.2	1.0
AF	33,760	500	6,562	3.7	358.7	358.7	359.6	0.9
AG	34,810	500	6,412	3.8	359.2	359.2	360.1	0.9
AH	36,000	470	5,439	4.5	359.5	359.5	360.5	1.0
AI	37,200	450	5,098	4.8	359.9	359.9	360.8	0.9
AJ	38,420	450	6,158	4.0	361.5	361.5	362.2	0.7
AK	40,020	450	5,954	4.1	362.4	362.4	363.2	0.8
AL	41,130	380	5,112	4.8	362.6	362.6	363.5	0.9
AM	41,680	275	4,072	6.0	365.0	365.0	365.0	0.0
AN	42,720	250	3,931	6.2	365.5	365.5	366.0	0.5
AO	44,020	250	2,698	9.1	365.7	365.7	366.5	0.8
AP	45,320	200	3,554	6.9	368.1	368.1	368.6	0.5
AQ	46,000	508	7,896	3.1	369.4	369.4	370.0	0.6
AR	46,730	577	8,229	3.0	369.5	369.5	370.2	0.7

[1]Feet above confluence with Potomac River
[2]Elevation computed without consideration of backwater effects from Potomac River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

OPEQUON 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
Opequon Creek (continued)								
AS	47,640	627	8,647	2.8	369.5	369.5	370.3	0.8
AT	47,970	700	9,677	2.5	369.6	369.6	370.4	0.8
AU	49,050	750	6,361	3.8	369.7	369.7	370.5	0.8
AV	50,280	736	9,076	2.7	370.5	370.5	371.3	0.8
AW	51,250	750	9,611	2.5	370.7	370.7	371.6	0.9
AX	52,360	800	9,786	2.5	370.9	370.9	371.8	0.9
AY	53,700	950	10,189	2.4	371.1	371.1	372.1	1.0
AZ	55,070	750	9,613	2.5	371.7	371.7	372.6	0.9
BA	56,260	736	8,521	2.9	371.8	371.8	372.7	0.9
BB	57,340	700	7,411	3.3	372.1	372.1	373.0	0.9
BC	58,690	700	6,502	3.8	372.5	372.5	373.4	0.9
BD	59,760	700	7,373	3.3	373.0	373.0	373.9	0.9
BE	60,680	600	5,464	4.1	373.2	373.2	374.1	0.9
BF	61,535	400	5,473	4.1	375.4	375.4	375.8	0.4
BG	62,480	500	5,497	4.1	375.5	375.5	376.1	0.6
BH	63,590	500	5,194	4.3	375.6	375.6	376.5	0.9
BI	64,600	500	5,011	4.5	376.6	376.6	377.3	0.7
BJ	65,720	500	4,888	4.6	377.3	377.3	378.2	0.9
BK	66,860	600	5,890	3.8	378.4	378.4	379.3	0.9
BL	67,930	800	6,277	3.6	378.7	378.7	379.7	1.0
BM	68,970	500	4,906	4.6	379.1	379.1	380.0	0.9
BN	70,050	650	6,514	3.4	379.8	379.8	380.8	1.0
BO	71,230	700	6,266	3.6	380.4	330.4	381.4	1.0
BP	72,200	650	6,504	3.4	381.0	381.0	381.9	0.9
BQ	73,350	500	5,480	4.1	381.5	381.5	382.5	1.0

[1]Feet above confluence with Potomac River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

OPEQUON 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
Opequon Creek (continued)								
BR	74,520	500	5,674	3.9	382.1	382.1	383.0	0.9
BS	75,610	516	5,456	4.0	382.9	382.9	383.6	0.7
BT	76,680	538	5,143	4.2	383.1	383.1	384.0	0.9
BU	77,880	550	5,302	4.1	384.0	384.0	384.9	0.9
BV	78,860	550	5,041	4.3	384.5	384.5	385.4	0.9
BW	79,880	549	4,748	4.6	385.4	385.4	386.1	0.7
BX	81,010	550	5,483	4.0	385.9	385.9	386.9	1.0
BY	82,190	450	5,229	4.2	386.5	386.5	387.5	1.0
BZ	83,400	400	3,691	5.9	386.8	386.8	387.8	1.0
CA	84,600	400	4,329	5.0	388.6	388.6	389.6	1.0
CB	85,580	450	3,573	6.1	389.6	389.6	390.5	0.9
CC	86,940	600	6,176	3.5	391.4	391.4	392.2	0.8
CD	87,920	600	6,083	3.6	391.9	391.9	392.7	0.8
CE	89,130	450	4,734	4.6	392.7	392.7	393.5	0.8
CF	90,410	400	4,089	5.3	393.5	393.5	394.3	0.8
CG	91,610	550	5,711	3.8	394.5	394.5	395.4	0.9
CH	92,780	400	3,856	5.6	395.2	395.2	396.1	0.9
CI	93,990	450	4,281	5.0	396.3	396.3	397.2	0.9
CJ	95,170	400	4,911	4.7	397.2	397.2	398.1	0.9
CK	96,210	450	5,561	3.9	397.9	397.9	398.8	0.9
CL	96,380	435	5,708	3.8	398.1	398.1	399.0	0.9
CM	98,380	433[2]	5,666	3.8	398.8	398.8	399.7	0.9
CN	101,312	310[2]	2,867	7.5	400.7	400.7	401.5	0.8
CO	102,650	407[2]	5,022	4.3	403.1	403.1	404.0	0.9
CP	107,550	625[2]	7,488	2.9	405.3	405.3	406.2	0.9

[1]Feet above confluence with Potomac River
[2]This width extends beyond county boundary

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

OPEQUON 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
Opequon Creek (continued)								
CQ	111,050	409[2]	5,250	4.1	408.0	408.0	408.8	0.8
CR	113,450	709[2]	7,084	3.0	410.4	410.4	411.2	0.8
CS	117,250	352[2]	4,610	4.6	412.7	412.7	413.6	0.9
CT	121,250	729[2]	9,551	2.1	415.2	415.2	416.1	0.9
CU	123,690	413[2]	4,986	4.0	416.4	416.4	417.3	0.9
CV	126,290	409[2]	4,579	4.4	418.2	418.2	419.1	0.9
CW	128,590	331[2]	3,871	5.2	420.1	420.1	421.0	0.9
CX	131,490	345[2]	3,837	5.2	424.1	424.1	425.0	0.9
CY	133,490	277[2]	3,587	5.6	425.7	425.7	426.6	0.9
CZ	138,140	308[2]	4,526	4.4	431.5	431.5	432.4	0.9
DA	140,340	244[2]	3,773	5.3	433.4	433.4	434.3	0.9
DB	143,640	538[2]	6,209	3.2	435.8	435.8	436.7	0.9
DC	146,640	200[2]	2,808	7.1	439.4	439.4	440.0	0.6
DD	148,940	375[2]	5,566	3.6	442.9	442.9	443.9	1.0
DE	150,690	553[2]	7,262	2.5	443.8	443.8	444.8	1.0
DF	152,550	557[2]	7,039	2.6	444.7	444.7	445.5	0.8
DG	154,850	271[2]	3,944	4.6	446.1	446.1	446.9	0.8
DH	156,650	307[2]	4,638	3.9	448.3	448.3	449.2	0.9
DI	159,250	555[2]	6,729	2.6	450.2	450.2	451.2	1.0
DJ	163,050	381[2]	4,083	4.3	452.4	452.4	453.4	1.0

[1]Feet above confluence with Potomac River
[2]This width extends beyond county boundary

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

OPEQUON 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
Rockymarsh Run								
A	20,212[1]	386[3]	502	4.0	423.8	423.8	424.5	0.7
B	21,309[1]	388[3]	1,148	1.7	425.5	425.5	425.9	0.4
C	22,229[1]	361[3]	1,144	1.7	426.0	426.0	426.5	0.5
D	22,659[1]	379[3]	1,256	1.6	426.0	426.0	426.6	0.6
Tributary to Rockymarsh Run								
A	1,320[2]	155[3]	282	5.1	429.5	429.5	430.3	0.8
B	2,490[2]	272[3]	1,098	1.3	430.5	430.5	431.4	0.9
C	3,078[2]	270[3]	1,112	1.3	430.5	430.5	431.5	1.0
D	3,678[2]	231[3]	427	3.4	435.2	435.2	435.9	0.7
E	4,396[2]	200[3]	1,520	0.9	435.3	435.3	436.1	0.8
Tributary 1 of the Potomac River								
A	190[1]	18	121	13.9	362.2	334.9[4]	335.1	0.2
B	300[1]	100	731	2.3	362.2	356.2[4]	357.2	1.0
C	630[1]	100	2,000	0.8	371.5	371.5	372.3	0.8
D	1,380[1]	100	1,856	0.9	371.5	371.5	372.3	0.8
E	1,940[1]	90	1,381	1.2	371.6	371.6	372.5	0.9
F	2,530[1]	95	1,071	1.6	371.6	371.6	372.6	1.0
G	3,430[1]	95	735	2.1	372.1	372.1	373.1	1.0
H	4,240[1]	90	283	5.5	377.8	377.8	377.8	0.0
I	5,270[1]	90	445	3.5	381.8	381.8	382.7	0.9

[1]Feet above confluence with Potomac River
[2]Feet above confluence with Rockymarsh Run
[3]Width extends beyond county boundary
[4]Elevation computed without consideration of backwater effects from Potomac River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

ROCKYMARSH RUN – TRIBUTARY TO ROCKYMARSH RUN – TRIBUTARY 1 OF THE POTOMAC RIVER

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
Tuscarora Creek								
A	-140	257/40[2]	1,622	1.2	385.1	385.1	386.1	1.0
B	60	78/70[2]	895	2.2	391.1	391.1	392.1	1.0
C	410	78	862	2.3	391.2	391.2	392.2	1.0
D	580	78	843	2.4	391.3	391.3	392.3	1.0
E	1,444	60	599	3.3	391.5	391.5	392.5	1.0
F	2,236	124	801	2.5	392.2	392.2	393.1	0.9
G	2,447	91	550	3.6	392.3	392.3	393.2	0.9
H	2,922	125	444	3.9	392.9	392.9	393.9	1.0
I	3,134	50	213	8.2	393.7	393.7	394.7	1.0
J	3,662	31	170	10.3	397.8	397.8	398.6	0.8
K	3,767	90	560	3.1	400.3	400.3	400.4	0.1
L	4,031	52	169	10.3	402.4	402.4	402.4	0.0
M	8,202	49	225	5.0	438.7	438.7	438.8	0.1
N	8,414	48	128	8.9	439.7	439.7	439.8	0.1
O	8,572	18	69	8.1	442.5	442.5	442.5	0.0
P	8,783	89	194	2.9	444.1	444.1	444.3	0.2
Q	8,889	116	299	1.9	446.1	446.1	446.2	0.1
R	9,153	51	174	6.8	450.0	450.0	450.8	0.8
S	9,311	200	629	1.9	453.0	453.0	453.0	0.0
T	10,262	166	509	2.3	454.2	454.2	454.8	0.6
U	10,790	134	382	3.1	454.5	454.5	455.3	0.8
V	11,634	124	278	4.2	454.8	454.8	455.8	1.0
W	11,793	136	344	3.4	456.9	456.9	457.8	0.9
X	13,166	376	1,075	1.1	458.6	458.6	459.2	0.6
Y	14,169	235	288	3.8	461.9	461.9	462.0	0.1
Z	14,327	220	269	4.1	462.0	462.0	462.3	0.3

[1]Feet from CSX Transportation
[2]Width/width within county boundary

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

TUSCARORA 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
Tuscarora Creek (continued)								
AA	15,066	56	181	6.1	465.4	465.4	460.4	1.0
AB	16,122	52	135	8.2	470.7	470.7	471.0	0.3
AC	16,439	31	113	9.8	475.2	475.2	475.5	0.3
AD	17,178	150	235	4.3	482.3	482.3	482.3	0.0
AE	17,700	41	163	6.2	484.5	484.5	484.6	0.1
AF	18,030	69	205	4.9	485.7	485.7	486.0	0.3
AG	18,560	80	265	3.8	489.6	489.6	490.5	0.9
AH	19,520	136	372	2.7	492.8	492.8	493.7	0.9
AI	20,750	95	171	5.3	498.7	498.7	499.0	0.3
AJ	21,880	83	249	3.7	504.0	504.0	504.6	0.6
AK	23,050	68	174	5.2	509.8	509.8	510.6	0.8
AL	23,485	33	140	6.5	514.0	514.0	514.1	0.1
AM	24,400	39	148	6.2	519.5	519.5	519.8	0.3
AN	24,900	97	210	4.3	522.7	522.7	522.8	0.1
AO	25,260	87	172	5.3	524.3	524.3	524.7	0.4
AP	26,270	36	158	4.8	530.2	530.2	530.3	0.1
AQ	26,540	36	143	5.3	531.3	531.3	531.6	0.3
AR	26,910	36	117	6.5	534.0	534.0	534.0	0.0
AS	27,390	99	341	2.2	537.9	537.9	538.6	0.7
AT	28,130	70	181	4.2	539.4	539.4	539.7	0.3
AU	29,030	50	126	6.0	544.4	544.4	545.0	0.6
AV	29,640	67	166	3.7	548.4	548.4	549.2	0.8
AW	30,330	80	222	2.7	550.2	550.2	550.9	0.7
AX	31,070	40	100	6.1	553.9	553.9	553.9	0.0
AY	31,630	57	130	4.7	558.4	558.4	558.6	0.2
AZ	32,240	64	165	3.7	562.4	562.4	562.8	0.4

[1]Feet from CSX Transportation

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

TUSCARORA 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
Tuscarora Creek (continued)								
BA	33,580	51	148	4.1	567.3	567.3	567.9	0.6
BB	34,730	46	117	4.4	572.1	572.1	572.9	0.8
BC	36,030	27	109	4.5	578.7	578.7	579.3	0.6
BD	37,230	30	114	3.9	583.6	583.6	584.1	0.5
BE	38,200	33	116	3.9	587.5	587.5	587.7	0.2
BF	39,320	22	77	4.9	592.4	592.4	592.6	0.2
BG	39,510	22	75	5.1	593.4	593.4	593.5	0.1

[1]Feet from CSX Transportation

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

TUSCARORA 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. These 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 report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base (1-percent annual chance) flood elevations (BFEs) 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 report by detailed methods. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent annual chance floodplain, areas within the 0.2-percent annual chance floodplain, areas of 1-percent annual chance flooding where average depths are less than 1 foot, areas of 1-percent annual chance flooding where the contributing drainage area is less than 1 square mile (sq. mi.), and areas protected from the base flood by levees. No BFEs 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 and, in the 1-percent annual chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent annual chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The countywide FIRM presents flooding information for the entire geographic area of Berkeley County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood-prone. This countywide FIRM also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community are presented in Table 5, “Community Map History.”

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Berkeley County (Unincorporated Areas)	December 16, 1977	None	August 4, 1988	November 20, 1998 August 6, 2002
*Hedgesville, Town of	N/A	N/A	N/A	N/A
Martinsburg, City of	June 7, 1974	June 18, 1976	December 18, 1979	June 15, 1984 January 3, 1997

*Non-Floodprone

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

Information pertaining to flood hazards for each jurisdiction within Berkeley County has been compiled into this FIS. Therefore, this FIS supersedes all previously printed FIS Reports, FIRMs, FBFMs, and FHBMs for Berkeley County, West Virginia and incorporated areas.

8.0 LOCATION OF DATA

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

9.0 BIBLIOGRAPHY AND REFERENCES

1. Federal Emergency Management Agency, Flood Insurance Study, Berkeley County, West Virginia (Unincorporated Areas), Washington, D.C., August 4, 1988.

2. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Local Climatological Data. Annual Summaries for Martinsburg West Virginia, Asheville, North Carolina, December 1975.

3. U.S. Department of the Interior, Geological Survey, State Discharge Data for the Tuscarora Gage Above Martinsburg, West Virginia, Prepared in 1977 (Unpublished).

4. U.S. Department of the Interior, Geological Survey, State Discharge Data for the Tuscarora Gage Above Martinsburg, West Virginia (Potomac River Basin), Charleston, West Virginia, 1976.

5. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study City of Martinsburg. Berkeley County, West Virginia, Washington, D.C., June 18, 1979.

6. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-l Flood Hydrographic Package Generalized Computer Program, Davis, California, April 1988.

7. Federal Emergency Management Agency, Flood Insurance Study, City of Martinsburg, Berkeley County, West Virginia, Washington, D.C., June 15, 1984 (Flood Insurance Study report); December 15, 1984 (Flood Insurance Rate Map).

8. U.S. Department of the Interior, Geological Survey, West Virginia Department of Highways Research project 16, Runoff Studies on Small Drainage Areas, Technique for Estimating Magnitude and Frequency of Floods in West Virginia by G.S. Runner, Charleston, West Virginia, 1980.

9. Photogrammetric Services Incorporated, Aerial Photographs of Martinsburg, West Virginia, Scale 1:4,800, Reynoldsburg, Ohio, 1977.

10. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, May 1991.

11. Buchart-Horn, Inc., Aerial Mapping, Scale 1:800, April 1994.

12. Henderson Aerial Surveys, Inc., of Columbus, Ohio, Aerial Photographs, Scale 1:14,400: Berkeley County, West Virginia, 1985.

13. Buchart-Horn, Inc., Stereoscopic Digitizing, December 1994.

14. Henderson Aerial Surveys Inc., of Columbus, Ohio, Topographic Maps Compiled from Aerial Photographs, Scale 1:4,800, Contour Interval 4 Feet: Berkeley County, West Virginia, 1985.

15. U.S. Department of the Interior, Geological Survey, Discharge-Frequency Data for the Opequon Creek Gage Near Martinsburg, West Virginia (Unpublished, 1984).

16. U.S. Department of the Interior, Geological Survey, Discharge-Frequency Data for the Tuscarora Creek Gage Near Martinsburg, West Virginia (Unpublished, 1984)

17. U.S. Department of the Interior, Geological Survey, Technique for Estimating Magnitude and Frequency of Floods in Virginia, by Earley M. Miller, Richmond, Virginia, January 1978.

18. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Unincorporated Areas of Jefferson County, West Virginia, Washington, D.C., October 15, 1980.

19. Water Resources Council, Guidelines for Determining Flood Flow Frequency, Bulletin 17, Washington, D.C., March 1976.

20. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-1 Flood Hydrograph Package, Davis, California, January 1984.

21. Pennsylvania State University, Department of Civil Engineering, Penn State Urban Hydrology Model (PSUHM), University Park, Pennsylvania. version 1994.

22. U.S. Department of Agriculture, Soil Conservation Service, Soil Survey, Jefferson County, West Virginia, Issued February 1973.

23. U.S. Department of Agriculture, Soil Conservation Service, Technical Release No. 55, Urban Hydrology for Small Watersheds, Washington, D.C., January 1975.

24. Aerial Mapping, Scale 1:800, Buchart-Horn, Inc., April 1995.

25. Federal Emergency Management Agency, Flood Insurance Study, Jefferson County, West Virginia (Unincorporated Areas), Washington, D.C., August 2, 1993.

26. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 Feet: Martinsburg, West Virginia, 1979; Middleway, West Virginia, 1978; Inwood, West Virginia-Virginia, 1966, Photorevised 1979.

27. Softdesk, Incorporated, Softdesk Civil/Survey, Version 7.0, Henniker, New Hampshire, November 1994.

28. Federal Emergency Management Agency, Flood Insurance Study, City of Charles Town, Jefferson County, West Virginia, Washington, D.C., September 30, 1992.

29. Federal Emergency Management Agency, Flood Insurance Study, City of Ranson, Jefferson County, West Virginia, Washington, D.C., January 20, 1993.

30. Federal Emergency Management Agency, Flood Insurance Study, Town of Harpers Ferry, Jefferson County, West Virginia, Washington, D.C., August 24, 1984.

31. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Town of Shepardstown, Jefferson County, West Virginia, Washington, D.C., March 18, 1980.

32. Federal Emergency Management Agency, Flood Insurance Study, Washington County, Maryland, Washington, D.C., September 30, 1992.

33. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Frederick County, Virginia, Washington, D.C., July 17, 1978.

34. U.S. Census Bureau, 2004 Population Estimates.

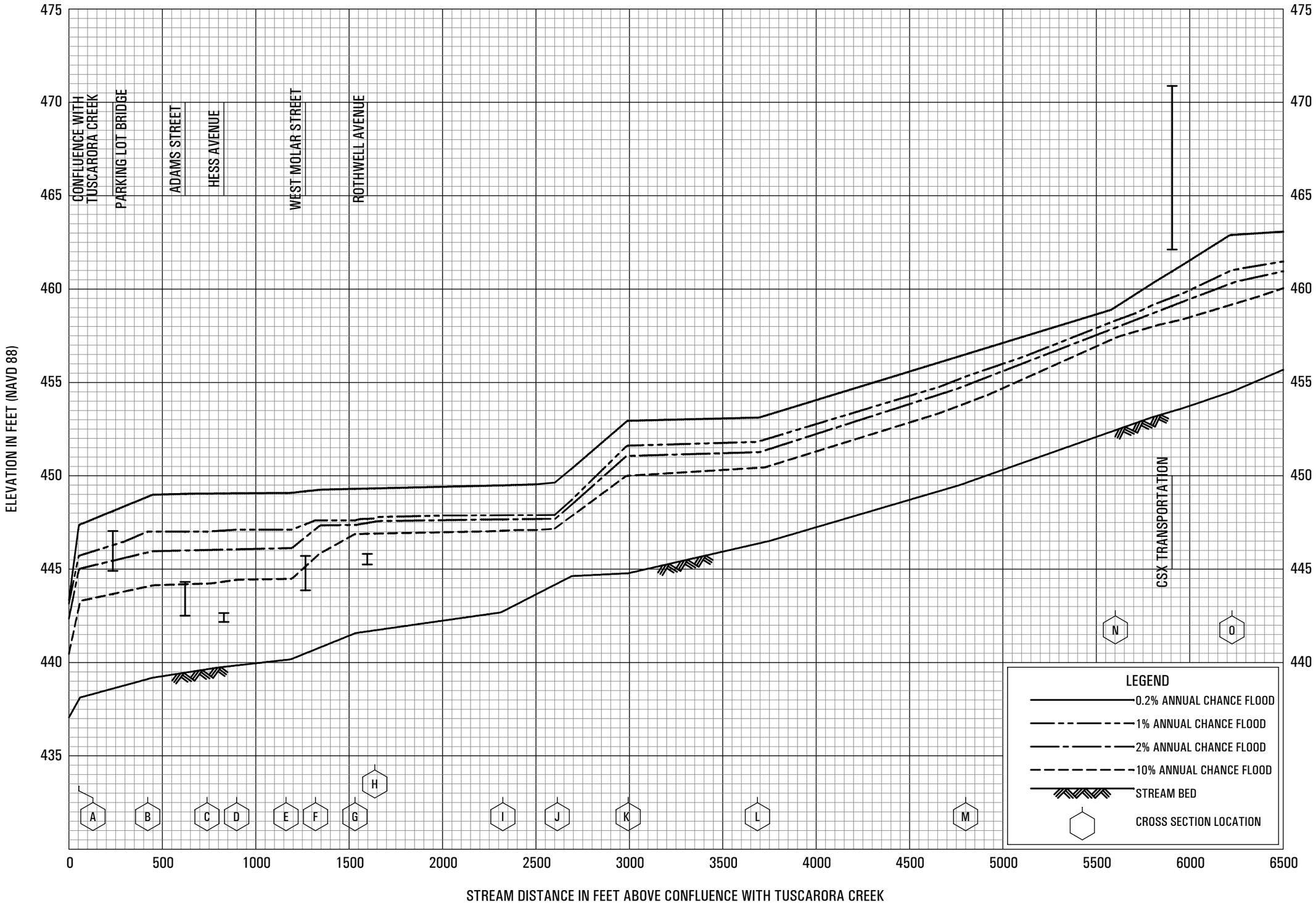
35. USGS, Peak Streamflow for West Virginia, http://nwis.waterdata.usgs.gov/wv

36. U.S. Department of the Interior, Geological Survey, Water Resources Investigations Report 00-4080, Estimating Magnitude and Frequency of Peak Discharges of Rural, Unregulated Streams in Virginia, by J. B. Wiley, J. T. Atkins, and G. D. Tasker, pages 26 and 62, 2000.

37. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS River Analysis System, Version 2.2, Generalized Computer Program, Davis, California, October 1977.

38. 3DI of Dulles, Virginia. Digital Topographic Information compiled from aerial photographs of 1:48,000 contour interval 5 feet and from aerial photographs of 1:4000 contour interval 2 feet: Berkeley County, West Virginia, 1999.

39. Federal Emergency Management Agency, Flood Insurance Study, Berkeley County, West Virginia (Unincorporated Areas), Washington, D.C., November 20, 1998.



FLOOD PROFILES

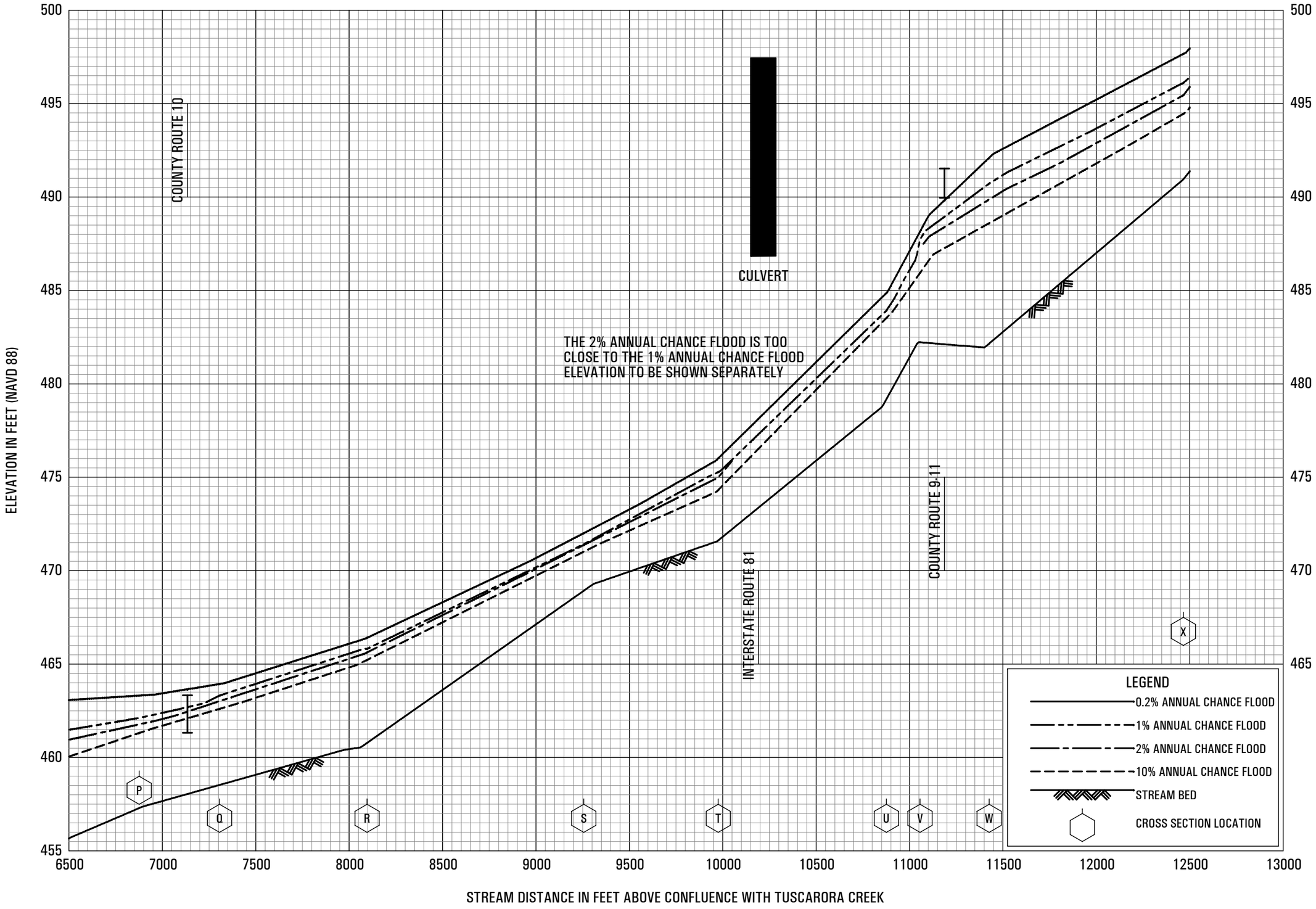
DRY RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS

01P



FLOOD PROFILES

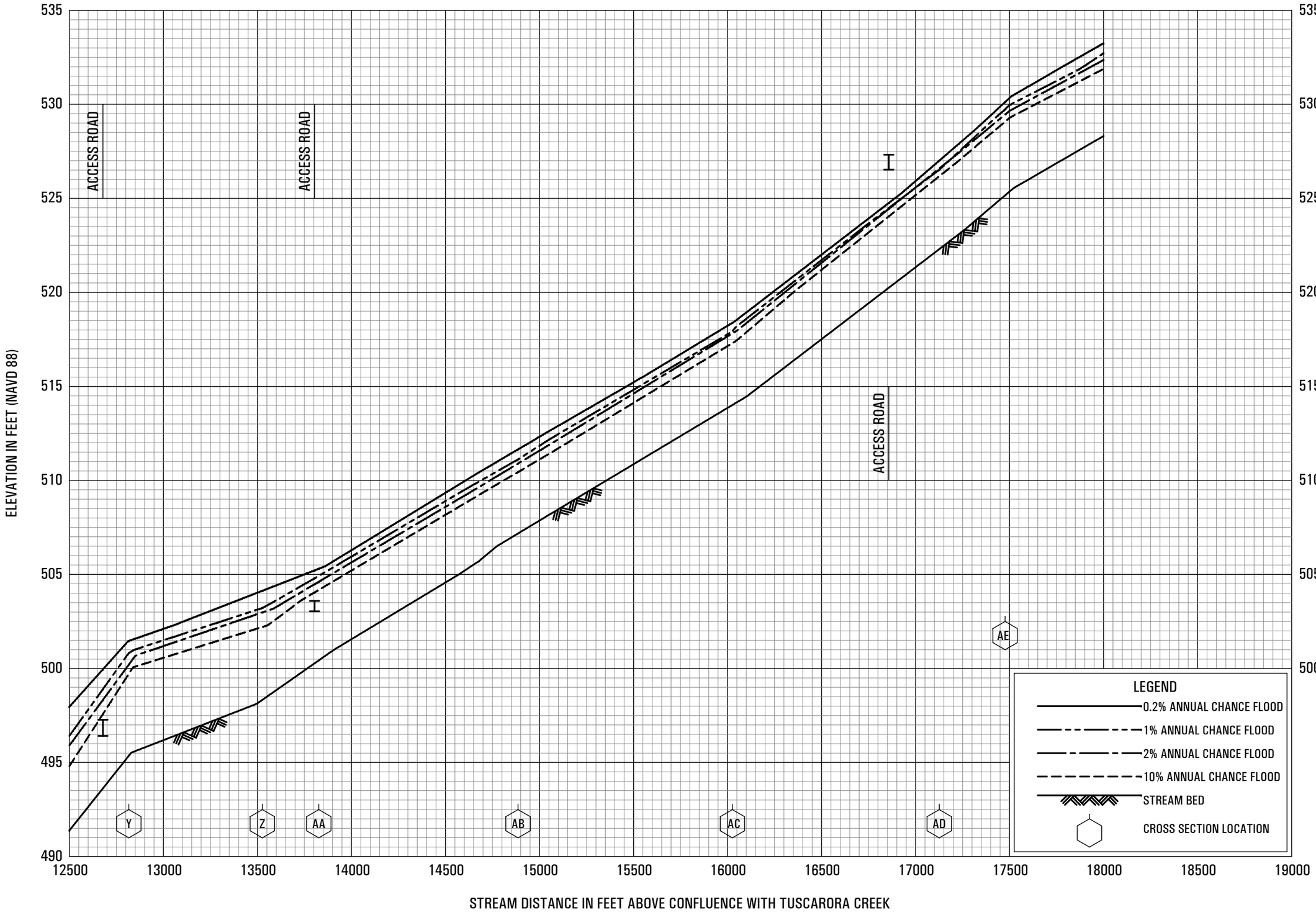
DRY RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS

02P



FLOOD PROFILES

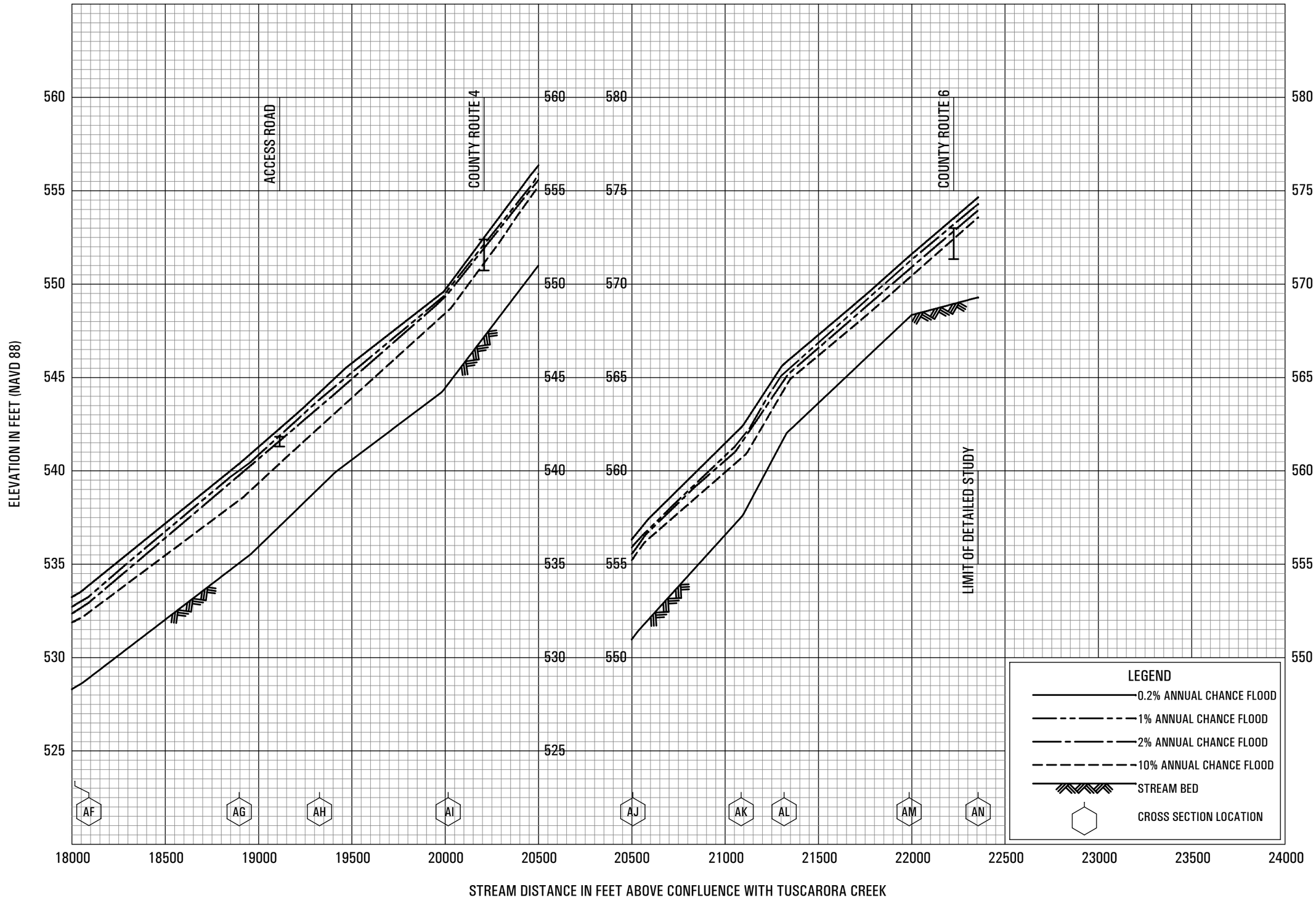
DRY RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS

03P



FLOOD PROFILES

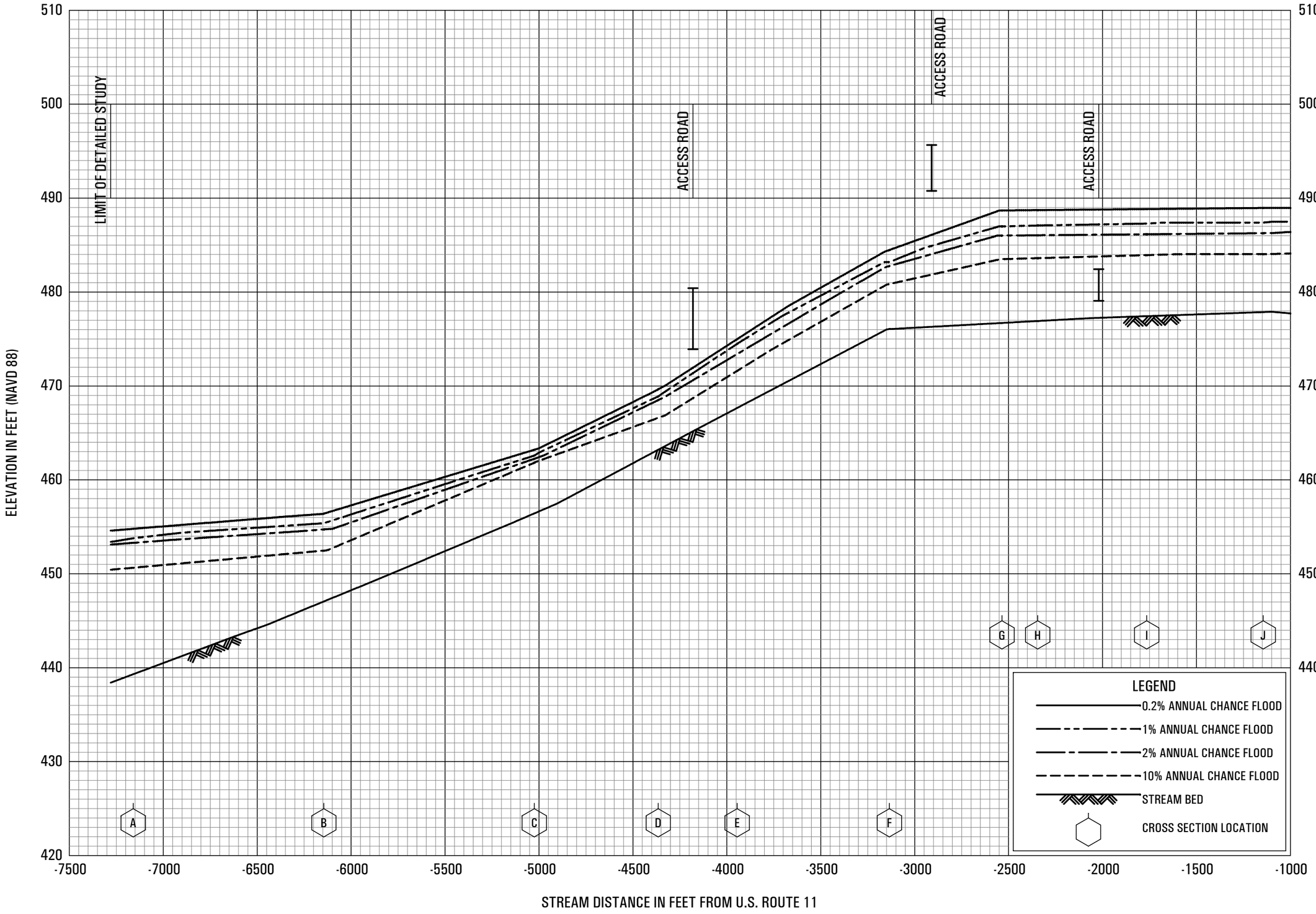
DRY RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS

04P



FLOOD PROFILES

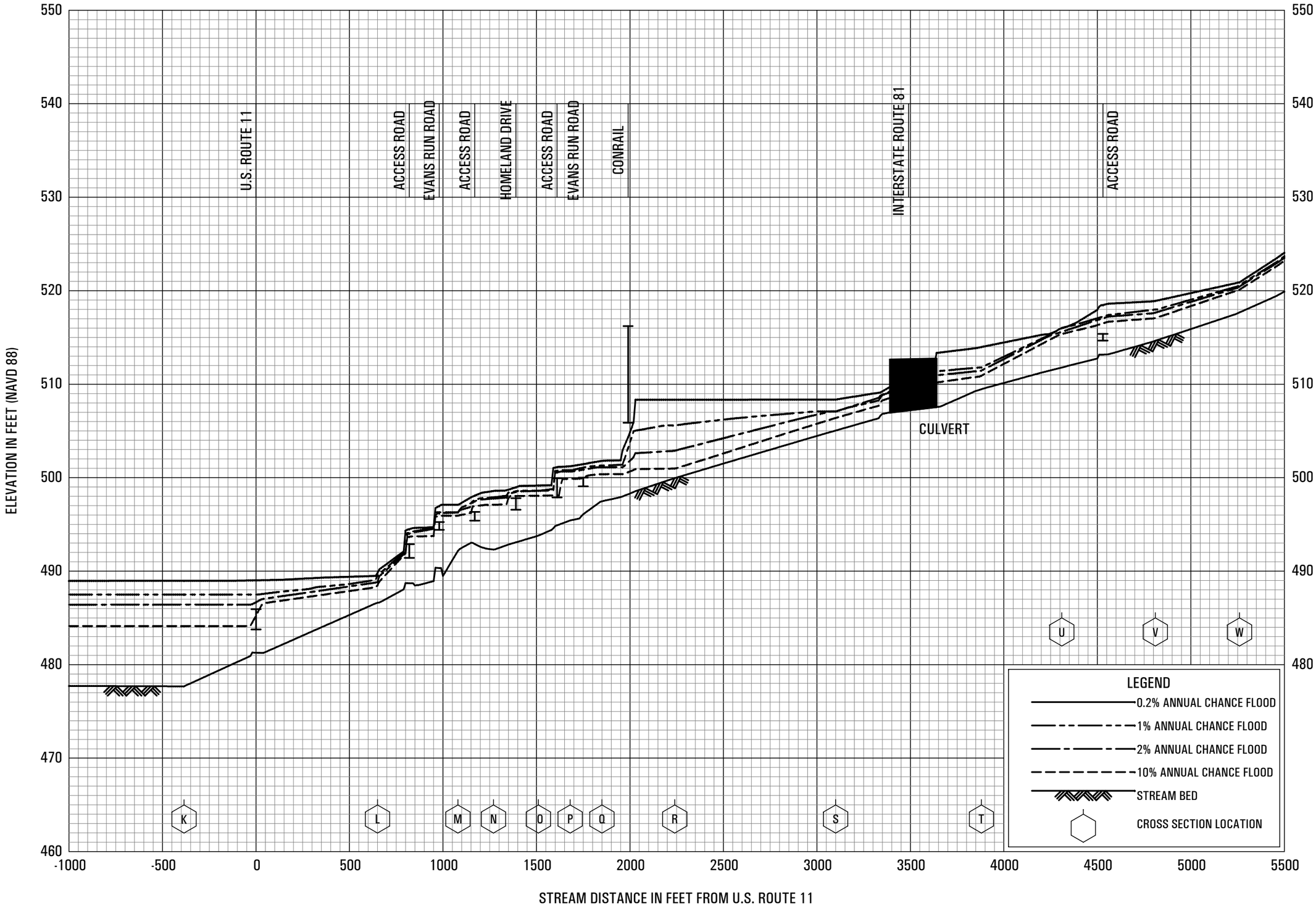
EVANS RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS

05P



FLOOD PROFILES

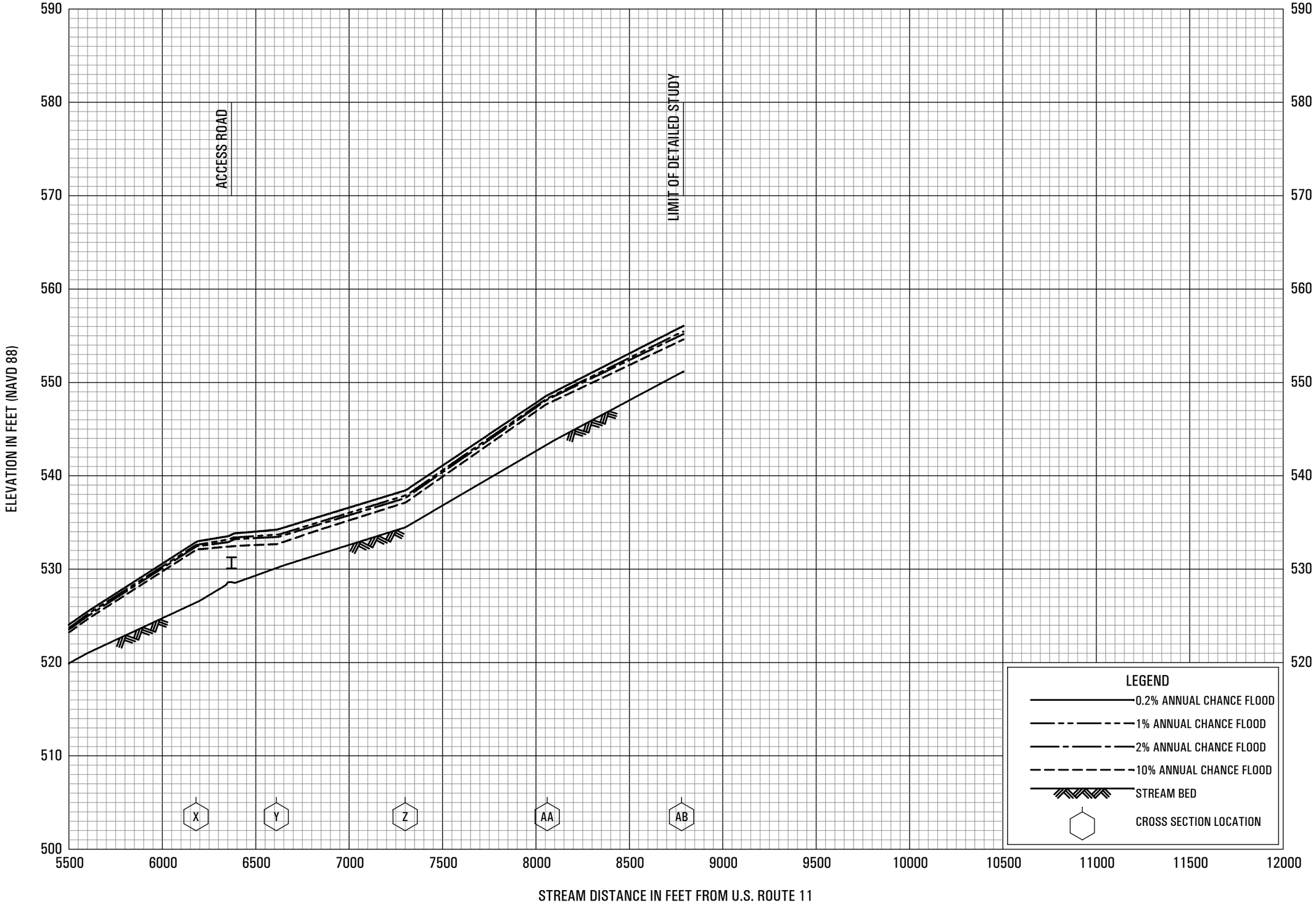
EVANS RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS

06P



FLOOD PROFILES

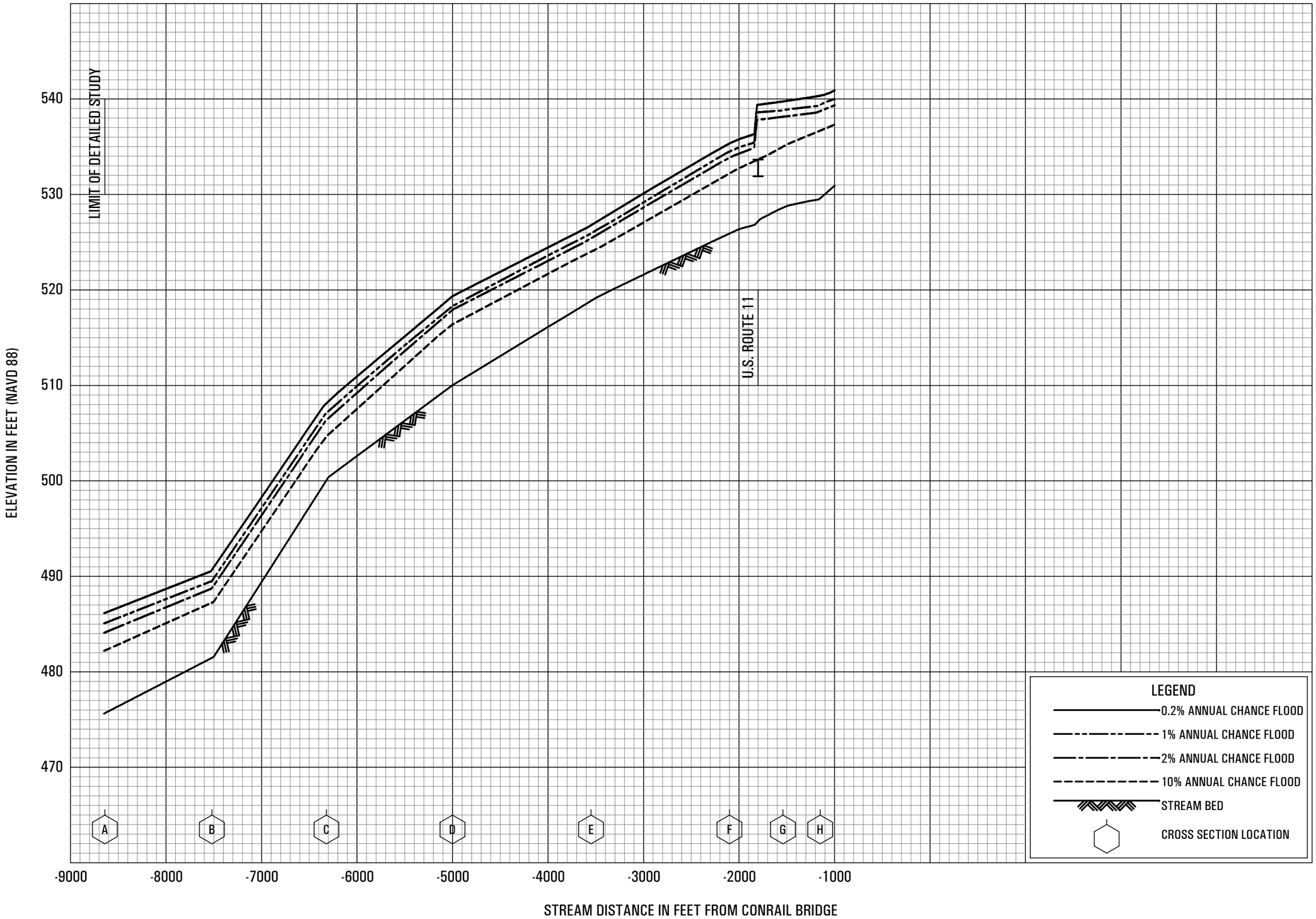
EVANS RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS

07P



FLOOD PROFILES

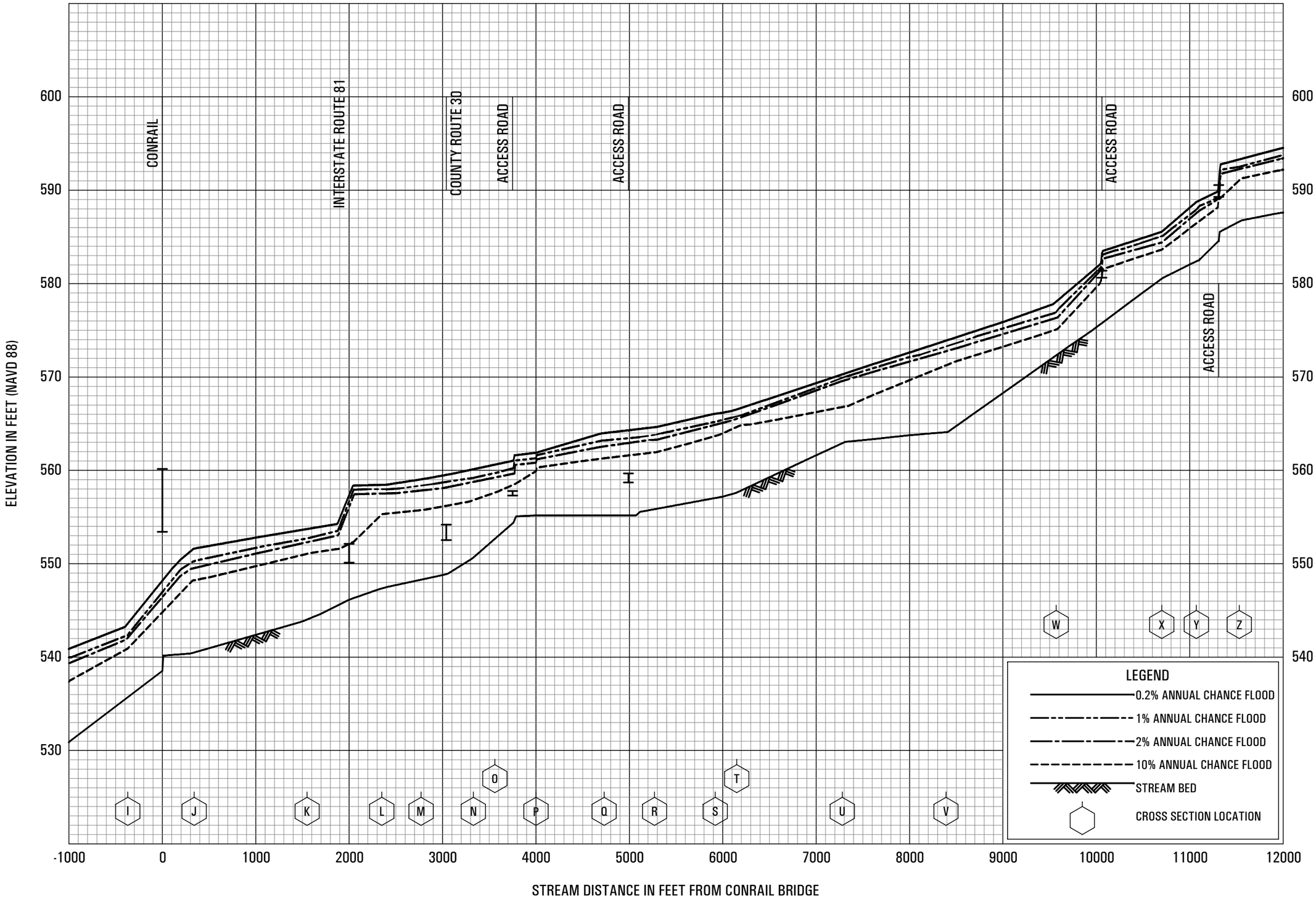
MIDDLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS

08P



FLOOD PROFILES

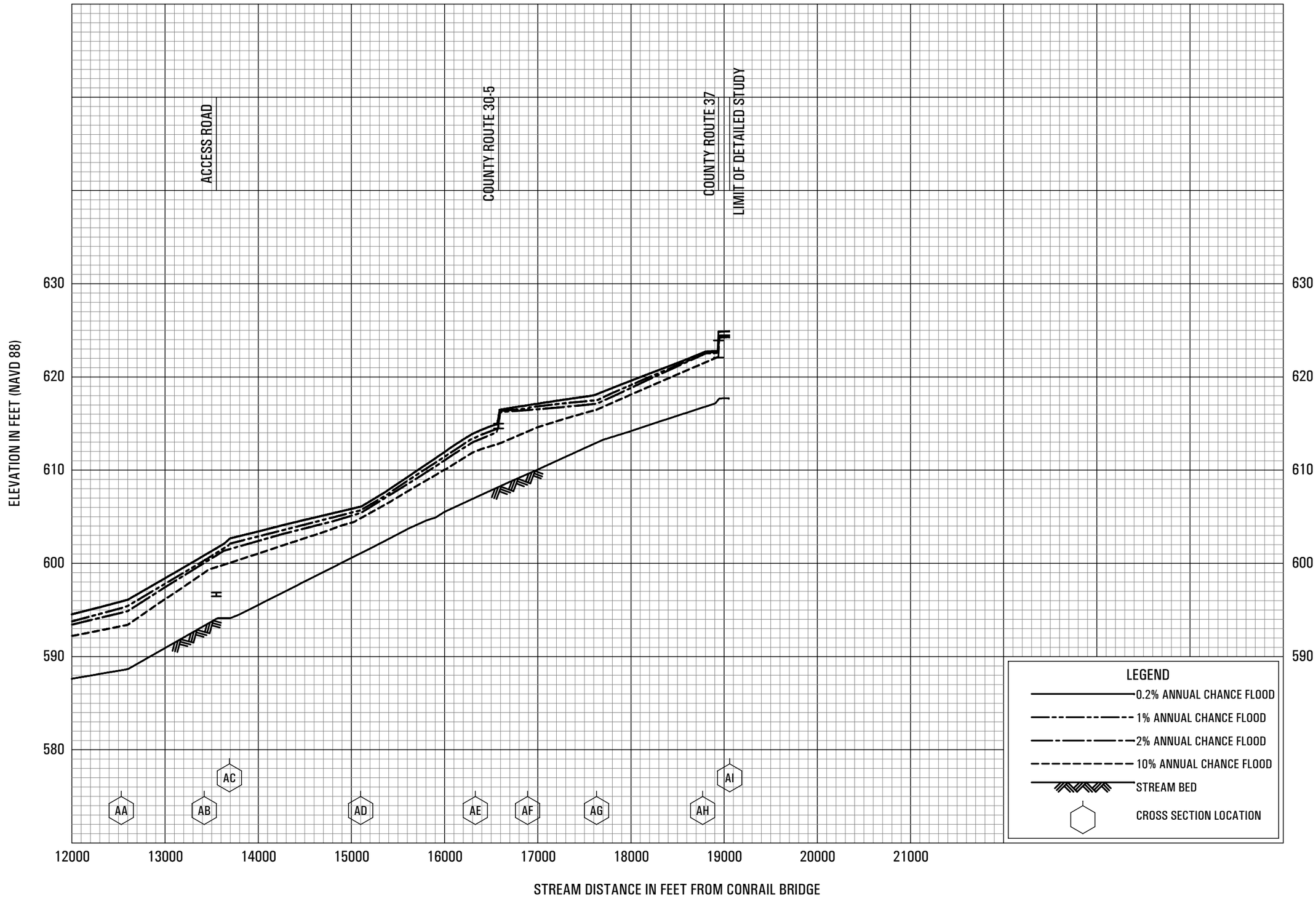
MIDDLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS

09P



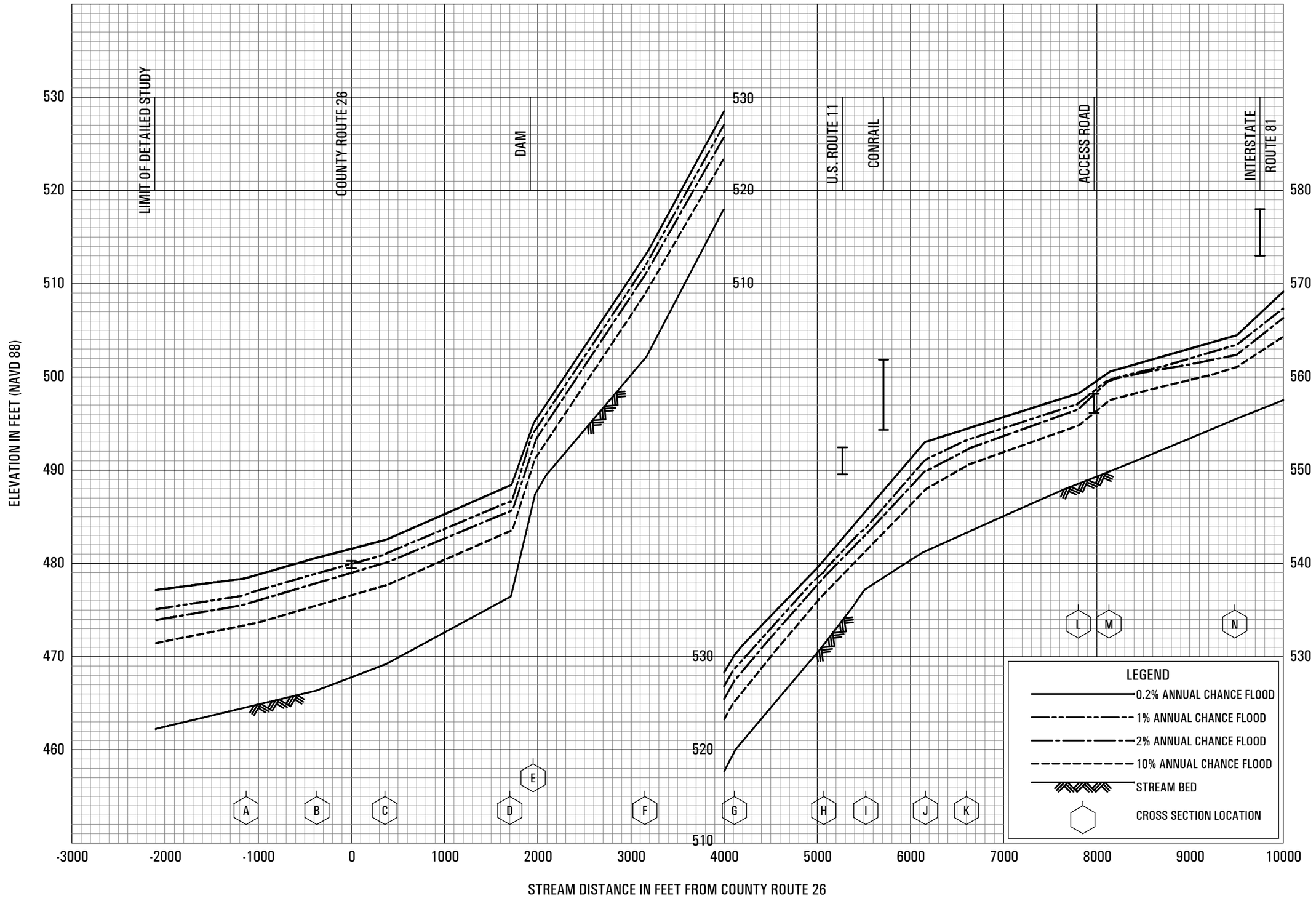
FLOOD PROFILES

MIDDLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



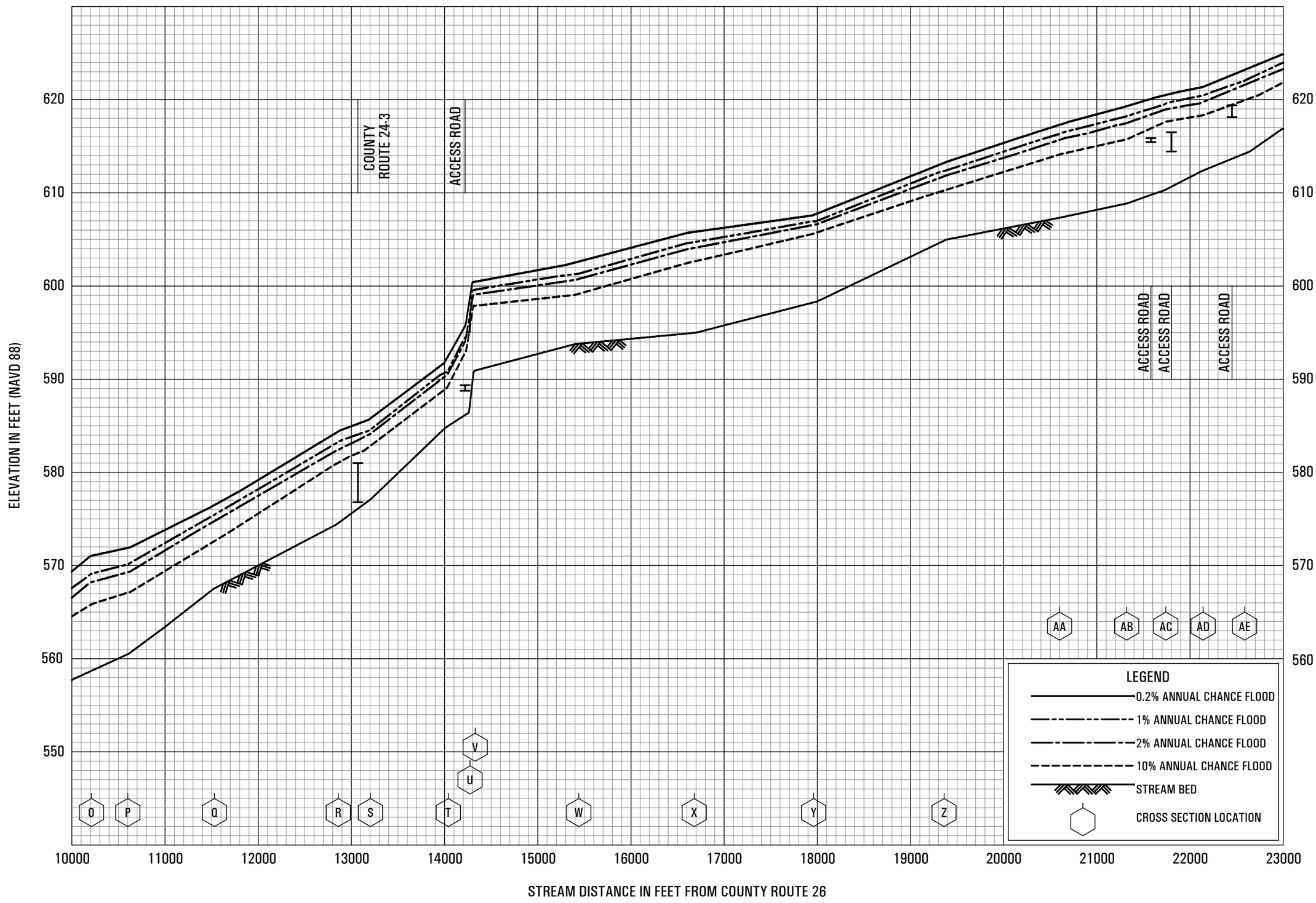
FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



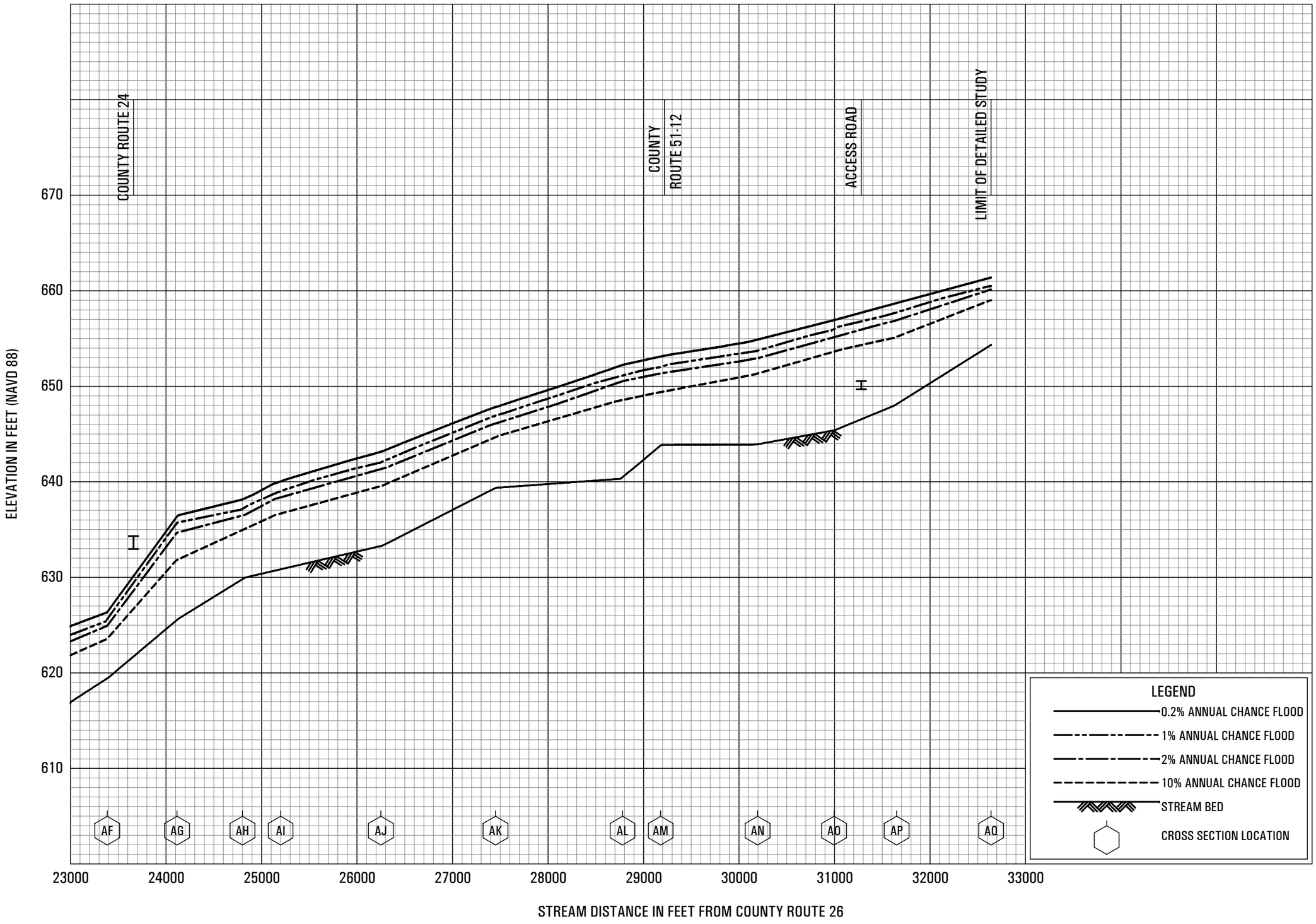
FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



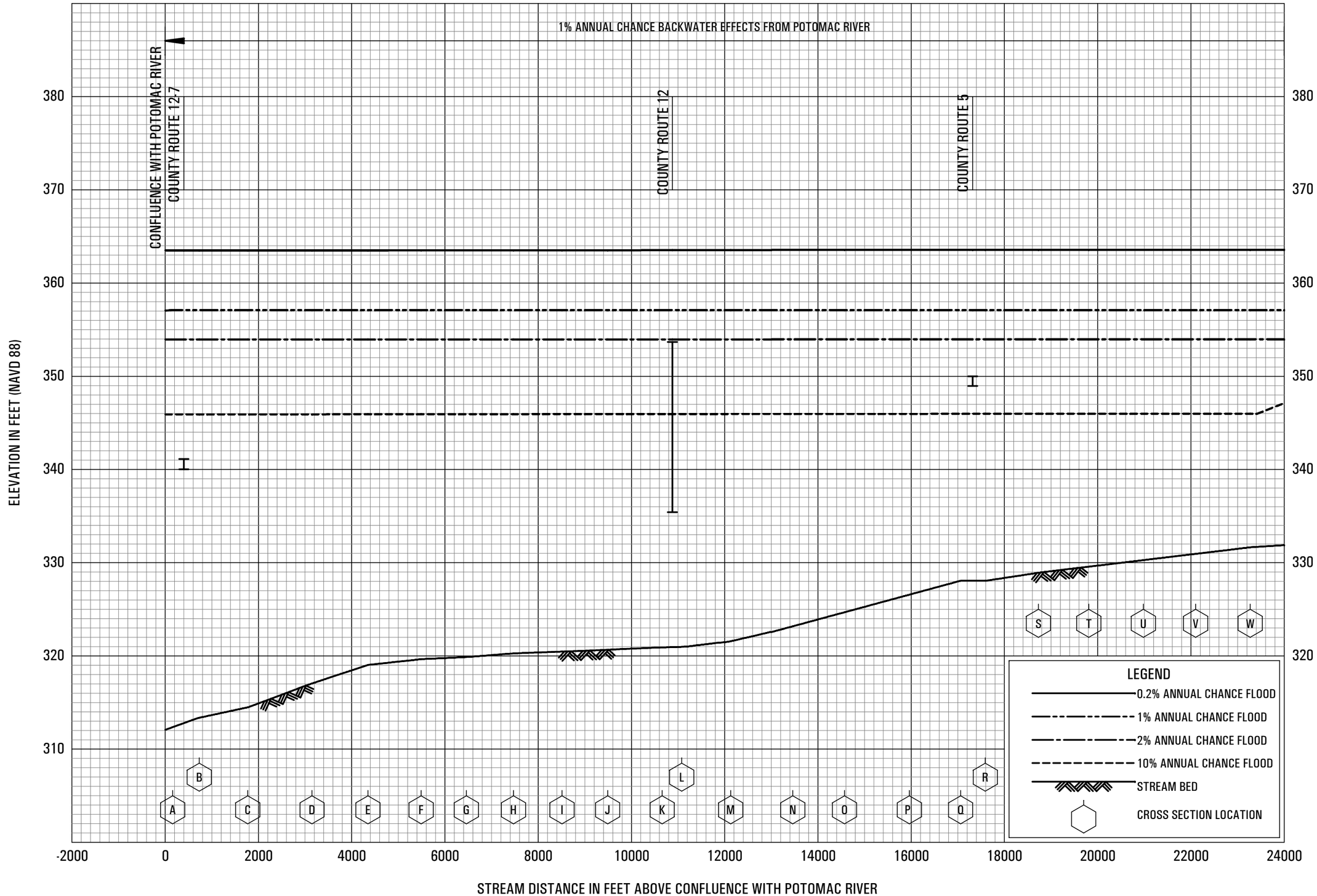
FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



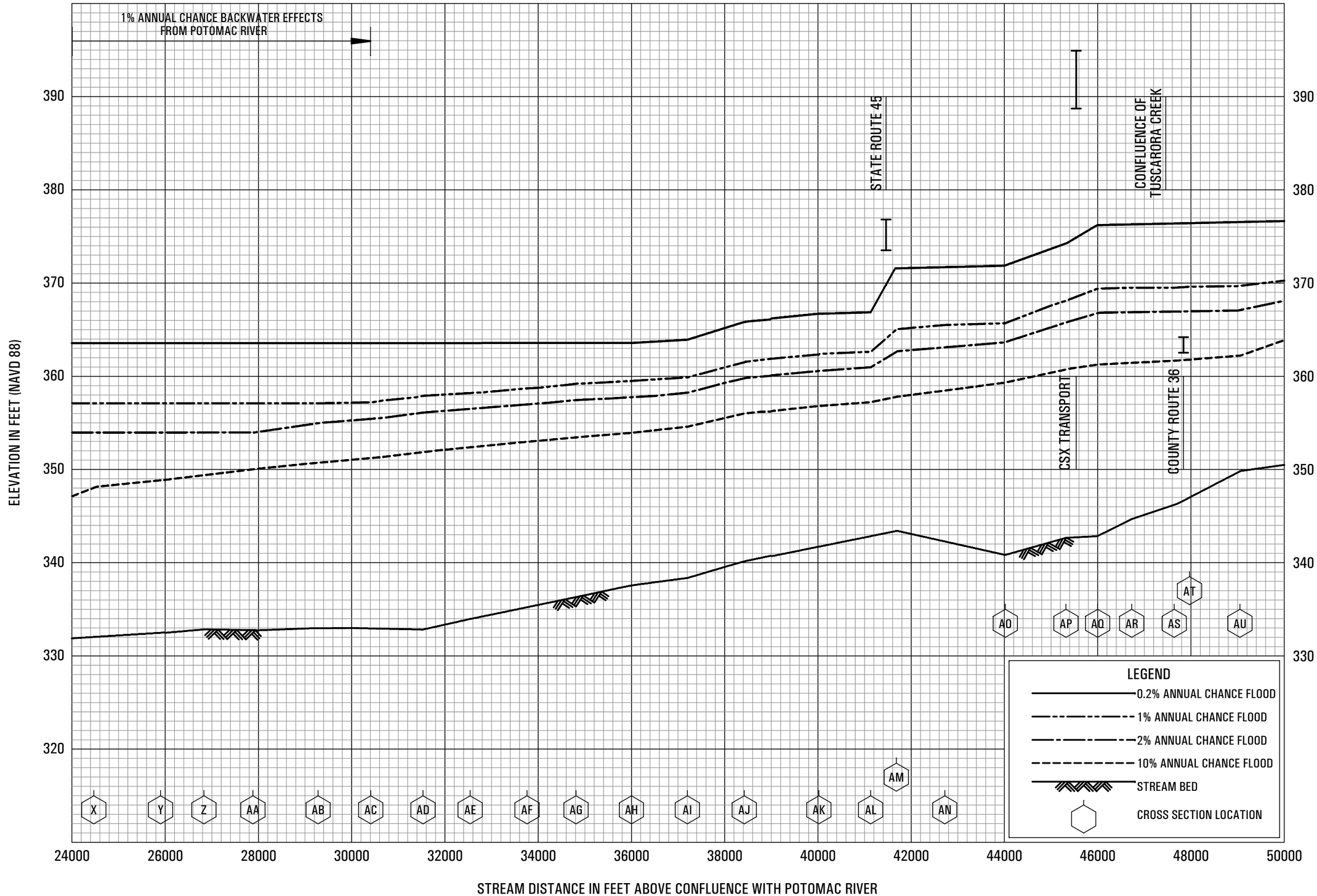
FLOOD PROFILES

OPEQUON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



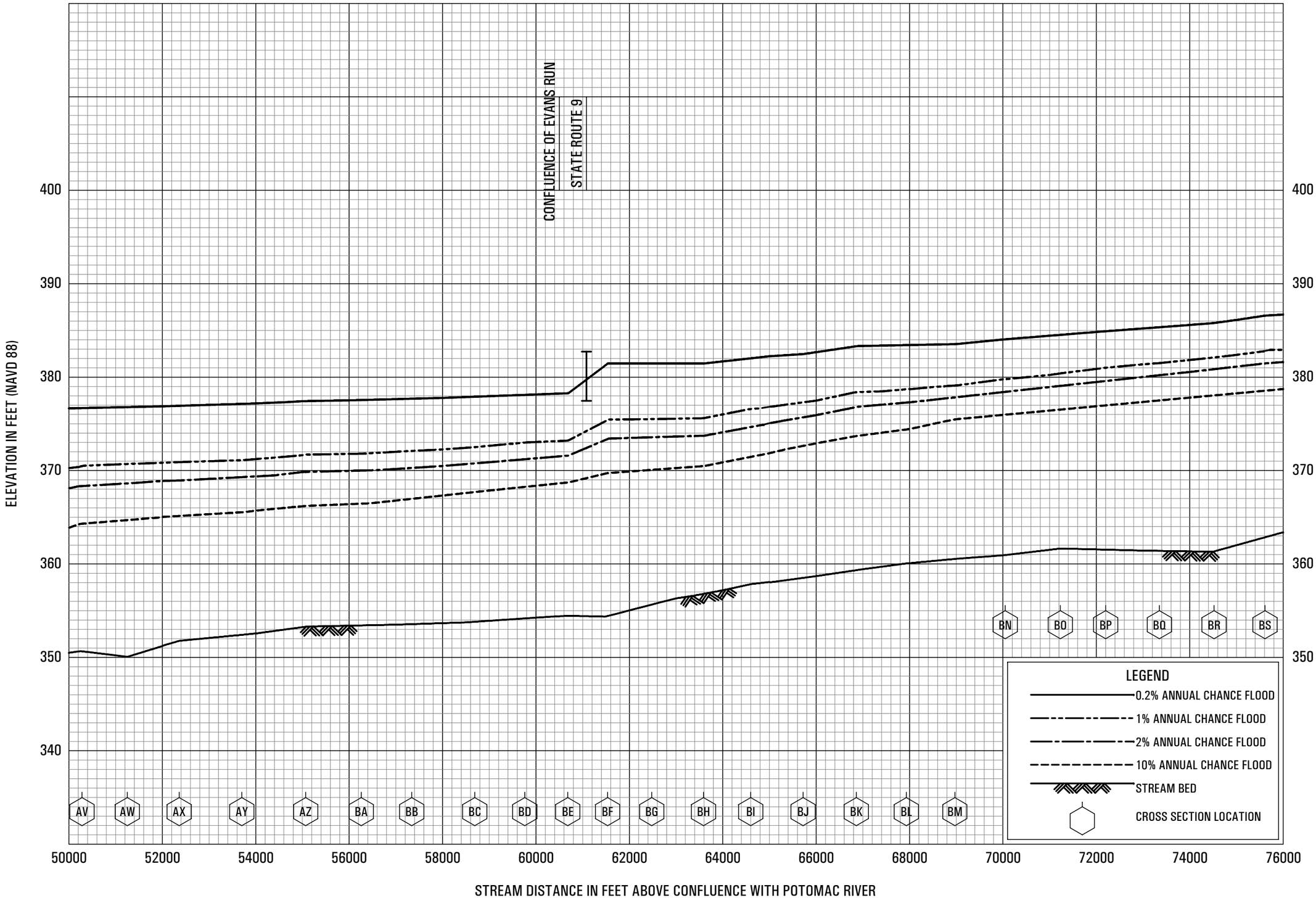
FLOOD PROFILES

OPEQUON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



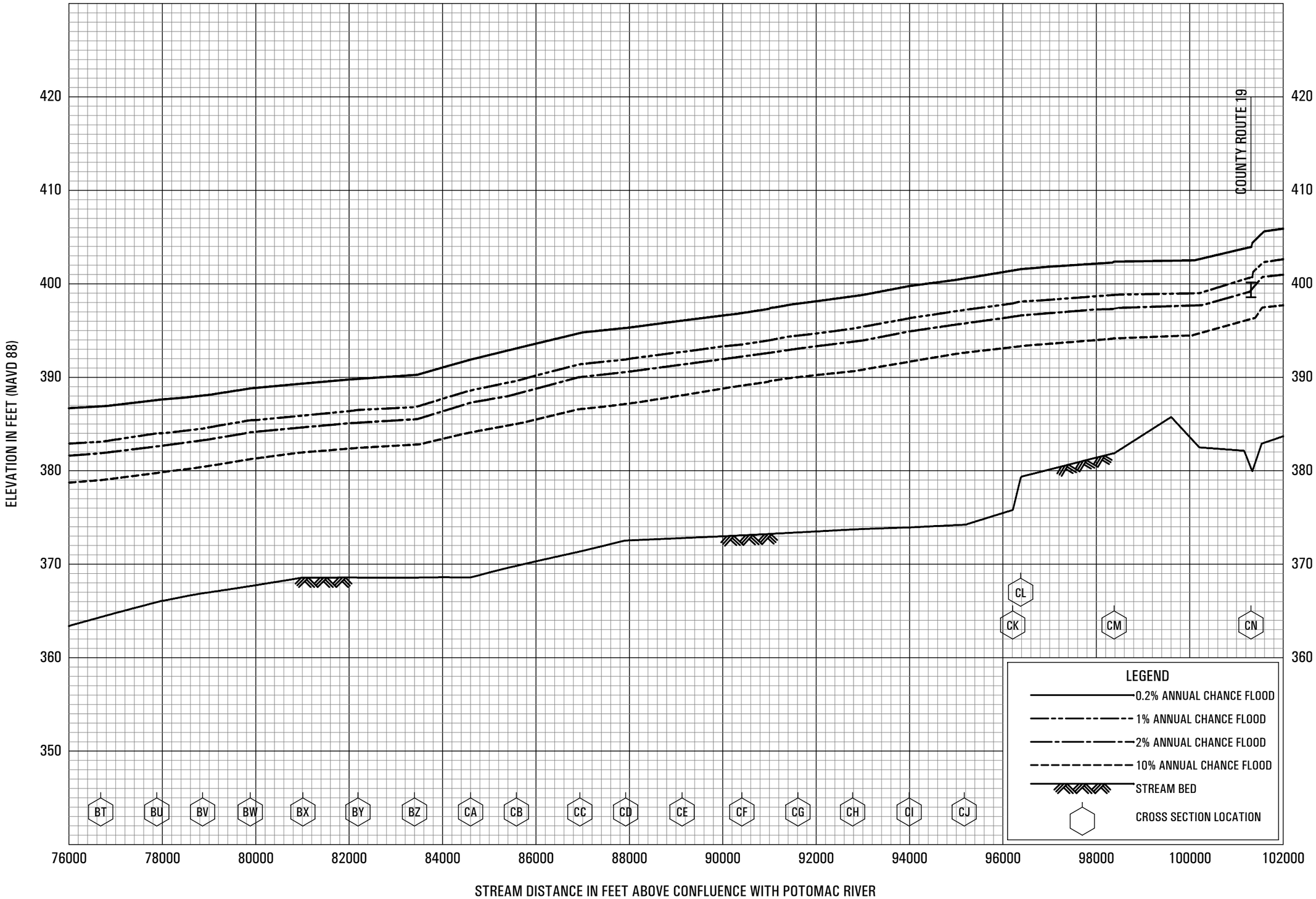
FLOOD PROFILES

OPEQUON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



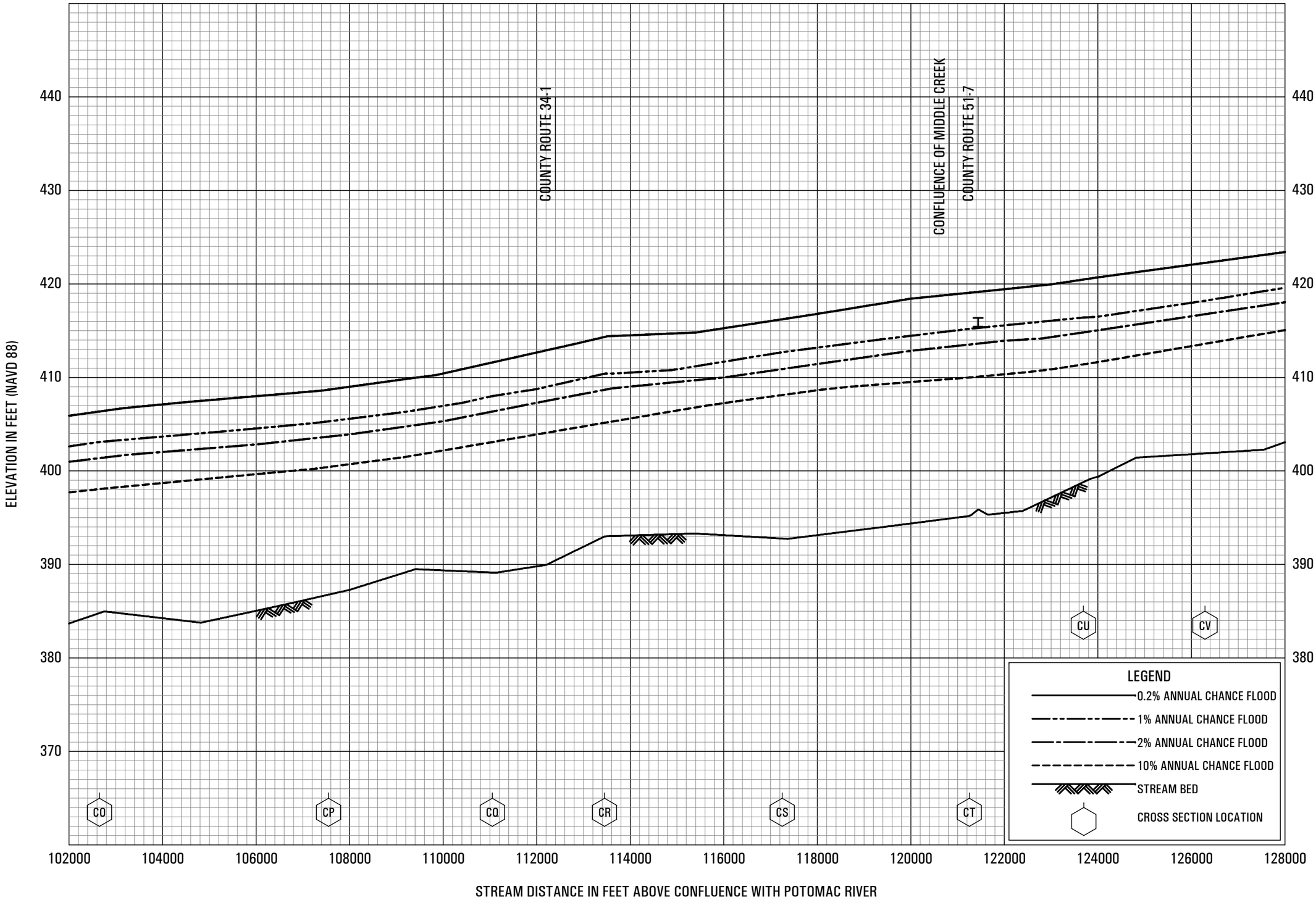
FLOOD PROFILES

OPEQUON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



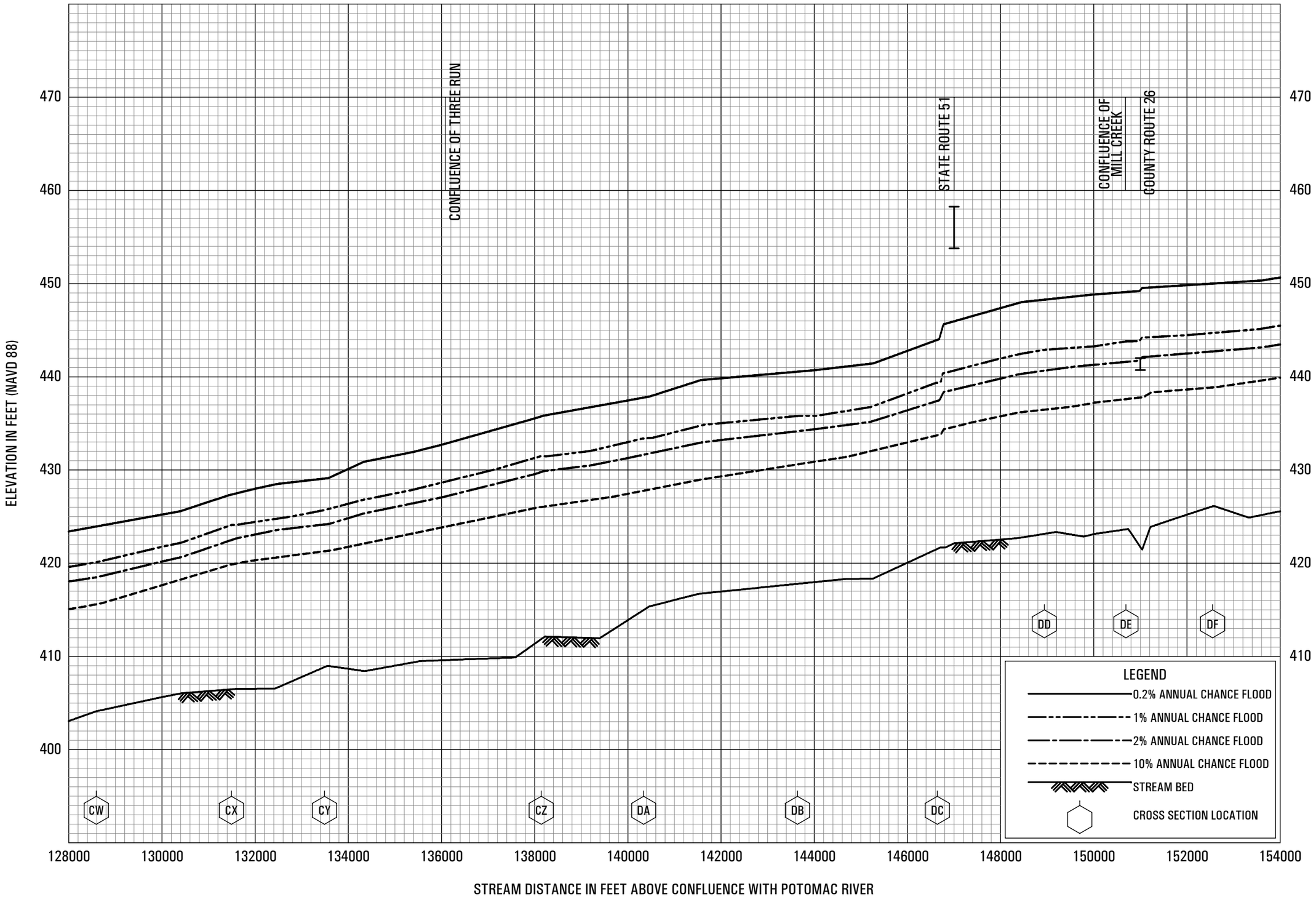
FLOOD PROFILES

OPEQUON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



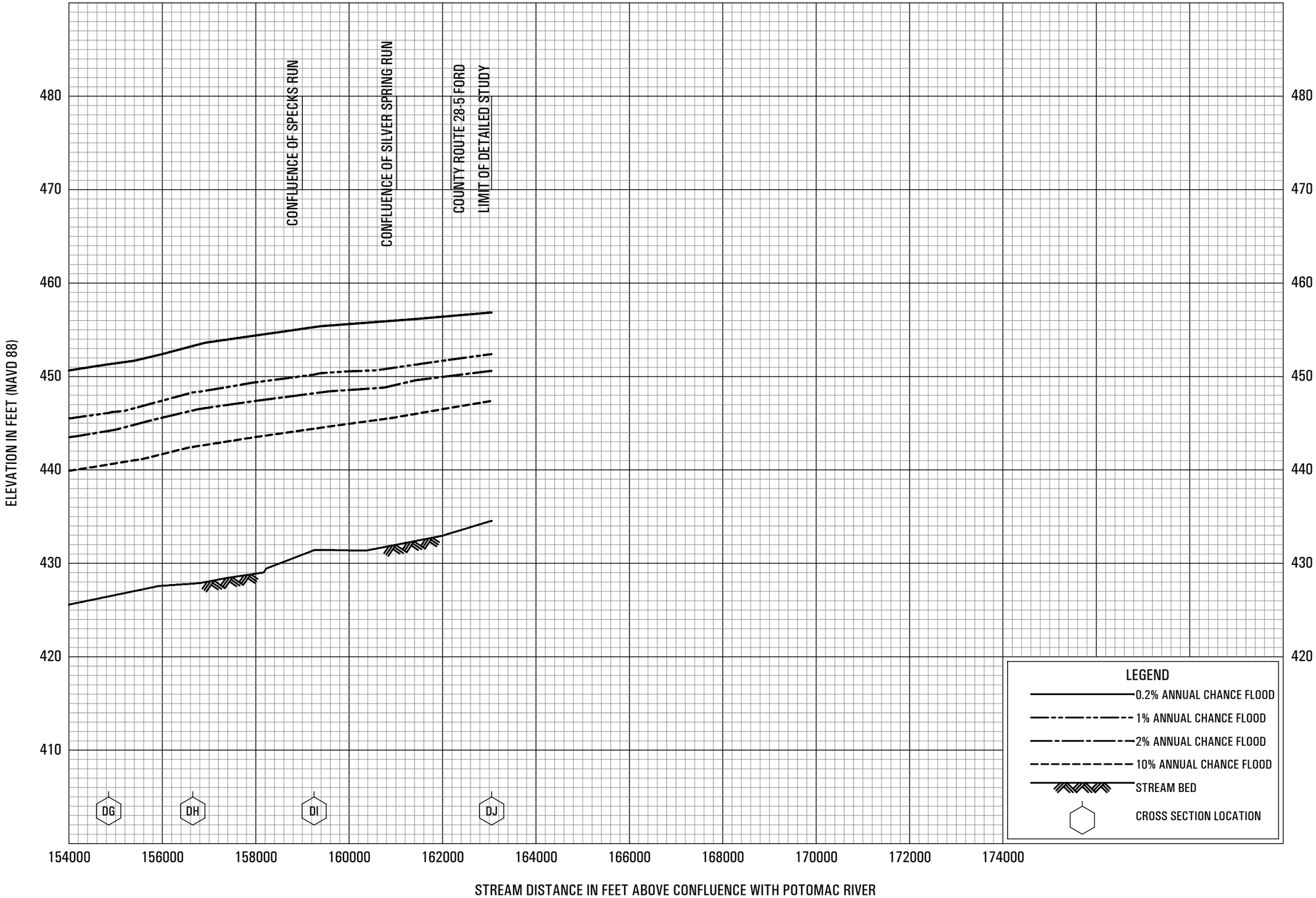
FLOOD PROFILES

OPEQUON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



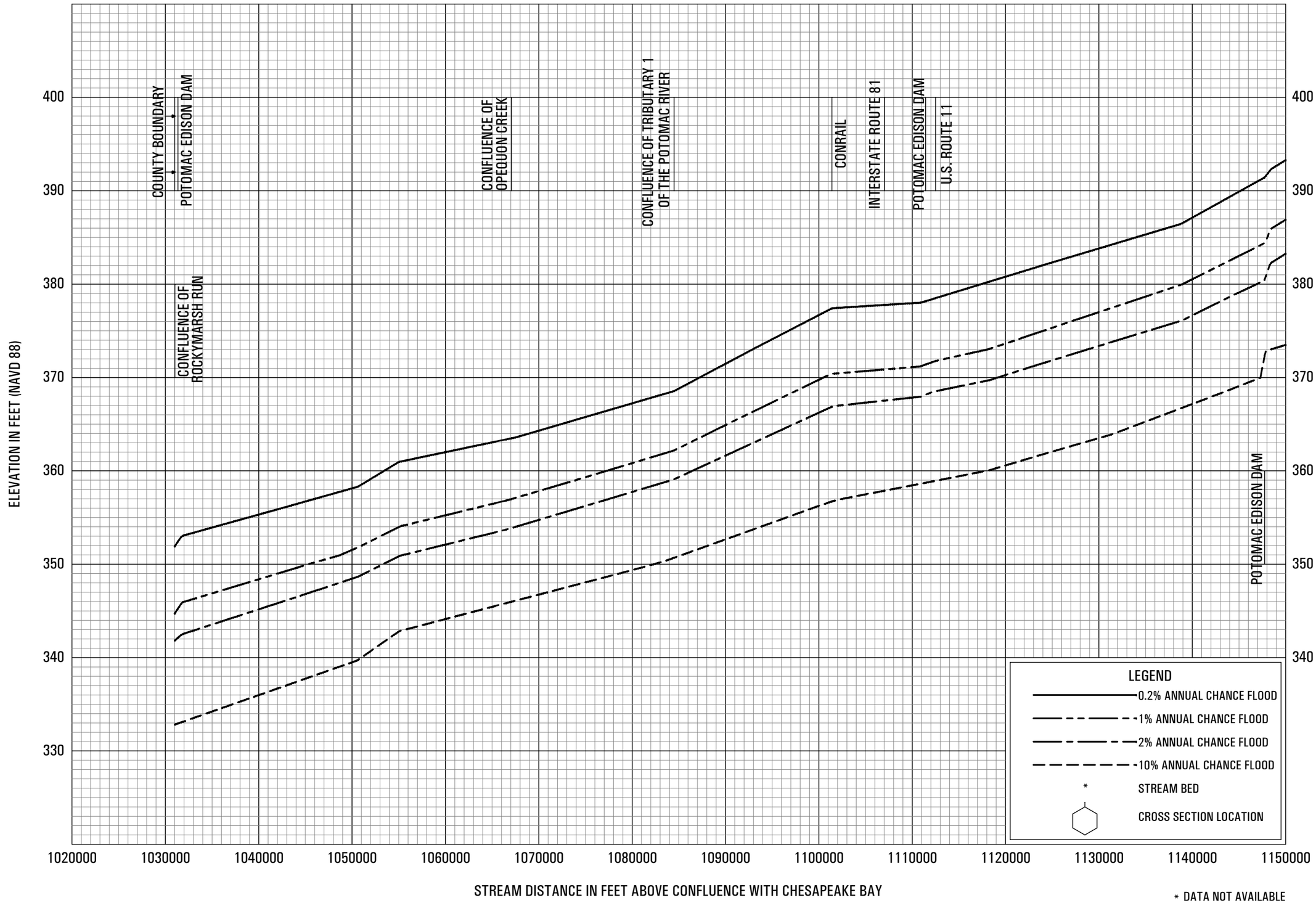
FLOOD PROFILES

OPEQUON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



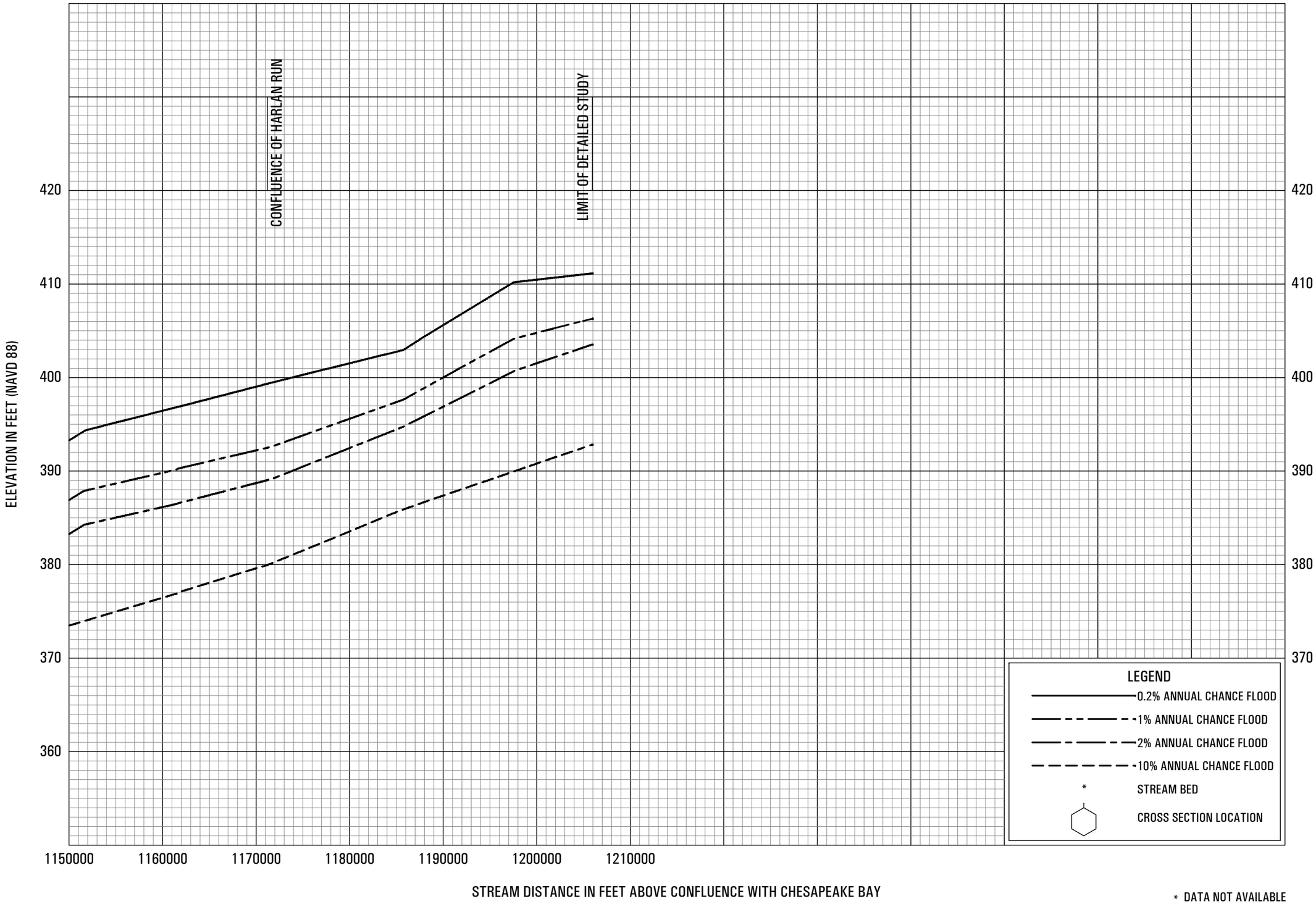
FLOOD PROFILES

POTOMAC RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



* DATA NOT AVAILABLE

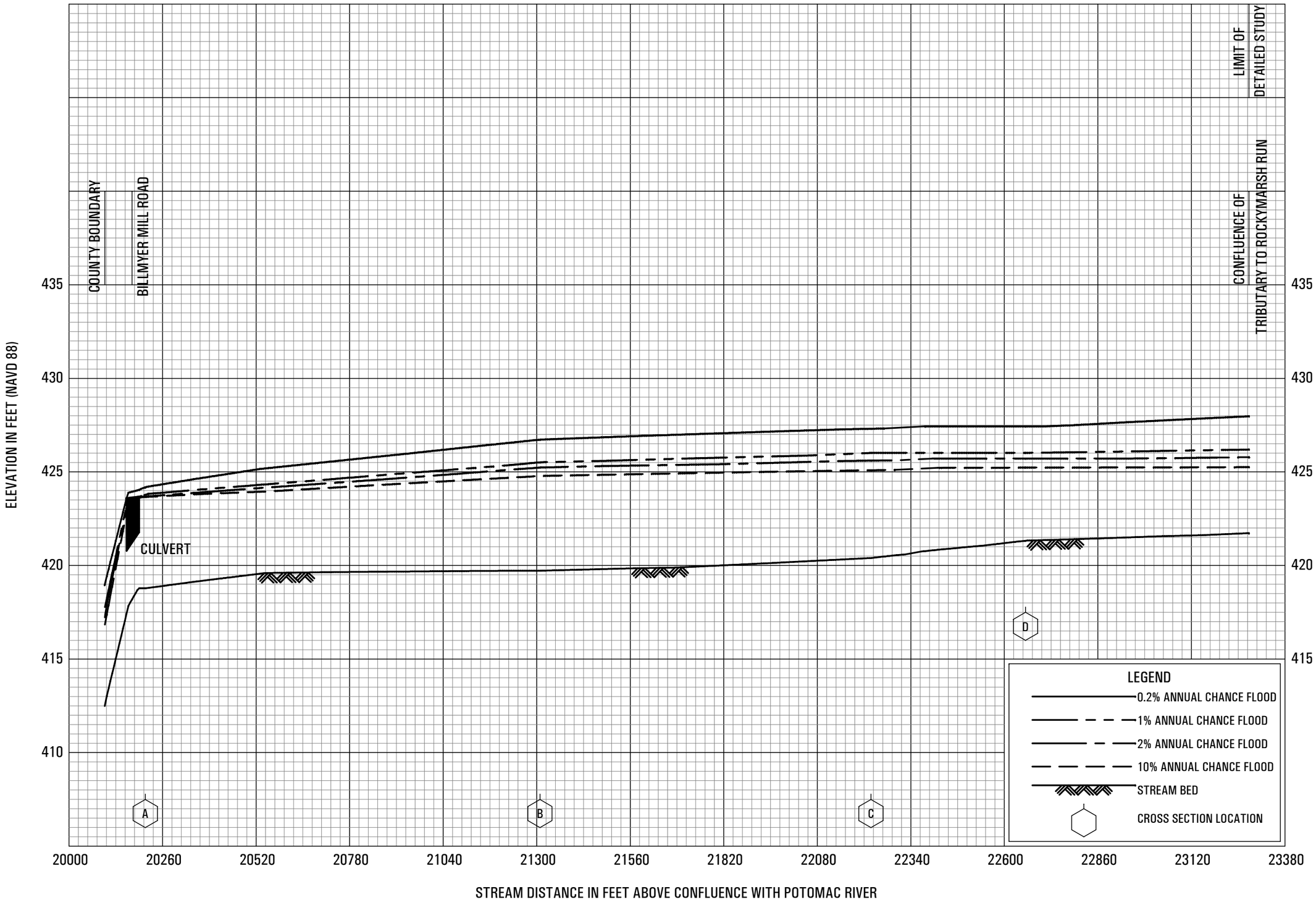
FLOOD PROFILES

POTOMAC RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



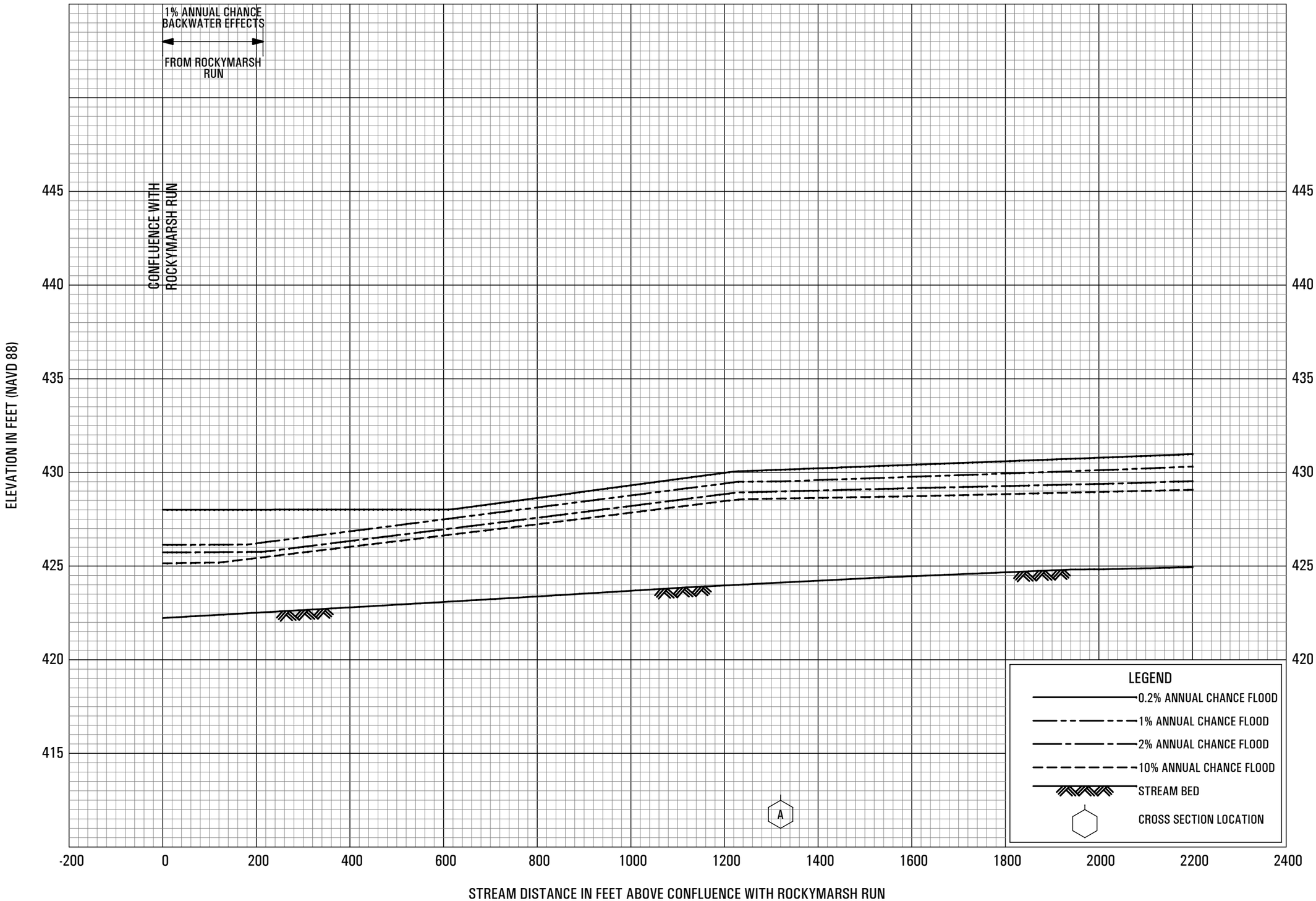
FLOOD PROFILES

ROCKYMARSH RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



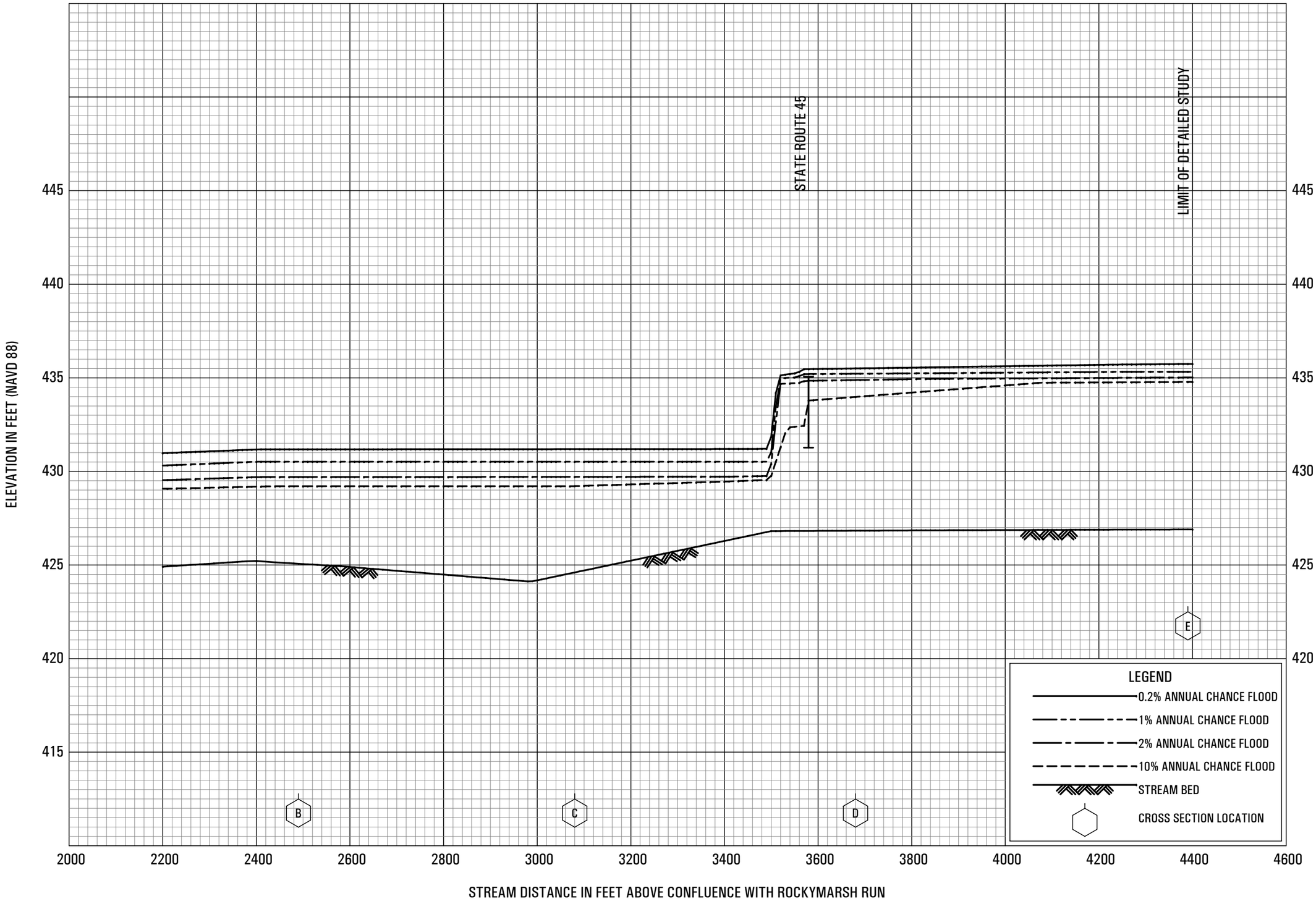
FLOOD PROFILES

TRIBUTARY TO ROCKYMARSH RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



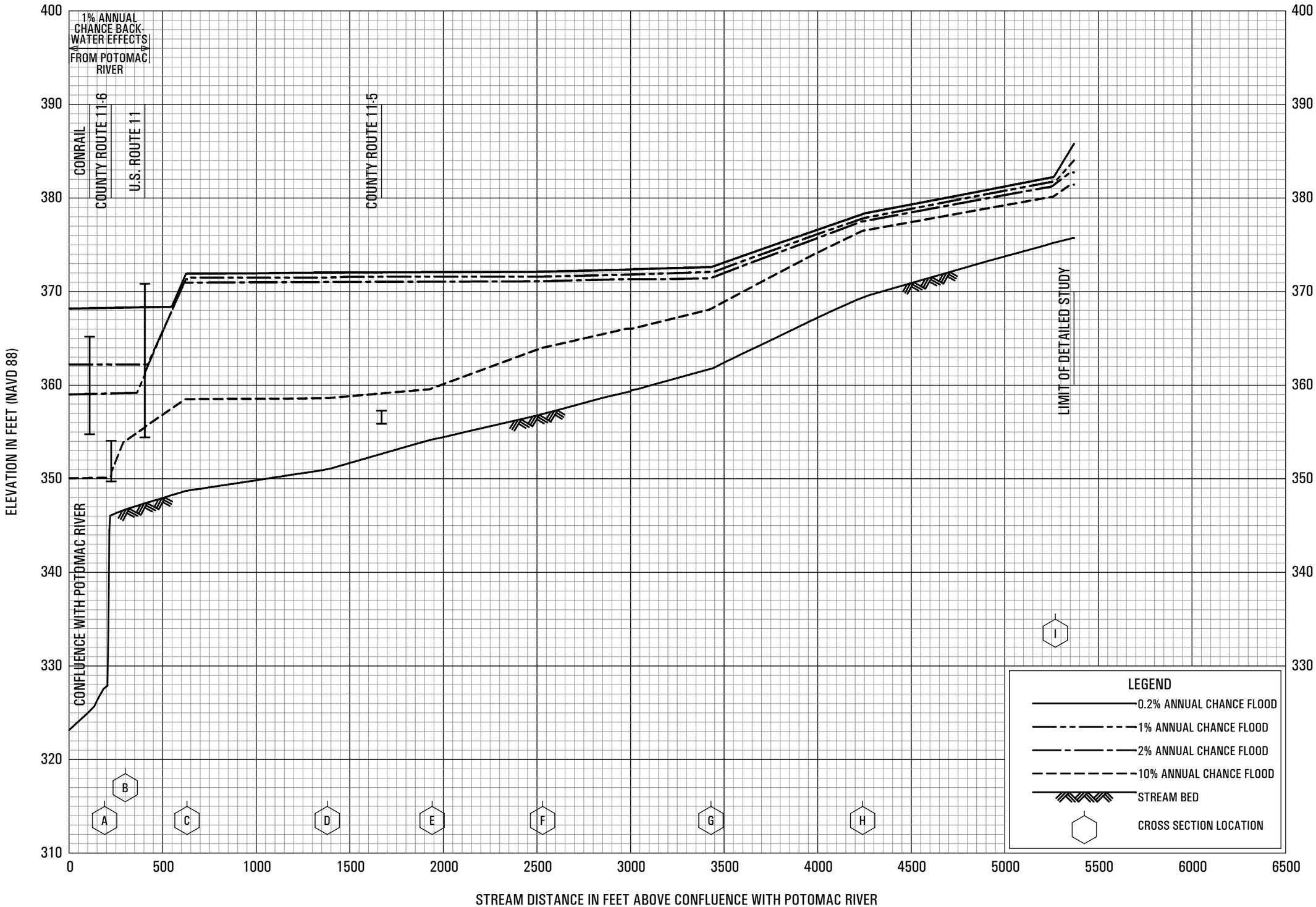
FLOOD PROFILES

TRIBUTARY TO ROCKYMARSH RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



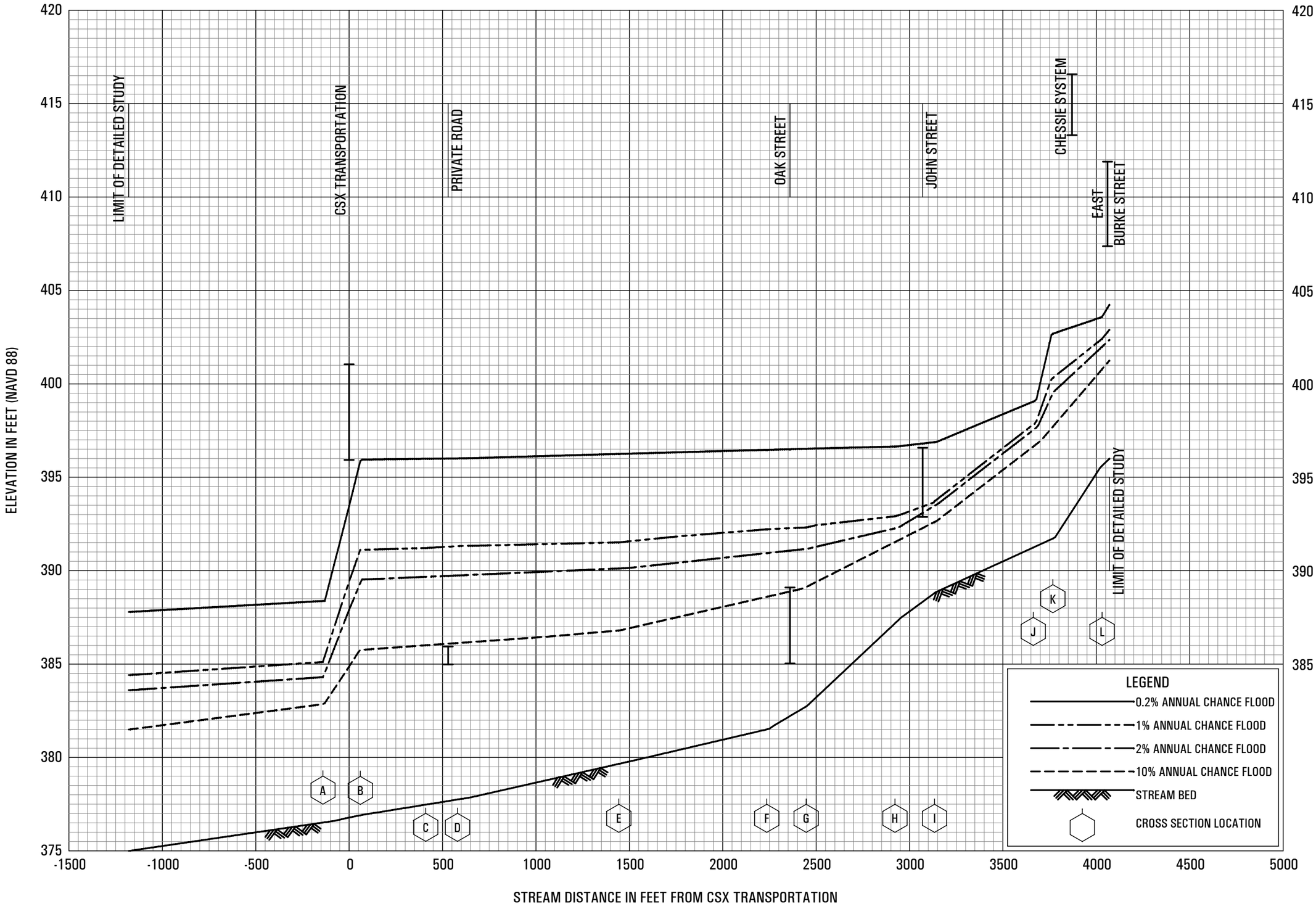
FLOOD PROFILES

TRIBUTARY 1 OF THE POTOMAC RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



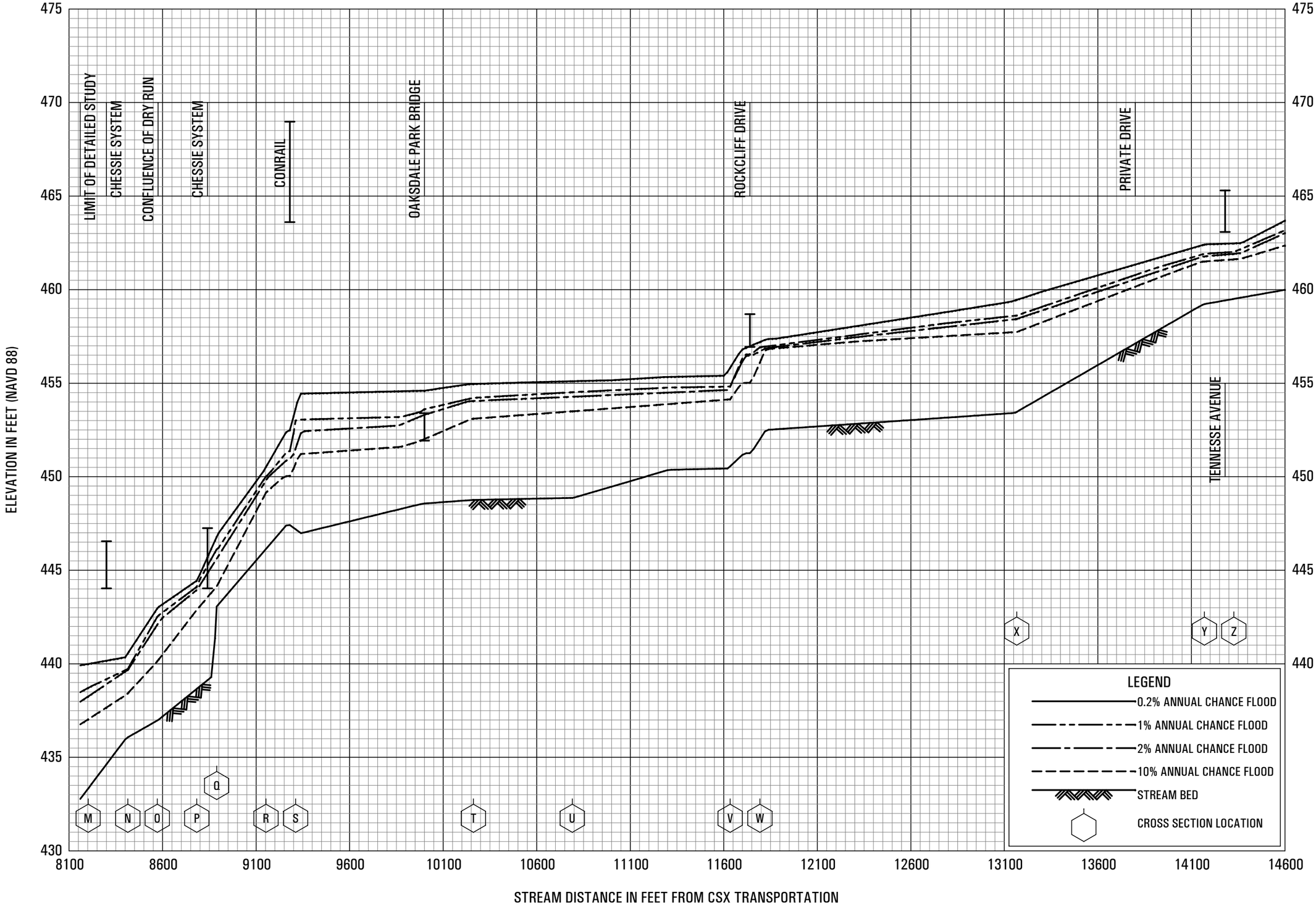
FLOOD PROFILES

TUSCARORA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



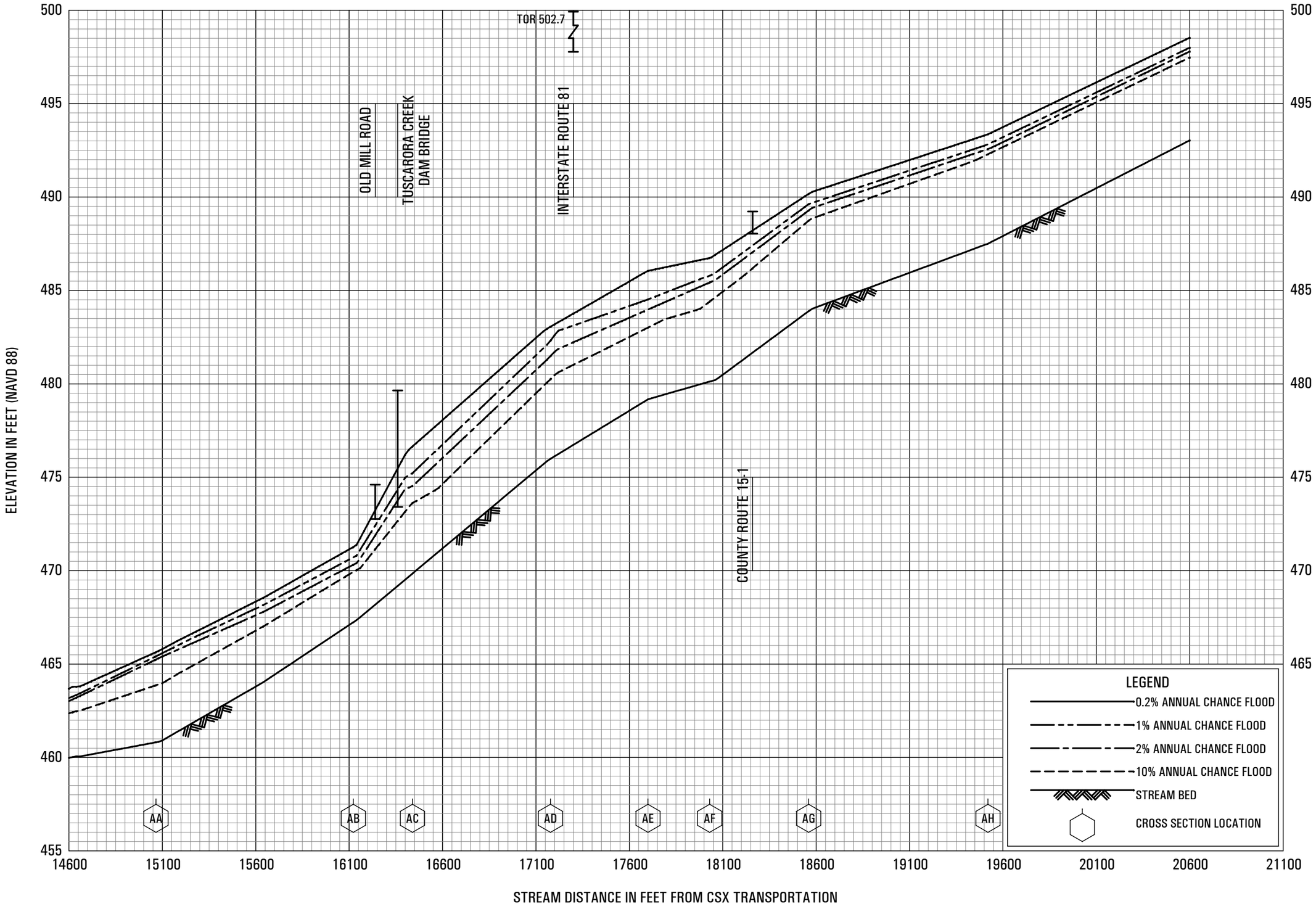
FLOOD PROFILES

TUSCARORA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



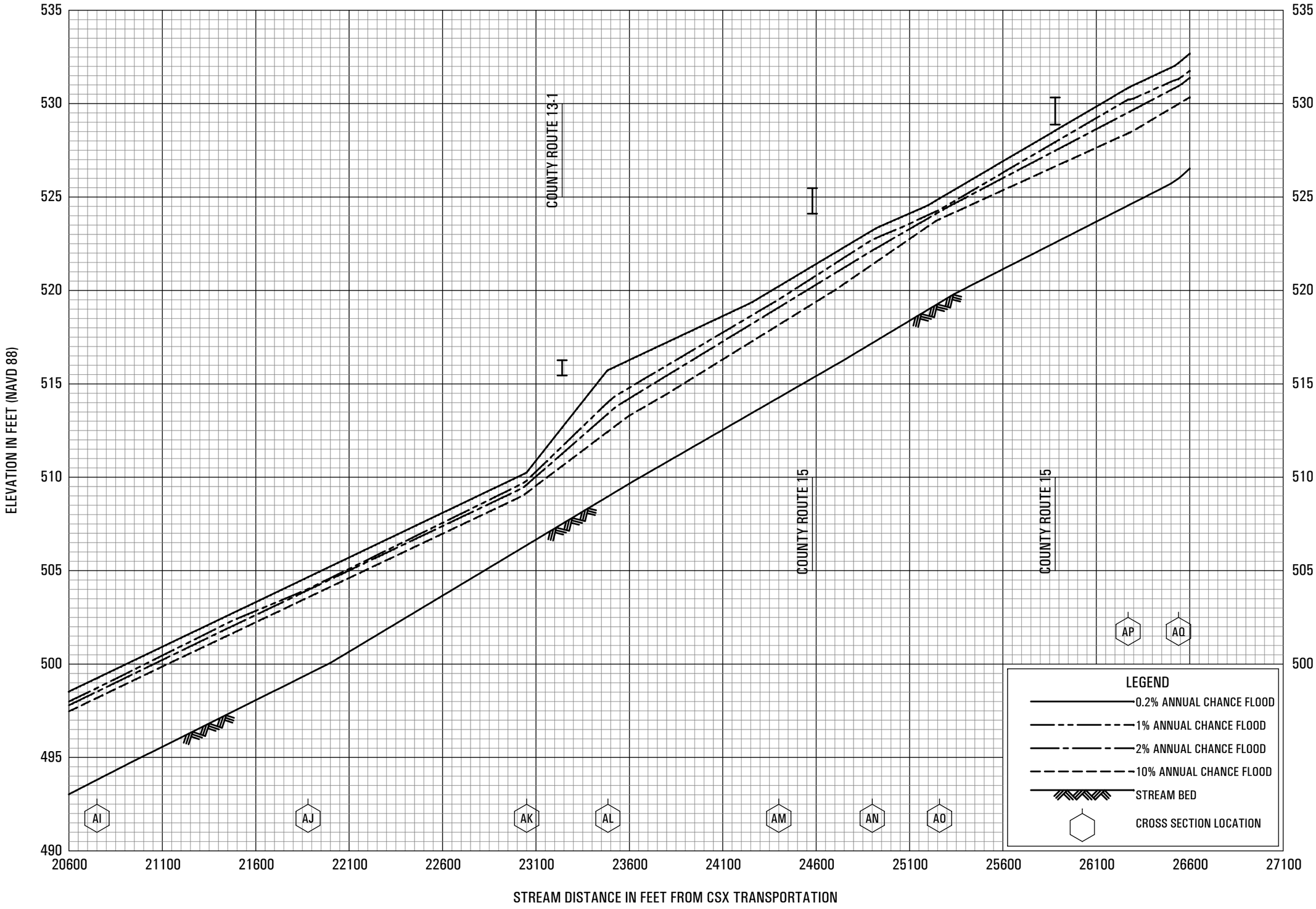
FLOOD PROFILES

TUSCARORA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



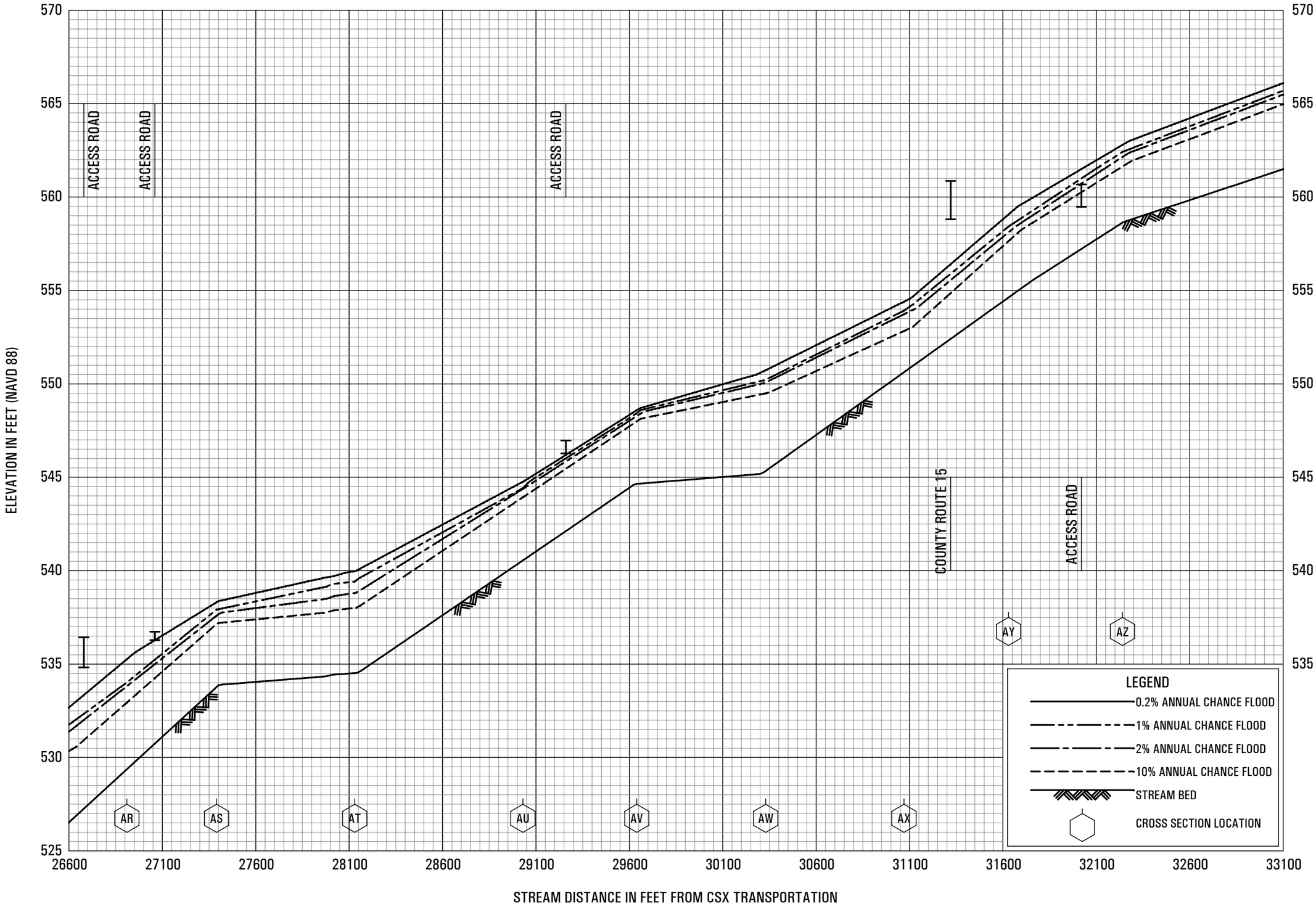
FLOOD PROFILES

TUSCARORA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



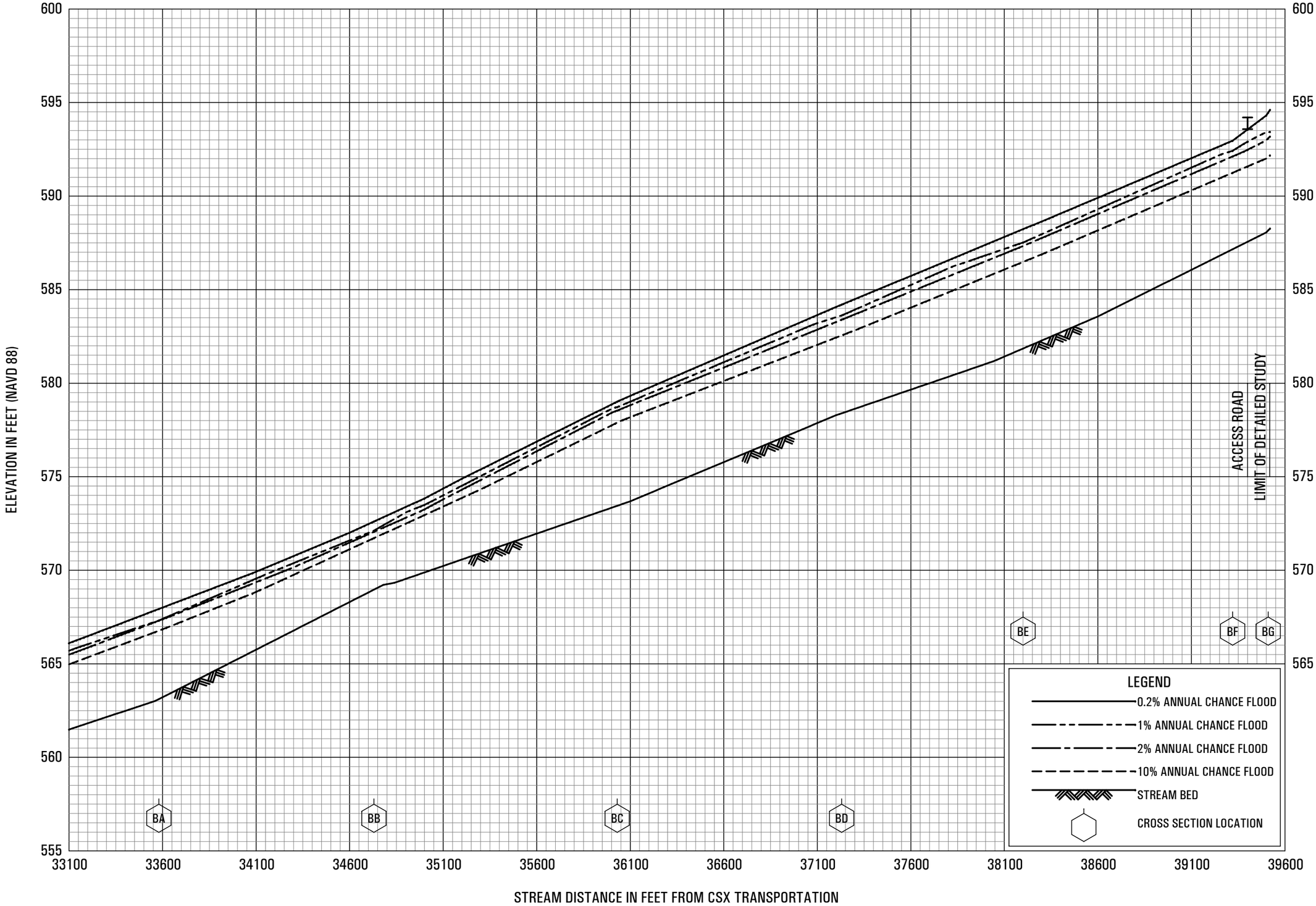
FLOOD PROFILES

TUSCARORA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS



FLOOD PROFILES

TUSCARORA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERKELEY COUNTY, WV

AND INCORPORATED AREAS