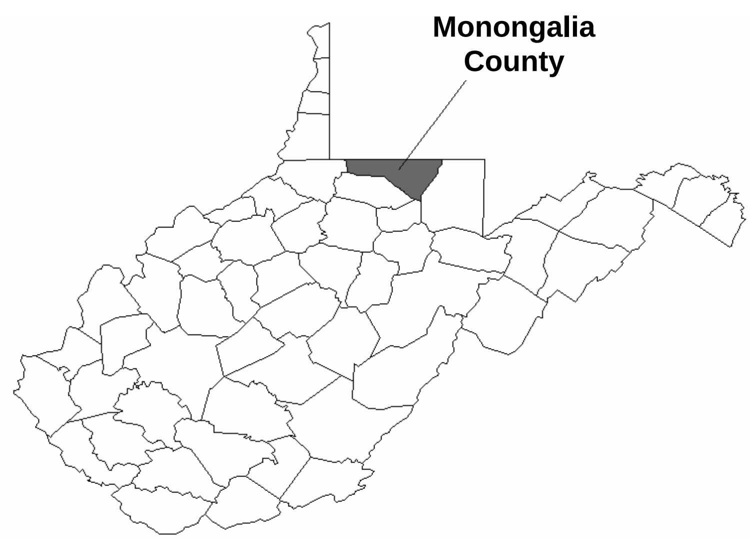
FLOOD INSURANCE STUDY

MONONGALIA COUNTY, WEST VIRGINIA AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
MONONGALIA COUNTY (UNINCORPORATED AREAS)	540139
BLACKSVILLE, CITY OF	540140
GRANVILLE, TOWN OF	540272
MORGANTOWN, CITY OF	540141
STAR CITY, TOWN OF	540273
WESTOVER, CITY OF	540274



January 20, 2010

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
54061CV000A

NOTICE TO
FLOOD INSURANCE STUDY USERS

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

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision (LOMR) 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 (FBFM) panels (e.g. floodways, cross-sections). In addition, former flood hazard zone designations have been changed as follows:

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

Initial Countywide FIS Effective Date: January 20, 2010

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FLOOD INSURANCE STUDY
MONONGALIA 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 Monongalia County, including the City of Blacksville, City of Morgantown, Town of Granville, Town of Star City, City of Westover, and the unincorporated areas of Monongalia County (referred to collectively herein as Monongalia 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 Monongalia 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.

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, Monongalia 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.

Granville, Town of

In the original June 15, 1983, FIS, the hydrologic and hydraulic analyses were prepared by the U.S. Army Corps of Engineers (USACE), Pittsburgh District, for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. IAA-H-9-79, Project Order No. 41. This work was completed in August 1982.

In the November 2, 1995, FIS, the hydrologic and hydraulic analyses for the Monongahela River were prepared by USACE, Pittsburgh District, for FEMA, under Inter-Agency Agreement No. EMW-90-E-3263, Project Order No. 4. This work was completed in October 1992. The hydraulic analyses for Dents Run were taken from the FIS for the City of Westover (Reference 1).

Monongalia County (Unincorporated Areas)

In the original November 1, 1983, FIS, and May 1, 1984, FIRM, (hereinafter referred to as the 1984 FIS), the hydrologic and hydraulic analyses were prepared by USACE, Pittsburgh District, for FEMA, under Inter-Agency Agreement No. IAA-H-9-79. Project Order No. 41. That work was completed in August 1982.

In the September 30, 1995, FIS, the hydrologic and hydraulic analyses for the Monongahela River were prepared by USACE, Pittsburgh District, for FEMA, under Inter-Agency Agreement No. EMW-90-E-3263, Project Order No. 4. This work was completed in October 1992. The September 30, 1995, FIS adds detailed analyses for Dents Run, which were taken from the FIS for the City of Westover, and detailed analyses for Cobun Creek, which were taken from the FIS for the City of Morgantown (References 1 and 12).

In the February 22, 1999, revision, the hydrologic and hydraulic analyses for Aaron Creek were prepared by the USGS, Charleston, West Virginia, for FEMA, under Inter-Agency Agreement Nos. EMW-93-E-4121 and EMW-94-E-4433. This work was completed in August 1995.

Morgantown, City of

In the original August 1, 1979, FIS, the hydrologic and hydraulic analyses were prepared by Burgess & Niple, Limited, for FEMA, under Contract No. H-4018. That work was completed in November 1977.

In the June 15, 1984, FIS, dated June 15, 1984, the hydrologic and hydraulic analyses were performed by USACE, Pittsburgh District, for FEMA. That work was completed in April 1983.

In the October 18, 1995, revision, the hydrologic and hydraulic analyses were prepared by USACE, Pittsburgh District, for FEMA, under Inter-Agency Agreement No. EMW-90-E-3263, Project Order No. 4. This work was completed in September 1989.

Star City, Town of

In the original February 1978, 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 May 1977.

In the October 18, 1995, revision, the hydrologic and hydraulic analyses for the Monongahela River were prepared by USACE, Pittsburgh District, for FEMA, under Inter-Agency Agreement No. EMW 90-E-3263, Project Order No. 4. This work was completed in October 1992.

Westover, City of

In the original February 1978, FIS, the hydrologic and hydraulic analyses were performed by Burgess & Niple, Limited, for the FIA, under Contract No. H-4018. That work was completed in May 1977.

In the December 19, 1995, revision, the hydrologic and hydraulic analyses were prepared by USACE, Pittsburgh District, for FEMA, under Inter-Agency Agreement No. EMW-90-E-3263, Project Order No. 4. This work was completed in October 1992.

The authority and acknowledgments for the City of Blacksville and the Town of Osage are not included because there were no previously printed FIS reports for those communities.

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, 12000, and 24000 from photography dated 2003. Additional information was derived from the U.S. Census Bureau, the West Virginia Statewide Addressing and Mapping Board (WV SAMB), the West Virginia Dept. of Environmental Protection (WV DEP), and the West Virginia Division of Natural Resources (WV DNR). 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 and AMEC Earth and Environmental, Inc. for FEMA, under Contract No. HSFE03-07-D-0030, Task Order No. HSFE03-08-J-0008.

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.

Granville, Town of

For the original study, an initial CCO meeting was held on November 16, 1978, and a final CCO meeting was held on January 11, 1983. Both of these meetings were attended by representatives of USACE, the Town of Granville, and FEMA.

For the November 2, 1995, FIS, an initial CCO meeting was held in September 1989, and was attended by representatives of USACE, Monongalia County, the Town of Granville, and FEMA.

Monongalia County (Unincorporated Areas)

For the 1984 FIS, an initial CCO meeting was held on November 16, 1978, and a final CCO meeting was held on June 19, 1983. Both of these meetings were attended by representatives of the county, USACE, and FEMA.

For the September 30, 1995, FIS, an initial CCO meeting was held in September 1989, and was attended by representatives of the county, USACE, and FEMA.

For the February 22, 1999, FIS, Monongalia County was notified by letter on January 28, 1998, that the FIS would be revised using the analyses prepared by USACE.

Morgantown, City of

For the original study, an initial CCO meeting was held on March 24, 1976, and was attended by representatives of Burgess & Niple, Limited, the City of Morgantown, and FEMA. A search for basic data was made at all levels of government. In addition, a legal notice was published in the Morgantown Dominion Post on September 14, 21, and 28, 1976, requesting anyone with flood information to make it available to the mayor of Morgantown. No response to this notice was received. An intermediate CCO meeting was held on October 27, 1977, to review the flood boundaries and floodway with the city engineer of Morgantown. A final CCO meeting was held on August 8, 1978 and was attended by representatives of Burgess & Niple, Limited, the City of Morgantown, and FEMA.

For the October 18, 1995, FIS, an initial CCO meeting was held in September 1989, and was attended by representatives of USACE, Monongalia County, the City of Morgantown, and FEMA.

Star City, Town of

For the original study, an initial CCO meeting was held on March 24, 1976, and was attended by representatives of the FIA, Burgess & Niple, Limited, and the Town of Star City; and the State Coordinator. The following were contacted to provide information pertinent to the study: the Office of Economic and Community Development; the State Coordinator; officials of the Town of Star City; USACE, Pittsburgh District; the USGS; and selected townspeople. An intermediate coordination meeting was held on May 2, 1977, to review the floodplain boundaries and the floodway with the mayor of Star City. The floodplain boundaries and floodway were accepted as presented in that meeting. A final CCO meeting was held on August 9, 1977, and was attended by representatives of Burgess & Niple, Limited, the Town of Star City, and the FIA.

For the October 18, 1995, FIS, an initial CCO meeting was held in September 1989, and was attended by representatives of USACE, the town, Monongalia County, and FEMA.

Westover, City of

For the original study, an initial CCO meeting was held on March 24, 1976, and was attended by representatives of Burgess & Niple, Limited, the City, and the FIA. Officials of the City of Westover, USACE, Pittsburgh District, the USGS, and local citizens were all contacted to provide information pertinent to that FIS. An intermediate meeting, attended by representatives of the City and the FIA was held on May 2, 1977.

A final CCO meeting was held on August 9, 1977, and was attended by representatives of Burgess & Niple, Limited, the City, and the FIA.

For the December 19, 1995, FIS, an initial CCO meeting was held in September 1989, and was attended by representatives of the City of Westover, Monongalia County, USACE, and FEMA.

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

TABLE 1 – INITIAL AND FINAL CCO MEETINGS

Community Name	Initial CCO Date	Final CCO Date
Granville, Town of	November 16, 1978	January 11, 1983
	September 1989	(November 2, 1995)
Monongalia County	November 17, 1978	June 19, 1983
(Unincorporated Areas)	September 1989	(September 30, 1995)
	January 28, 1998	(February 22, 1999)
Morgantown, City of	March 24, 1976	August 8, 1978
	October 27, 1977	
	September 1989	(October 18, 1995)
Star City, Town of	March 24, 1976	August 9, 1977
	May 2, 1977	
	September 1989	(October 18, 1995)
Westover, City of	March 24, 1976	August 9, 1977
	May 2, 1977	
	September 1989	(December 19, 1995)

For this revision, a final meeting was held on March 19, 2009 and was attended by representatives of Monongalia County, cities of Blacksville, Morgantown and Westover, towns of Granville and Star City, the study contractor, and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

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

All or portions of the flooding sources listed below were studied by detailed methods. Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRM.

TABLE 2 – FLOODING SOURCES STUDIED BY DETAILED METHODS

Aaron Creek	Dunkard Creek
Cobun Creek	Knocking Run
Deckers Creek	Monongahela River
Dents Run	Pompano Run

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 Monongalia County.

Monongalia County (Unincorporated Areas)

In the 1984 FIS, the following flooding sources were studied by detailed methods: Deckers Creek, Dunkard Creek, the Monongahela River, and Aaron Creek. In the September 30, 1995, FIS, the Monongahela River was restudied for its entire length within the county. In addition, Dents Run, from a point approximately 250 feet downstream of Dents Run Boulevard to a point approximately 700 feet downstream of Interstate Route 79; and Cobun Creek, from a point approximately 0.26 mile above the confluence with the Monongahela River to a point approximately 0.33 mile above the confluence with the Monongahela River were restudied by detailed methods. In the February 22, 1999 revision, Aaron Creek was restudied from the confluence with Deckers Creek to a point approximately 2.4 miles upstream of the confluence with Deckers Creek.

All or portions of the following streams were studied by approximate methods: Aaron Creek, Bennefield Prong, Booths Creek, Boyd Run, Brushy Fork, Camp Run, the Cheat River, Crooked Run, Days Run, Deckers Creek, Dents Run, Dolls Run, Dunkard Creek, Indian Creek, Jakes Run, Laurel Run, Little Pawpaw Creek, McFarland Run, Miracle Run, Owl Creek, Pennsylvania Fork, Pumpkin Run, Range Run, Right Branch Miracle Run, Right Fork Miracle Run, Robinson Run, Rubles Run, Scotts Run, Snider Run, South Fork, Stewart Run, Thomas Run, Tibbs Run, Virginia Fork, West Run, West Virginia Fork, White Creek, and Whiteday Creek. Approximate analyses were used to study those areas having minimal flood hazards or a low development potential. The scope and methods of study were proposed to, and agreed upon by FEMA and the county.

Granville, Town of

In the June 15, 1983 (FIS)/December 15, 1983 (FIRM) study, the Monongahela River and Dents Run were studied by detailed methods.

For November 2, 1995 revision, the Monongahela was studied by detailed methods for its entire length within the community.

Morgantown, City of

In the original study, the following streams were studied by detailed methods: the Monongahela River, Deckers Creek, Cobun Creek, Aaron Creek, and Knocking Run.

For the FIS, dated June 15, 1984, the floodway for Deckers Creek was rerun to adjust for higher discharges, which caused a change in the flood boundaries and elevations for Deckers Creek. The City of Morgantown's corporate limits also changed.

In the October 18, 1995 revision, the Monongahela River was restudied by detailed methods for its entire length within the community.

Star City, Town of

In the original (February 1978 FIS/ August 1, 1978 FIRM) study, the Monongahela River and Pompano Run were studied by detailed methods.

In the October 18, 1995 revision, the Monongahela River was restudied for its entire length within the community.

A portion of Pompano Run was 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 the town.

Westover, City of

In the original (February 1978 FIS/ August 1, 1978 FIRM) study, the Monongahela River and Dents Run were studied by detailed methods.

For the December 19, 1995 revision, the Monongahela River was restudied by detailed methods for its entire length within the community.

2.2 Community Description

Monongalia County, located in the northern region of West Virginia, is bordered by Preston County to the east; Taylor County to the south; Marion County to the southwest; Wetzel County to the west; and Greene and Fayette Counties, Pennsylvania, to the north. The population for Monongalia County as determined by the 2000 Census was 81,866, and the 2006 estimated population was 84,752, an increase of 3.5% (Reference 31).

The Monongahela River drains 7,348 square miles and joins the Allegheny River to form the Ohio River at Pittsburgh, Pennsylvania. The Monongahela River is formed by the junction of the West Fork River and the Tygart River at Fairmont, West Virginia, 128.7 miles above its mouth. These rivers originate on the western slopes of the Appalachian Mountains in northwestern West Virginia. The Monongahela River flows north throughout its entire length.

Most of the Monongahela River watershed is forested, with some agriculture in the southern portion of the basin. Residential and industrial developments are located in the valleys of the river. The drainage area at the upstream county boundary is 2,469 square miles and 2,716 square miles at the downstream county boundary. Local relief above the stream valley in Monongalia County rises approximately 800 feet to an average hilltop elevation of approximately 1,250 feet. The average slope of the Monongahela River from the downstream county boundary to Morgantown Locks and Dam is approximately 2 feet per mile, and 3 feet per mile from Morgantown Locks and Dam to the upstream county boundary. The valley floor in the area averages approximately 500 to 1,000 feet in width.

Deckers Creek has a drainage area of approximately 50.1 square miles at its confluence with the Monongahela River. The headwaters of the creek are located in Clinton District, Monongalia County. The creek flows approximately 4 miles southeast into Preston County, where it turns north to Masontown, and then flows northeast to its confluence. Local relief above the stream valley within the Deckers Creek watershed rises from approximately 800 feet to an average hilltop elevation of approximately 1,600 feet at the headwaters. The average slope of Deckers Creek within the study area is approximately 50 feet per mile.

Dunkard Creek, with a drainage area of approximately 179 square miles at the downstream study limit, flows east to its confluence with the Monongahela River. Local relief above the stream valley within the Dunkard Creek watershed rises from approximately 90 feet to an average hilltop elevation of approximately 1,600 feet at the headwaters. The average slope of the creek within the study area is approximately 3 feet per mile.

Aaron Creek has a drainage area of approximately 7.13 square miles at its confluence with Deckers Creek. The headwaters of the creek are located in Monongalia County. and the creek flows north to its confluence. Local relief above the stream valley within the Aaron Creek watershed rises from approximately 900 feet to an average hilltop elevation of approximately 2,100 feet at the headwaters. The average slope of the creek within the study area is approximately 60 feet per mile.

The climate of Monongalia County is temperate with the usual seasonal variation in temperature. The area is geographically situated in a region of variable air mass activity and is subject to polar, tropical, continental, and maritime air mass invasion. The weather is usually moderate, but it may have frequent and rapid changes resulting from air mass movement. Measurable precipitation occurs approximately 95 days per year and amounts to approximately 42 inches. The average monthly temperature ranges from 33 degrees Fahrenheit (°F) in January to 74°F in July (Reference 2).

Granville, Town of

The Town of Granville is located in central Monongalia County, West Virginia, in north-central West Virginia. It is bordered by the City of Morgantown to the north and east, the City of Westover to the east, the Town of Star City to the north, and the unincorporated areas of Monongalia County to the north and west. The population for the Town of Granville as determined by the 2000 Census was 788 (Reference 31).

Most of the Monongahela River watershed is forested with some agriculture in the southern portion of the basin. Residential and industrial developments are located in the valleys of the river. The average slope of the Monongahela River from the downstream Monongalia County boundary to Morgantown Locks and Dam is approximately 2 feet per mile and 3 feet per mile from Morgantown Locks and Dam to the upstream Monongalia County boundary. The valley floor in the area averages approximately 500 to 1,000 feet wide.

Hills rise steeply from 600 to 800 feet above the stream valleys. The river valley is relatively narrow throughout the study area, with an average width of 500 to 1,000 feet.

Morgantown, City of

The City of Morgantown is located in central Monongalia County in northwestern West Virginia. It is bordered by the City of Westover to the south and west, the Town of Granville to the west, the Town of Star City to the north, and the unincorporated areas of Monongalia County to the south and east. Situated on the Monongahela River, approximately 100 miles upstream from Pittsburgh, the City of Morgantown is approximately 127 miles northeast of Charleston, the state capital, and approximately 190 miles northwest of Washington, D.C. The population for the City of Morgantown as determined by the 2000 Census was 26,809 and the 2006 estimated population was 28,654, an increase of 7.4% (Reference 31).

The City of Morgantown has, for the most part, been developed for residential, commercial, and industrial uses. The major manufacturing concern in the city is the glass and glassware industry. However, mining, forestry, pharmaceutical, and textiles all represent major portions of the industrial development of Morgantown. The city is also the site of West Virginia University, the largest university in the state.

The vast natural forests that once covered most of the Appalachian Plateau have been cleared from most of Morgantown. However, remains of the forest, consisting of a variety of Appalachian mixed hardwood trees, still comprise the major natural vegetation of the City of Morgantown. Morgantown is served by a system of highways including Interstate Route 79, U.S. Route 19. and State Route 7. The CSX Transportation also provides access to Morgantown.

Along the banks of the Monongahela River, floodplain development is characterized by light to moderate commercial and residential areas. The floodplains of Deckers Creek and Knocking Run contain heavily developed commercial and residential areas, while the floodplain of Aaron Creek is mostly undeveloped, except for a few scattered residential and commercial areas. The floodplain of Cobun Creek is also undeveloped, except for an industrial section in the vicinity of U.S. Route 48.

The City of Morgantown lies in the unglaciated Appalachian Plateau. This plateau is intricately dissected and exhibits a network of deep-sided valleys and narrow, winding ridges. Elevations in the study area range from 800 feet to over 1,300 feet, with a slope ranging from 0 to 25 percent. Although Morgantown is situated on land with moderate elevations and slopes, nearby areas may exhibit slopes of 45 percent and peak elevations of approximately 2,200 feet.

<u>Star City, Town of</u>

The Town of Star City is located near the northern boundary of West Virginia, in northeastern Monongalia County. Situated on the Monongahela River, approximately 98 miles upstream from Pittsburgh, the Town of Star City is located approximately 128 miles northeast of Charleston, the state capital, and approximately 160 miles northwest of Washington, D.C. The Town of Star City is bordered by the City of l4organtown to the east and north and the unincorporated areas of Monongalia County to the west and south. The population for the Town of Star City as determined by the 2000 Census was 1,366 (Reference 31).

The Town of Star City lies in the unglaciated Appalachian Plateau. This plateau is intricately dissected and exhibits a network of deep-sided valleys and narrow, winding ridges. Elevations in the study area range from 800 feet to over 1,000 feet, with a slope range of 0 to 25 percent. Although the town is situated on land with moderate elevations and slopes, nearby areas may exhibit slopes of 45 percent and peak elevations near 2,200 feet.

The vast, natural forest which once covered most of the Appalachian Plateau has been cleared from most of the Town of Star City. However, remains of this forest, consisting of a variety of Appalachian mixed hardwood trees, still comprise the major natural vegetation of the town.

For the most part, the town has been developed for residential and commercial uses.

It is served by a system of highways, including Interstate Route 79, U.S. Route 19, and West Virginia Route 7. The CSX Transportation also provides railroad access to the Town of Star City.

Westover, City of

The City of Westover is located in central Monongalia County, in northern West Virginia. It is bordered by the City of Morgantown to the north and east, the unincorporated areas of Monongalia County to the south, and the Town of Granville to the west. Situated on the Monongahela River, approximately 100 miles upstream from Pittsburgh, the City of Westover is approximately 126 miles northeast of Charleston, the state capital, and approximately 160 miles northwest of Washington, D.C. The population for the City of Westover as determined by the 2000 Census was 3,941 (Reference 31).

The City of Westover has, for the most part, been developed for residential, commercial, and industrial uses. The vast natural forests that once covered most of the Appalachian Plateau have been cleared from most of Westover. However, remains of the forest, consisting of a variety of Appalachian mixed hardwood trees, still comprise the major natural vegetation of the City of Westover. Westover is served by a system of highways including Interstate Route 79, U.S. Route 19, and State Route 7. The CSX transportation system also provides access to Westover.

The City of Westover lies in the unglaciated Appalachian Plateau. This plateau is intricately dissected and exhibits a network of deep-sided valleys and narrow, winding ridges. Elevations in the study area range from 800 feet to over 1,200 feet, with a slope ranging from 0 to 25 percent. Although Westover is situated on land with moderate elevations and slopes, nearby areas may exhibit slopes of 45 percent and peak elevations of approximately 2,200 feet.

2.3 Principal Flood Problems

The history of flooding on the Monongahela River within Monongalia County indicates that floods can occur during any season of the year, although the main flood season is usually December through April. Most floods occurring during this period are the result of heavy rain and snowmelt. However, floods can occur at any time and can last several days.

The highest flood of record at Morgantown Locks and Dam occurred on March 7, 1967. The largest flood on record at the Lock and Dam 10 upper gage was the flood of March 1918, which had a crest elevation of 818 feet and a peak discharge of 100,000 cubic feet per second (cfs).

The upper stages prior to 1967, when gates were added to the existing dam, were converted to the lower gage readings. The stages for floods prior to 1938 do not reflect the reductions that would have been provided had any of USACE upstream dams and reservoirs been in operation. Since 1985, Stonewall Jackson Dam has been completed in the Monongahela River basin. This project would provide a negligible additional reduction at the Morgantown Locks and Dam.

The highest flood of record from Point Marion Locks and Dam, River Mile 90.8 to Morgantown Locks and Dam, River Mile 102.0, occurred on November 5, 1985, during the remnants of Hurricane Juan. The backwater from the Cheat River caused the record high stages upstream of Point Marion Locks and Dam. The October 1954 flood was caused by intense rainfall of relatively short duration from Hurricane Hazel.

The greatest known flood to occur on the Monongahela River at Locks and Dam No. 10, which was located 0.3 mile downstream of Morgantown Locks and Dam was the historic flood of July 1888. Although its exact height is not known, it is estimated to have risen to an elevation of 824 feet at the site of Morgantown Locks and Dam.

Approximate discharges for floods of note on Monongahela River at Greensboro, Pennsylvania are as follows (Reference 32):

Date	Discharge (cfs)
December 16, 1948	115,000
May 24, 1968	115,000
February 4, 1939	118,000
February 14, 1948	124,000
March 5, 1963	127,000
February 9, 1994	132,200
March 7, 1967	134,000
March 18, 1936	137,000
October 16, 1954	140,000
November 5, 1985	220,000

Flooding also occurs on Deckers Creek, Dunkard Creek, Cobun Creek, Aaron Creek, and Knocking Run. Flooding on Deckers Creek and Cobun Creek can be due to backwater from the Monongahela River, while flooding on Aaron Creek and Knocking Run can be due to backwater from Deckers Creek.

Approximate discharges for floods of note on Deckers Creek at Morgantown are as follows (Reference 32):

Date	Discharge (cfs)
April 13, 1948	3,080
March 7, 1967	3,800
July 8, 2003	4,140
June 23, 1972	5,000
August 5, 1956	5,680
August 18, 1980	7,550

Approximate discharges for floods of note on Dunkard Creek at Shannopin, Pennsylvania are as follows (Reference 32):

Date	Discharge (cfs)
February 26, 1979	11,000
January 26, 1978	11,300
February 19, 2000	12,100
March 2, 1997	12,400
January 12, 2005	13,400
January 28, 1994	13,600
March 5, 1963	14,300
November 19, 2003	15,600
June 4, 1941	16,800
August 18, 1980	17,600

Approximate discharges for floods of note on Cobun Creek at Morgantown are as follows (Reference 32):

Date	Discharge (cfs)
July 19, 1996	1,200
July 11, 2000	1,600
June 23, 1972	1,770
August 18, 1980	3,100

Flooding can also occur on Burroughs Run, Falling Run, Hartman Run, Jerome Hollow, Limehurst Hollow, and Tributary No. 1 to Deckers Creek. However, flooding is not expected to be as serious in these areas due to the lack of development or small drainage areas.

Flooding may also occur on Pompano Run and Dents Run. However, backwater from the Monongahela River will generally cause more severe flooding on the lower reaches of both Pompano Run and Dents Run than would be expected if they acted independently of the Monongahela River.

Monongalia County (Unincorporated Areas)

The highest flood of record at Morgantown Locks and Dam occurred on March 7, 1967. The highest recorded flood at Locks and Dam No. 10, which was located 0.3 mile downstream of Morgantown Locks and Dam, occurred on March 14, 1918. The greatest known flood to occur in this portion of the river was the flood of November 5, 1985. The floods of record at Morgantown Locks and Dam are shown in Table 3, “Floods of Record on the Monongahela River at Morgantown Locks and Dam.”

TABLE 3 - FLOODS OF RECORD ON THE MONONGAHELA RIVER AT MORGANTOWN LOCKS AND DAM

Date of Crest	Elevation (feet NGVD)		Natural Recurrence Interval (c) (years)
July 1888	824.0	(a)	100 (Estimated)
March 11, 1905	815.8		3
January 18, 1907	816.7		6
January 30, 1911	815.8		4
July 25, 1912	815.8		5
November 16, 1913	816.2		5
January 22, 1917	817.0		5
January 29, 1918	816.0		4
March 14, 1918	818.0		10
January 2, 1919	817.6		9
December 24, 1921	816.0		4
March 29, 1924	815.7		4
May 12, 1924	816.4		5
March 18, 1936	814.9		2
March 25, 1936	815.6		4
March 5, 1963	811.1	(b)	40
March 7,1967	811.6	(b)	20
November 5, 1985	825.0		71,700 (d)

Note: Prior to July 1950, elevations at Locks and Dam No. 10

(a) Estimated from profile
(b) Includes reduction from upstream flood control dam
(c) Without flood control dam
(d) Discharge in cubic feet per second, no recurrence interval available

The floods are referenced to the lower gage at the Morgantown Locks and Dam for its period of record (since July 1950), and to the upper gate of Locks and Dam No. 10 for its period of record (May 1904 to August 1950). Both of these locations are upstream of the study area. Flooding may also occur on Dents Run, a small stream with a drainage area of approximately 1.3 square miles. However, backwater from the Monongahela River will generally cause more severe flooding on the lower reach of Dents Run than would be expected if Dents Run acted independently of the Monongahela River.

Flooding on Deckers Creek, Dunkard Creek, and Aaron Creek can occur during any season of the year, but it is more likely to occur in the summer and winter months. A USGS gaging station was maintained on Deckers Creek from 1947 to 1969. The August 1956 flood was the highest flood of record at the station. The flood of August 1980 surpassed the elevation of the 1956 flood. The following tabulation shows floods of record on Deckers Creek at the USGS gaging station at Morgantown:

Date of Crest	Elevation (feet NGVD)	Natural Recurrence Interval (c) (years)
April 13, 1948	811.4	11
August 5, 1956	815.7	4
December 14, 1956	811.0	3
March 5, 1963	811.56	2
March 7, 1967	813.27	2
August 14, 1980*	817.95	35

*Highest known flood based on high-water mark at gage

On Dunkard Creek, a gage has been maintained by the USGS at Shannopin, Pennsylvania, since 1940; the highest known flood at the gage occurred on August 14, 1980. The following tabulation shows floods of record at the USGS gage a Shannopin:

Date of Crest	Elevation (feet NGVD)	Natural Recurrence Interval (c) (years)
June 4, 1941	820.3	25
March 5,1963	819.3	14
January26, 1978	818.1	6
February 22, 1979	818.0	5
August 14, 1980	820.5	33

The largest discharge for Cobun Creek recorded near Green bag Road was 1,770 cubic feet per second in June 1972.

Granville, Town of

The principal flood problem within the town of Granville is overbank flooding of the Monongahela River, which has a history of flooding dating from the 1800's. The most significant floods of record experienced on the Monongahela River, as measured at Locks and Dam No. 4, are shown in Table 4, “Floods of Record on the Monongahela River Lower Gage at Morgantown Locks and Dam.”

TABLE 4 - FLOODS OF RECORD ON THE MONONGAHELA RIVER
LOWER GAGE AT MORGANTOWN LOCKS AND DAM

Date of Crest	Stage (feet NGVD[1])	Elevation (feet NGVD[1])	Discharge (cfs)
November 5, 1985	37.0	825.0[2]	71,700
March 7, 1967	29.1	811l.6[3]	85,000
March 5, 1963	28.6	811l.l[3]	82,000
May 24, 1968	21.5	809.5[3]	71,000
January 26, 1978	21.3	809.3[3]	63,600
December 9, 1978	20.5	808.5[3]	58,500
December 14, 1956	25.8	808.3[3]	63,000
March 20, 1963	24.9	807.4[3]	57.500
February 1, 1951	24.1	806.6[3]	56,000
August 7, 1956	23.9	806.4[3]	52,000

Note: Zero datum at the lower gage was 782.52 feet NGVD until November 1967
Zero datum at the lower gage was 788.0 feet NGVD from November 1967 to present

[1]National Geodetic Vertical Datum of 1929
[2]Elevation is modified by present reservoir system
[3]Elevation is modified by Tygart Lake and Dam

Since 1985, Stonewall Jackson Dam has been completed in the Monongahela River basin. Flood stage on the Monongahela River at Morgantown Locks and Dam referenced to the lower gage is 26 feet.

The highest recorded flood at Locks and Dam No. 10, which was located 0.3 mile downstream of Morgantown Locks and Dam, occurred on March 14, 1918. Previously, the greatest known flood to occur in this reach of the river was the historic flood of July 1888. Although its exact height is not known, it is estimated to have risen to an elevation of 824 feet at the site of Morgantown Locks and Dam.

Morgantown, City of

The principal flood problem within the city of Morgantown is overbank flooding of the Monongahela River, which has a history of flooding dating from the 1800s. The highest flood of record from Point Marion Locks and Dam, River Mile 90.8 to Morgantown Locks and Dam, River Mile 102.0, occurred on November 5, 1985, the remnants of Hurricane Juan. The backwater from the Cheat River caused the record high stages upstream of Point Marion Locks and Dam. Floods on the Monongahela River usually occur between December and March. Most of these floods are caused by a combination of heavy rain and snowmelt. Large floods, however, can occur at any time. The floods of June 1941 and August 1956 resulted from widespread thunderstorms with high-intensity rainfall. The October 1954 flood was caused by intense rainfall of relatively short duration from Hurricane Hazel. The duration of flooding on the Monongahela River may be several days (Reference 3).

Flooding also occurs on Deckers Creek, Cobun Creek, Aaron Creek, and Knocking

Run. Flooding on Deckers Creek and Cobun Creek can be due to backwater from the Monongahela River, while flooding on Aaron Creek and Knocking Run can be due to backwater from Deckers Creek. Records from Deckers Creek show that the largest discharge recorded near its confluence was 5,680 cubic feet per second (cfs) in August 1956. Similar records for Cobun Creek show that the largest discharge recorded near Greenbag Road was 1,770 cfs in June 1972.

Flooding can also occur on Burroughs Run, Falling Run, Hartman Run, Jerome Hollow, Limehurst Hollow, and Tributary No. 1 to Deckers Creek. However, flooding is not expected to be as serious in these areas due to the lack of development or small drainage areas.

Star City, Town of

Floods caused by overflow of the Monongahela River occur periodically in the Town of Star City. These floods generally occur in either late winter or early spring as a result of snowmelt accompanied by heavy rains. Although no information on the specific effects of floods in the town was available, it is likely that damage to structures in the Monongahela River floodplain occurred during floods such as those experienced n 1888, 1918, 1924, 1936, 1963, and 1967. A total of 15 floods on the Monongahela River were recorded prior to 1936.

Flood stage on the Monongahela River at Morgantown Lock and Dam, referenced to the lower gage, is 26 feet.

The largest flood on record at the Lock and Dam 10 upper gage was the flood of March 1918, which had a crest elevation of 818 feet and a peak discharge of 100,000 cubic feet per second (cfs).

The upper stages prior to 1967, when gates were added to the existing dam, were converted to the lower gage readings. The stages for floods prior to 1938 do not reflect the reductions that would have been provided had any of the USAGE upstream dams and reservoirs been in operation. Since 1985, Stonewall Jackson Dam has been completed in the Monongahela River basin. This project would provide a negligible additional reduction at the Morgantown Lock and Dam.

Flooding may also occur on Pompano Run, a small stream with a drainage area of approximately 3.2 square miles. However, backwater from the t4onongahela River will generally cause more severe flooding on the lower reach of Pompano Run than would be expected if Pompano Run acted independently of the Monongahela River.

Westover, City of

The principal flood problem within the city of Westover is overbank flooding of the Monongahela River, which has a history of flooding dating from the 1800's.

Flooding may also occur on Dents Run, a small stream with a drainage area of approximately 14.3 square miles. However, backwater from the Monongahela River will generally cause more severe flooding on the lower reach of Dents Run than would be expected if Dents Run acted independently of the Monongahela River.

2.4 Flood Protection Measures

Monongalia County (Unincorporated Areas), February 22, 1999, FIS

Tygart Dam, located on the Tygart River near Grafton, West Virginia is the only flood control dam and reservoir effective in reducing flood levels on the Monongahela River in Monongalia County. USACE built the dam, and has operated and maintained the facility since February 1938. It controls a drainage area of 1,184 square miles and reduces major flood crests through Monongalia County by 4 to 6 feet. Stonewall Jackson Dam on the West Fork River upstream of Weston, West Virginia, causes only a slight reduction of floods on the Monongahela River in the county. Morgantown Dam, Hildebrand Dam, and Opekiska Dam are located on the Monongahela River within Monongalia County. They are not, however, used for flood control and do not affect flows on the river.

There are seven Soil Conservation Service (SCS) dams on the upper portion of Deckers Creek; however, they have little effect on flooding within the study area.

At present, there are no flood protection structures on Dunkard Creek, Aaron Creek, Cobun Creek, or Dents Run that would affect flooding in Monongalia County.

Granville, Town of

Flood control projects completed or authorized on the Monongahela River include the following: Tygart Lake on the Tygart River near Grafton, West Virginia (completed 1938); Stonewall Jackson Lake on the West Fork River near Weston, West Virginia (completed 1990); Rowlesburg Lake on the Cheat River near Rowlesburg, West Virginia; Deep Creek Reservoir on the Youghiogheny River near McHenry, Maryland (completed 1925); and Youghiogheny River Lake on the Youghiogheny River near Confluence, Pennsylvania (completed 1948). The reservoirs on the Youghiogheny River have no effect on flooding in the Town of Granville, however, because the Youghiogheny River joins the Monongahela River downstream of the town. Tygart Lake controls runoff from 1,184 square miles, and Stone wall Jackson Lake controls 102 square miles. All of these reservoirs, with the exception of Deep Creek Reservoir, were constructed for flood control. All of the reservoirs have or will have secondary purposes that include flow augmentation for navigation, water supply, recreation, and power generation (References 4, 5, and 6). Presently Tygart Lake reduces major flood crests by four to six feet at the Town of Granville.

Morgantown, City of

Flood control projects completed or authorized on the Monongahela River include the following: Tygart Lake on the Tygart River near Crafton, West Virginia (completed 1938); Stonewall Jackson Lake on the West Fork River near Weston, West Virginia (completed 1990); Rowlesburg Lake on the Cheat River near Rowlesburg, West Virginia (authorized). Tygart Lake controls runoff from 1,184 square miles, while Stonewall Jackson Lake controls 102 square miles. Both of these reservoirs were constructed for flood control. Both of the reservoirs have or will have secondary purposes that include flow augmentation for navigation, water supply, recreation, and power generation (References 4, 5, and 6). Presently Tygart Lake and the Stonewall Jackson Dam reduce major flood crests by four to six feet at the City of Morgantown.

Star City, Town of

The Town of Star City has no local flood protection measures. However, it does benefit from the following flood control projects, which have been completed on the Monongahela River: Tygart Lake on the Tygart River near Grafton, West Virginia (completed 1938); Stonewall Jackson Lake on the West Fork River near Weston, West Virginia (completed 1990); Rowlesburg Lake on the Cheat River near Rowlesburg, West Virginia (authorized); Deep Greek Reservoir on the Youghiogheny River near McHenry, Maryland (completed 1925); and Youghiogheny River Lake on the Youghiogheny River near Confluence, Pennsylvania (completed 1948). Tygart Lake controls runoff from 1,184 square miles, and Stonewall Jackson Lake controls 102 square miles. All of these reservoirs, with the exception of Deep Greek Reservoir, were constructed for flood control. All of the reservoirs have or will have secondary purposes that include flow augmentation for navigation, water supply, recreation, and power generation (References 4, 5, and 6). Tygart Lake dam and reservoir reduce major flood peaks in Monongalia County by 4 to 6 feet. No significant flood protection is provided by the series of locks and dams on the Monongahela River (Reference 3).

The Town of Star City also has zoning and building code ordinances, which provide for some floodplain management.

Westover, City of

Flood control projects completed or authorized on the Monongahela River include the following: Tygart Lake on the Tygart River near Grafton, West Virginia (completed 1938); Stonewall Jackson Lake on the West Fork River near Weston, West Virginia (completed 1990); Rowlesburg Lake on the Cheat River near Rowlesburg, West Virginia (authorized); Deep Creek Reservoir on the Youghiogheny River near McHenry, Maryland (completed 1925); and Youghiogheny River Lake on the Youghiogheny River near Confluence, Pennsylvania (completed 1948). Tygart Lake controls runoff from 1,184 square miles, and Stonewall Jackson Lake controls 102 square miles. All of these reservoirs, with the exception of Deep Creek Reservoir, were constructed for flood control. All of the reservoirs have or will have secondary purposes that include flaw augmentation for navigation, water supply, recreation, and power generation (References 4, 5, and 6). Presently Tygart Lake reduces major flood crests by four to six feet at the City of Westover.

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 Monongalia County that has a previously printed FIS report, the hydrologic analyses described in those reports are listed below.

Monongalia County (Unincorporated Areas)

For the 1984 FIS, discharges for Deckers Creek were taken from the USGS gaging station in Morgantown and developed using multiple regression formulae based on factors determined from a study of frequencies of small streams in the Pittsburgh District (Reference 16). The factors are drainage area, stream slope, and basin shape.

Data from the frequencies developed from actual records and from multiple regression formulae were used to develop a peak flow per square mile-drainage area relationship. This relationship was used to determine flows for Deckers Creek.

Discharges for Dunkard Creek were taken from the USGS gaging station in Shannopin and derived from the discharge-frequency curve at the gaging station.

The curve was computed following methods outlined by Water Resources Council Bulletin 17A (Reference 17). Gage readings were obtained at Locks and Dam No. 10 from May 1904 to August 1950, when the dam was removed. Gage readings also have been obtained at Morgantown Locks and Dam since July 1950. Both are located in the study area and are maintained by USACE, Pittsburgh District.

For the September 30, 1995, FIS, hydrologic data for the Monongahela River were developed from flood flows at the Point Marion Pool based on statistical analyses of stage-discharge records that have been maintained at Morgantown Locks and Dam located at Morgantown over an 82-year period. Actual gage readings during flood events have been recorded at Morgantown Locks and Dam since 1905.

All stage-discharge records are maintained by USACE, Pittsburgh District. The actual peak flows at Morgantown Locks and Dam were adjusted for the effects of the upstream flood control reservoirs that were constructed by USACE between 1938 and 1990 to compute a natural peak flow for each flood event.

The analyses of the natural peak discharge-frequency curves on the Monongahela River followed a standard log-Pearson Type III method as outlined by the Water Resources Council Bulletin 17B (Reference 18). The resulting flood flow frequencies developed at Morgantown Locks and Dam were modified by means of an average reduction curve in order to reflect flow reduction by the present upstream flood control reservoirs. The reduced flows at Hildebrand Locks and Dam and Opekiska Locks and Dam were developed by drainage-area flow relationships developed for the entire Monongahela River.

Hydrologic data for Dents Run were developed from provisional equations being developed by the USGS to update previous reports (Reference 19). These equations were based on a log-Pearson Type Ill analysis of gaging station records with a subsequent regression analysis to define the parameters for application to the ungaged watersheds. The 500-year frequency peak discharges were determined from an extrapolation of the constants used in the USGS equations (Reference 20).

Hydrologic data for Cobun Creek were developed by using USGS-provided provisional equations at a gage approximately 1.4 miles above its confluence with the Monongahela River. Peak discharges were extended for use in the study area using generalized equations for northern West Virginia (Reference 19).

Granville, Town of

For Dents Run, peak discharges were obtained from the FIS for the City of Westover (Reference 1).

Morgantown, City of

The USGS provided provisional equations to be used for determining discharges for small watersheds in northern West Virginia and discharge-frequency data for Deckers Creek at a gage approximately 0.6 mile above its confluence, and for Cobun

Creek at a gage approximately 1.4 miles above its confluence (Reference 19). Peak discharges for the Deckers Creek gage (period of record 1947-1969) and the Cobun Creek gage, which has been in operation for 22 years, were extended for use in the study area using generalized equations for northern West Virginia (Reference 19). Discharges for Deckers Creek were modified to match high-water marks in the study area. Records for the Cobun Creek gage show that the maximum discharge on record, at the time, occurred on June 23, 1972, and had a peak value of 1,770 cfs. This value is approximately 1,560 cfs less than the 1-percent annual chance discharge used in this study.

Because Knocking Run, Aaron Creek, Pompano Run, and Dents Run have no streamflow records, provisional equations developed by the USGS to update previous reports were applied to establish 10-, 2-, and 1-percent annual chance peak discharges. These equations were based on a log-Pearson Type III analysis of gaging station records with a subsequent regression analysis to define the parameters for application to the ungaged watersheds (Reference 28). The 0.2-percent annual chance peak discharges were determined from an extrapolation of the constants used in the USGS equations.

<u>Star City, Town of</u>

Because Pompano Run has no streamflow record, provisional equations being developed by the USGS to update previous reports were applied to establish the 10-, 50-, and 100-year peak flood discharges (Reference 19). These equations were based on log-Pearson Type III analyses of gaging station records, with subsequent regression analysis to define the parameters for application to the ungaged watersheds (Reference 4). The 500-year frequency peak discharges were determined from an extrapolation of the constants used in the USGS equations.

The 2-, 1-, and 0.2-percent annual chance flood discharges on Pompano Run were modified to reflect the storage effect created by embankment fill over culverts in this area. The storage effect thus reduces the effective discharges of the 2-, 1-, and 0.2-percent annual chance floods at the mouth of Pompano Run.

<u>Westover, City of</u>

Because Dents Run has no streamflow record, provisional equations developed by the USGS to update previous reports were applied to establish the 10-, 50-, and 100-year peak flood discharges. These equations were based on a log-Pearson Type III analysis of gaging station records with subsequent regression analysis to define the parameters for application to the ungaged watersheds. The 500-year frequency peak discharges were determined from an extrapolation of the constants used in the USGS equations (References 19 and 20).

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 5, "Summary of Discharges."

Countywide Revision

No new hydrologic analyses were developed for this FIS.

TABLE 5 - 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
AARON CREEK					
At confluence with Deckers Creek	7.16	*	*	2,300	*
At the mouth	7.13	1,065	1,574	1,831	2,426
At a point approximately 0.26 mile upstream of mouth	7.04	1,065	1,574	1,831	2,426
Above confluence of unnamed tributary at a point approximately 4,780 feet upstream of confluence with Deckers Creek	6.55	*	*	2,180	*
COBUN CREEK					
At mouth	11.3	1,240	2,510	3,340	6,300
At Greenbag Road	10.9	1,210	2,440	3,240	6,100
At upstream Morgantown corporate limits	10.4	1,210	2,440	3,240	6,100
DECKERS CREEK					
At the mouth	63.4	5,300	9,100	11,100	17,400
At the upstream corporate limits	50.1	4,610	8,160	9,970	15,800
At Richard	46.8	4,150	7,350	9,000	13,850
Upstream of the confluence of unnamed tributary at Dellslow	40.1	3,700	6,500	8,020	11,900
DENTS RUN					
At the confluence with Monongahela River	14.3	1,758	2,526	2,917	3,785
At Town of Granville corporate limits	11.5	1,562	2,260	2,613	3,408
DUNKARD CREEK					
At the confluence with Monongahela River	179	12,600	17,800	19,900	25,500

*Data not available

TABLE 5 - 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
KNOCKING RUN					
At the mouth	1.77	391	610	720	994
At a point approximately 79 feet upstream of Monongalia County Route 68	1.71	391	610	720	994
MONONGAHELA RIVER					
At Point Marion Locks and Dam	2,715 1,429[1]	64,300	85,300	94,600	116,200
At Morgantown Locks and Dam	2,585 1,299[1]	62,500	83,000	92,000	113,000
At River Mile 102.7	*	62,000	82,400	91,300	112,500
At River Mile 104.7	2,544 1,258[1]	61,000	81,200	90,000	110,900
At Opekiska Locks and Dam	2,389 1,103[1]	61,000	81,200	90,000	110,900
At River Mile 115.4	*	58,400	78,100	86,700	107,000
POMPANO RUN					
At mouth	3.24	604	829	312*	1,075
At the limit of detailed study	3.16	604	921	1,079	1,464

[1]Reduced by Tygart Dam and Stonewall Jackson Dam
*Data not available

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 Monongalia County that has a previously printed FIS report, the hydraulic analyses described in those reports are listed below.

Water-surface elevations of floods of the selected recurrence intervals for Deckers Creek, Dunkard Creek, the Monongahela River, Cobun Creek, Dents Run, and Pompano Run were computed using the USACE HEC-2 step-backwater computer program (Reference 9). Aaron Creek was analyzed using the USGS WSPRO step-backwater computer and culvert program A-526 (Reference 23).

Cross sections for the Monongahela River were obtained from a digital 3-dimensional terrain model created by utilizing an Intergraph/Inroads software design package with the digital design map files and hydrographic data developed in 1992 (Reference 8). All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry.

Starting water-surface elevations for the Point Marion Pool of the Monongahela River were obtained from the continuation of profiles from the upper end of the Pool 7 and transferred to the upper pool at Point Marion Locks and Dam by weir computations. The starting water-surface elevations for the Morgantown Pool of the Monongahela River were obtained by continuation of profiles from the upper end of the Point Marion Pool and transferred to the upper poo1 at Morgantown Locks and Dam by weir computations. The starting water-surface elevations for the Hildebrand Pool of the Monongahela River were obtained from the continuation of profiles from the upper end of the Morgantown Pool and transferred to the upper pool at Hildebrand Locks and Dam by weir computations. The starting water-surface elevations for the Opekiska Pool of the Monongahela River were obtained from the continuation of profiles from the upper end of the Hildebrand Pool and transferred to the upper pool at Opekiska Locks and Dam by weir computations.

For Aaron Creek, twenty-seven cross sections were obtained from field surveys. All bridges and culverts were field surveyed to obtain elevation data and structural geometry.

Starting water surface elevations for Aaron Creek were computed by means of standard slope/conveyance techniques using WSPRO.

Cross-sectional data for Dunkard Creek were obtained by field measurement. For the locks and dams, cross-sectional data were taken from construction drawings. Field checks were made in cases where information was questionable or in areas requiring specific roughness inspection and evaluation.

Starting water-surface elevation for Dunkard Creek was determined by a stage-discharge rating curve based on high-water marks.

For Dents Run, Cobun Creek, Deckers Creek, Knocking Run, and Pompano Run, cross sections were obtained by taking channel soundings to obtain channel geometry data, while overbank geometry data were obtained from 5-foot contour interval topographic maps at scales of 1:2,400 (Reference 22) and 1:4,800 (Reference 21). All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry.

Starting water-surface elevations for Deckers Creek were determined using the combined effects of flood-frequency flows with the Monongahela River. Thus, flood elevations on Deckers Creek at the mouth are higher than those of the Monongahela River. Starting water-surface elevations for Cobun Creek, Aaron Creek, Dents Run, and Knocking Run were determined by the slope/area method.

Channel roughness factors (Manning's "n") used in the hydraulic computations for the Monongahela River were chosen by calibration to high water marks from actual floods. The March 1963, March 1967, May 1968, June 1972, January 1978, August 1980, June 1981, November 1985, and February 1989 high water profiles were verified in this manner. Channel roughness factors (Manning's "n") for the remaining streams were chosen by field inspection and based on engineering judgment. The following tabulation shows the channel and overbank "n" values for the streams studied by detailed methods:

Stream	Channel "n"	Overbank "n"
Deckers Creek	0.035-0.040	0.040-0.080
Dunkard Creek	0.030-0.040	0.070
Monongahela River	0.019-0.028	0.055-0.060
Aaron Creek	0.035-0.050	0.035-0.055
Cobun Creek	0.035-0.040	0.040-0.080
Dents Run	0.035-0.060	0.035-0.060
Pompano Run	0.04-0.08	0.04-0.08
Knocking Run	0.035-0.04	0.035-0.08

The elevations for the streams studied by approximate methods were based on stage-frequency curves developed through an analysis of 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 0.41 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

The boundaries were interpolated between cross sections for the Monongahela River using HEC-2 output data, the Intergraph/Inroads software package, and digitally prepared topographic base maps at a scale of 1"=200' with a contour interval of 5 feet (References 8 and 10). The boundaries were interpolated between cross sections for 1:4,800 reduced from a scale of 1:2,400 with a contour interval of 5 feet (Reference 22).

For Aaron Creek, existing topographic work maps, supplemented by approximately 27 field surveyed cross-sections and bridge sections, were utilized. Elevation

Reference Marks (ERM) were established and existing ERMs were verified at each surveyed bridge and other convenient locations with contour 7.5-minute series Topographic maps at a scale of 1:24,000 and a contour interval of 20 feet (Reference 26).

For Dents Run, between cross sections, the boundaries were interpolated using topographic maps at a scale of l"='400', with a contour interval of 4 feet (Reference 11).

The floodplain boundaries were interpolated between cross sections for all remaining streams using topographic maps at a scale of 1:4,800 with a contour interval of 5 feet (Reference 21).

For the portion of Pompano Run studied by approximate methods, the 100-year floodplain boundaries were delineated using topographic maps at a scale of 1:4,800 with a contour interval of 5 feet (Reference 30).

For the remaining streams studied by approximate methods, the 1-percent annual chance floodplain boundaries were delineated using the Flood Hazard Boundary Maps for the unincorporated areas of Monongalia County (Reference 27).

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 0.41 foot downward applied to the elevation values.

Floodways extend beyond the county boundary for Aaron Creek, Deckers Creek, Dunkard Creek, the Monongahela River, and Dents Run. Portions of the floodways for the Monongahela River, Deckers Greek, and Aaron Creek extend beyond the corporate limits of Morgantown, WV. Portions of the floodway widths for the Monongahela River extend beyond the corporate limits of Star City. Portions of the floodway for the Monongahela River and Dents Run extend beyond the corporate limits of the City of Westover.

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 6). 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.

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 6 for certain downstream cross sections are lower than the regulatory flood elevations in that area, which must take into account the 1-percent annual chance flooding due to backwater from other sources.

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage, and heightens potential flood hazards by further increasing velocities. A listing of stream velocities at selected cross sections is provided in Table 6, “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."

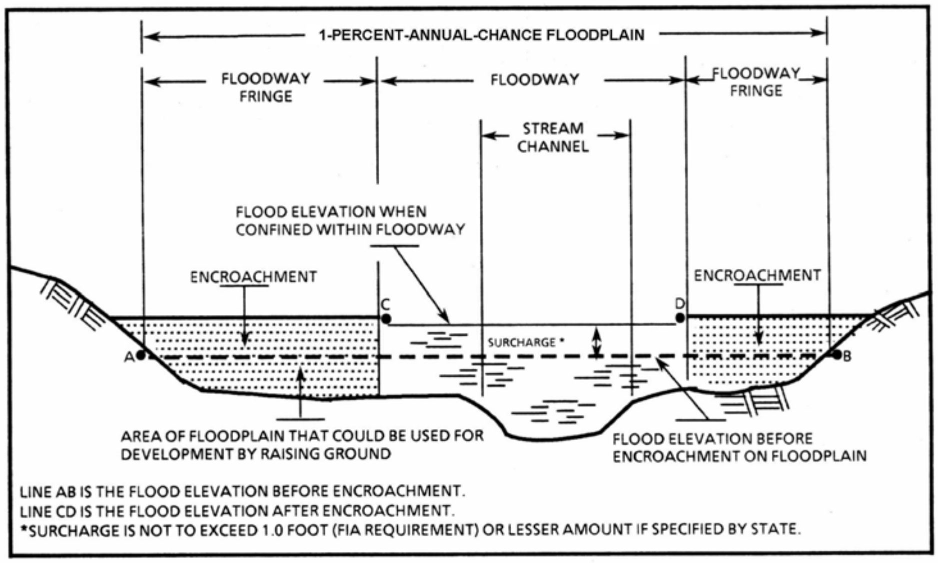

Figure 1: Floodway Schematic

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Aaron Creek								
A	623[1]	None	220	8.3	845.6	843.6[2]	844.3	0.7
B	977[1]	None	171	10.7	845.6	844.9[2]	845.9	1.0
Cobun Creek								
A	180[3]	146	691	4.8	817.8	816.3[4]	817.3	1.0
B	333[3]	120	750	4.5	817.8	817.0[4]	817.7	0.7
C	660[3]	50	292	11.4	820.6	820.6	821.2	0.6
D	1,452[3]	30	1,065	3.1	824.0	824.0	824.1	0.1
E	2,049[3]	60	217	15.4	835.3	835.3	835.4	0.1
F	5,359[3]	70	745	4.5	892.9	892.9	893.0	0.1
G	6,384[3]	125	514	6.5	893.5	893.5	894.1	0.6
H	7,709[3]	100	941	3.6	895.2	895.2	896.0	0.8
I	7,957[3]	125	1,563	2.1	907.4	907.4	908.2	0.8
J	9,367[3]	125	1,883	1.8	907.4	907.4	908.3	0.9

[1]Feet above confluence with Deckers Creek
[2]Elevation computed without consideration of backwater effects from Deckers Creek
[3]Feet above confluence with Monongahela River
[4]Elevation computed without consideration of backwater effects from Monongahela River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

AARON CREEK – COBUN 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
Deckers Creek								
A	370	70	899	12.4	813.8	807.9[2]	808.0	0.1
B	2,196	93	917	12.1	814.4	812.1[2]	812.4	0.3
C	3,010	74	910	12.2	817.6	816.1[2]	816.1	0.0
D	4,044	83	919	12.1	820.1	820.1	820.1	0.0
E	5,275	100	1,450	7.7	825.6	825.6	825.7	0.1
F	6,605	100	1,104	10.0	830.6	830.6	831.4	0.8
G	9,156	130	1,116	10.0	837.4	837.4	838.1	0.7
H	11,568	150	1,585	6.3	845.6	845.6	846.1	0.5
I	12,936	205	1,382	7.2	851.2	851.2	851.8	0.6
J	15,624	286	1,323	7.5	861.5	861.5	862.5	1.0
K	16,912	100	960	10.4	871.0	871.0	871.9	0.9
L	18,543	90	836	11.9	878.6	878.6	878.6	0.0
M	20,275	251	1,696	5.9	892.2	892.2	893.2	1.0
N	24,394	179	965	10.3	914.5	914.5	914.6	0.1
O	27,720	345	1,639	5.5	940.4	940.4	941.1	0.7
P	29,621	65	493	18.3	957.4	957.4	957.7	0.3

[1]Feet above confluence with Monongahela River
[2]Elevation computed without consideration of effects of combined flood-frequency flows with Monongahela River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

DECKERS 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
Dents Run								
A	708	120	1,647	1.8	812.8	804.7[2]	805.7	1.0
B	2,260	120	598	4.9	812.8	805.7[2]	806.7	1.0
C	3,142	70	294	9.9	812.8	809.0[2]	809.0	0.0
D	4,345	90	551	5.3	815.1	815.1	815.2	0.1
E	5,856	92	532	4.9	817.6	817.6	817.8	0.2
F	6,114	62	375	7.0	820.8	820.8	820.9	0.1
G	7,323	43	373	7.0	825.4	825.4	825.4	0.0
H	7,920	41	258	10.1	830.6	830.6	830.6	0.0
Dunkard Creek								
A	94,776	182	3,315	6.0	913.8	913.8	914.6	0.8
B	102,538	343[3]	4,896	4.1	918.0	918.0	919.0	1.0
C	110,035	176	3,387	5.9	923.1	923.1	923.8	0.7
D	119,381	175	2,731	7.3	928.9	928.9	929.9	1.0
E	127,987	204	4,208	4.7	934.1	934.1	935.0	0.9
F	135,590	322	4,811	4.1	937.3	937.3	938.3	1.0
G	146,362	175	3,466	5.7	944.3	944.3	944.8	0.5
H	154,704	175	3,031	6.6	949.6	949.6	950.3	0.7
I	161,198	286	4,914	4.0	954.9	954.9	955.6	0.7

[1]Feet above confluence with Monongahela River
[2]Elevation computed without consideration of backwater effects from Monongahela River
[3]This width extends beyond county boundary

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

DENTS RUN – DUNKARD 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
Knocking Run								
A	929	63	183	3.9	859.6	859.6	860.3	0.7
B	1,077	60	331	2.2	864.5	864.5	865.2	0.7
C	1,183	35	121	6.0	865.2	865.2	865.8	0.6
D	1,262	25	101	7.1	865.8	865.8	866.2	0.4
E	1,452	30	106	6.8	869.3	869.3	869.3	0.0

[1]Feet above confluence with Deckers Creek

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

KNOCKING 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
Monongahela River								
A	482,145	566/260[2]	16,213	5.8	808.7	808.7	809.7	1.0
B	483,135	631	16,721	5.7	808.8	808.8	809.8	1.0
C	483,960	726	17,925	5.3	808.9	808.9	809.9	1.0
D	485,460	626	16,111	5.9	808.9	808.9	809.9	1.0
E	487,000	504	15,082	6.3	809.0	809.0	810.0	1.0
F	488,250	573	16,975	5.6	809.3	809.3	810.2	0.9
G	489,500	554	15,949	5.9	809.3	809.3	810.2	0.9
H	491,360	561	16,935	5.6	809.5	809.5	810.4	0.9
I	492,600	545	15,514	6.1	809.5	809.5	810.4	0.9
J	494,000	539	15,425	6.1	809.6	809.6	810.5	0.9
K	495,050	522	15,379	6.1	809.7	809.7	810.6	0.9
L	497,020	515	15,413	6.1	809.9	809.9	810.7	0.8
M	498,400	537	14,941	6.3	810.0	810.0	810.8	0.8
N	499,760	493	14,661	6.5	810.1	810.1	810.9	0.8
O	501,100	563	16,369	5.8	810.4	810.4	811.2	0.8
P	502,000	521	15,690	6.0	810.4	810.4	811.2	0.8
Q	503,300	542	15,521	6.1	810.5	810.5	811.3	0.8
R	504,720	501	14,211	6.7	810.5	810.5	811.3	0.8
S	506,400	513	15,400	6.1	810.8	810.8	811.6	0.8
T	508,100	623	17,217	5.5	811.1	811.1	811.9	0.8
U	509,500	633	18,283	5.2	811.2	811.2	812.0	0.8
V	510,620	567	17,711	5.3	811.3	811.3	812.1	0.8
W	512,900	538	15,369	6.2	811.4	811.4	812.1	0.7
X	514,200	604	15,448	6.1	811.5	811.5	812.2	0.7
Y	515,340	537	14,715	6.4	811.6	811.6	812.3	0.7
Z	516,720	619	15,696	6.0	811.8	811.8	812.5	0.7

[1]Feet above confluence with Ohio River
[2]Total width/width within county boundary

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

MONONGAHELA 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
Monongahela River (continued)								
AA	519,140	479	15,034	6.3	812.1	812.1	812.8	0.7
AB	521,460	622	14,880	6.4	812.3	812.3	813.0	0.7
AC	522,480	546	13,696	6.9	812.3	812.3	813.0	0.7
AD	523,600	599	15,780	6.0	812.7	812.7	813.2	0.5
AE	524,950	670	17,615	5.4	812.9	812.9	813.5	0.6
AF	526,100	648	17,555	5.4	813.0	813.0	813.6	0.6
AG	529,300	598	15,870	6.0	813.3	813.3	813.9	0.6
AH	530,300	545	13,840	6.8	813.3	813.3	813.9	0.6
AI	531,300	511	12,895	7.3	813.3	813.3	813.9	0.6
AJ	532,440	570	14,974	6.3	813.7	813.7	814.3	0.6
AK	535,400	543	14,449	6.4	814.1	814.1	814.6	0.5
AL	536,700	561	14,726	6.2	814.3	814.3	814.8	0.5
AM	538,090	559	12,747	7.2	814.3	814.3	814.8	0.5
AN	539,200	575	14,243	6.5	817.2	817.2	818.2	1.0
AO	540,900	540	11,324	8.1	817.3	817.3	818.3	1.0
AP	542,000	557	12,123	7.5	817.8	817.8	818.7	0.9
AQ	543,120	431	11,408	8.0	818.1	818.1	819.0	0.9
AR	543,960	532	12,283	7.4	818.4	818.4	819.2	0.8
AS	545,000	468	11,447	8.0	818.6	818.6	819.4	0.8
AT	545,600	523	11,151	8.2	818.7	818.7	819.5	0.8
AU	546,600	462	10,933	8.4	819.0	819.0	819.8	0.8
AV	547,680	474	10,329	8.8	819.3	819.3	820.1	0.8
AW	549,260	583	13,623	6.7	820.3	820.3	821.0	0.7
AX	550,660	562	12,779	7.1	820.5	820.5	821.1	0.6
AY	552,040	687	12,670	7.2	820.9	820.9	821.5	0.6
AZ	554,560	789	15,493	5.8	821.9	821.9	822.4	0.5

[1]Feet above confluence with Ohio River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

MONONGAHELA 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
Monongahela River (continued)								
BA	555,600	799	15,203	5.9	822.1	822.1	822.6	0.5
BB	557,200	584	13,242	6.8	822.3	822.3	822.8	0.5
BC	558,240	499	11,809	7.6	822.4	822.4	822.8	0.5
BD	559,500	408	9,713	9.3	822.4	822.4	822.8	0.5
BE	561,200	449	12,041	7.5	823.4	823.4	822.8	0.4
BF	563,500	398	9,228	9.7	823.6	823.6	822.8	0.4
BG	564,500	440	9,804	9.2	824.2	824.2	822.8	0.4
BH	565,400	425	10,217	8.8	824.6	824.6	822.8	0.4
BI	566,600	455	10,580	8.5	825.1	825.1	822.8	0.4
BJ	567,800	439	10,700	8.4	825.5	825.5	822.8	0.4
BK	568,500	454	11,467	7.8	825.8	825.8	822.8	0.3
BL	569,220	537	12,630	7.1	826.2	826.2	822.8	0.3
BM	570,750	677	10,064	8.9	834.6	834.6	822.8	1.0
BN	571,100	635	11,940	7.5	835.3	835.3	822.8	0.9
BO	571,600	608	11,389	7.9	835.5	835.5	822.8	0.8
BP	573,020	509	11,413	7.9	836.2	836.2	822.8	0.7
BQ	574,420	444	9,707	9.3	836.5	836.5	822.8	0.7
BR	575,500	414	9,616	9.4	837.1	837.1	822.8	0.6
BS	576,600	639	12,195	7.4	838.2	838.2	822.8	0.6
BT	577,640	560	11,524	7.8	838.6	838.6	822.8	0.5
BU	578,530	576	11,492	7.8	839.0	839.0	822.8	0.5
BV	579,600	396	9,207	9.8	839.0	839.0	822.8	0.5
BW	580,600	525	12,450	7.2	840.2	840.2	822.8	0.4
BX	581,700	472	11,316	7.9	840.4	840.4	822.8	0.4
BY	582,230	517	12,227	7.4	840.8	840.8	822.8	0.4
BZ	583,660	477	10,458	8.6	841.1	841.1	841.5	0.4

[1]Feet above confluence with Ohio River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

MONONGAHELA 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
Monongahela River (continued)								
CA	585,000	418	11,272	8.0	841.7	841.7	842.0	0.3
CB	586,340	513	12,631	7.1	842.4	842.4	842.7	0.3
CC	587,980	446	12,437	7.2	842.8	842.8	843.1	0.3
CD	589,440	538	11,878	7.6	843.1	843.1	843.4	0.3
CE	590,000	477	10,861	8.3	843.2	843.2	843.5	0.3
CF	590,580	471	10,338	8.7	843.3	843.3	843.6	0.3
CG	591,700	440	11,788	7.6	844.0	844.0	844.3	0.3
CH	593,120	485	10,813	8.3	844.4	844.4	844.7	0.3
CI	594,300	393	9,664	9.3	844.7	844.7	845.0	0.3
CJ	595,760	540	13,419	6.7	845.9	845.9	846.2	0.3
CK	598,860	412	10,293	8.7	846.7	846.7	846.9	0.2
CL	600,400	466	10,298	8.7	847.3	847.3	847.5	0.2
CM	601,600	398	10,627	8.5	847.9	847.9	848.1	0.2
CN	602,800	443	10,997	8.2	848.4	848.4	848.6	0.2
CO	603,960	473	12,795	7.0	849.0	849.0	849.2	0.2
CP	605,100	439	10,635	8.5	849.1	849.1	849.3	0.2
CQ	606,300	516	12,197	7.4	849.8	849.8	850.0	0.2
CR	607,100	610	14,330	6.3	850.2	850.2	850.4	0.2
CS	608,130	665	14,815	6.1	850.5	850.5	850.7	0.2
CT	609,830	550	10,772	8.4	856.6	856.6	857.6	1.0
CU	610,030	539	11,194	8.0	856.8	856.8	857.8	1.0
CV	610,960	554	10,666	8.4	857.0	857.0	858.0	1.0
CW	612,000	698	10,220	8.5	857.4	857.4	858.3	0.9
CX	613,260	510	8,617	10.0	857.7	857.7	858.5	0.8
CY	614,900	521	9,243	9.4	858.9	858.9	859.5	0.6
CZ	615,940	584	10,985	7.9	859.8	859.8	860.4	0.6

[1]Feet above confluence with Ohio River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

MONONGAHELA 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
Monongahela River (continued)								
DA	617,600[1]	530	11,960	7.2	860.4	860.4	860.9	0.5
DB	619,300[1]	504	10,094	8.6	860.5	860.5	861.0	0.5
DC	620,550[1]	491	10,668	8.1	861.0	861.0	861.5	0.5
DD	621,540[1]	491	10,744	8.1	861.3	861.3	861.7	0.4
Pompano Run								
A	1,241[2]	52	785	1.4	843.7	843.7	844.7	1.0
B	1,758[2]	72	1,397	0.8	862.3	862.3	863.3	1.0

[1]Feet above confluence with Ohio River
[2]Feet above confluence with Monongahela River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

MONONGAHELA RIVER – POMPANO RUN

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 Monongalia 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 7, "Community Map History."

7.0 OTHER STUDIES

In June 1975, the USACE released a floodplain information report on the Monongahela River in Monongalia County, West Virginia (Reference 2).

USACE prepared Flood Plain Information reports for Monongalia and Marion Counties, West Virginia; and Green and Fayette Counties, Pennsylvania (References 2, 33, 34, and 3). These reports concern flooding of the Monongahela River and the effect of its flooding on major tributaries. All hydrologic and hydraulic analyses for this FIS were coordinated with these reports.

FISs have been prepared for the Cities of Morgantown and Westover, the Towns of Granville and Star City, and the unincorporated areas of Monongalia, Marion and Wetzel Counties, all in West Virginia; and the Townships of Dunkard and Springhill, Pennsylvania (References 35, 36, 37, 38, 39, 40, 41 and 42).

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

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Blacksville, City of	October 25, 1974	None	None	None
Granville, Town of	November 29, 1974	None	December 15, 1983	November 2, 1995
Monongalia County (Unincorporated Areas)	July 18, 1975	October 9, 1981	May 1, 1984	September 30, 1995 February 22, 1999
Morgantown, City of	August 2, 1974	December 31, 1976	August 1, 1979	June 15, 1984 October 18, 1995
Star City, Town of	November 22, 1974	None	August 1, 1978	October 18, 1995
Westover, City of	November 22, 1974	None	August 1, 1978	December 19, 1995

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

9.0 BIBLIOGRAPHY AND REFERENCES

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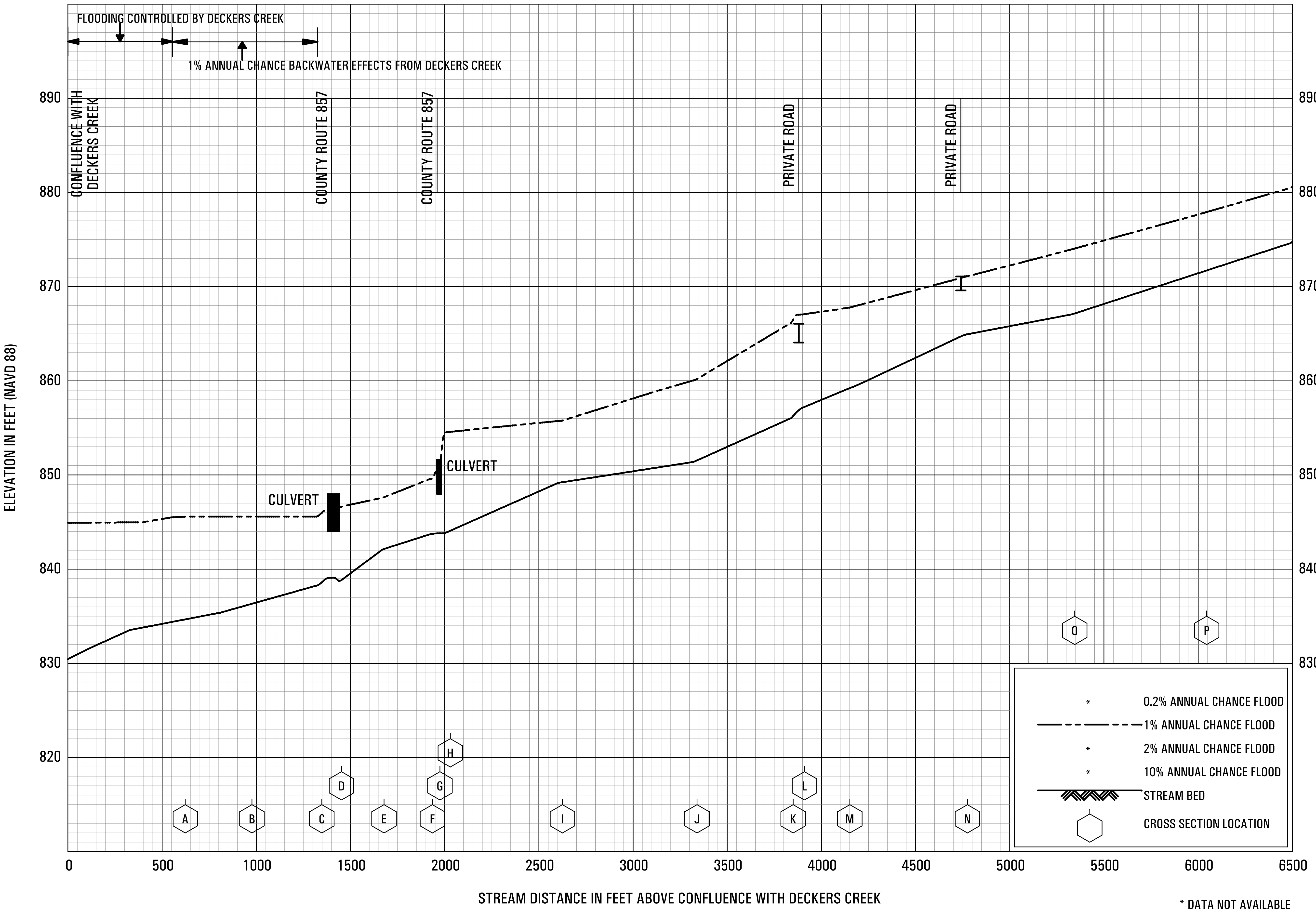

FLOOD PROFILES

AARON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS

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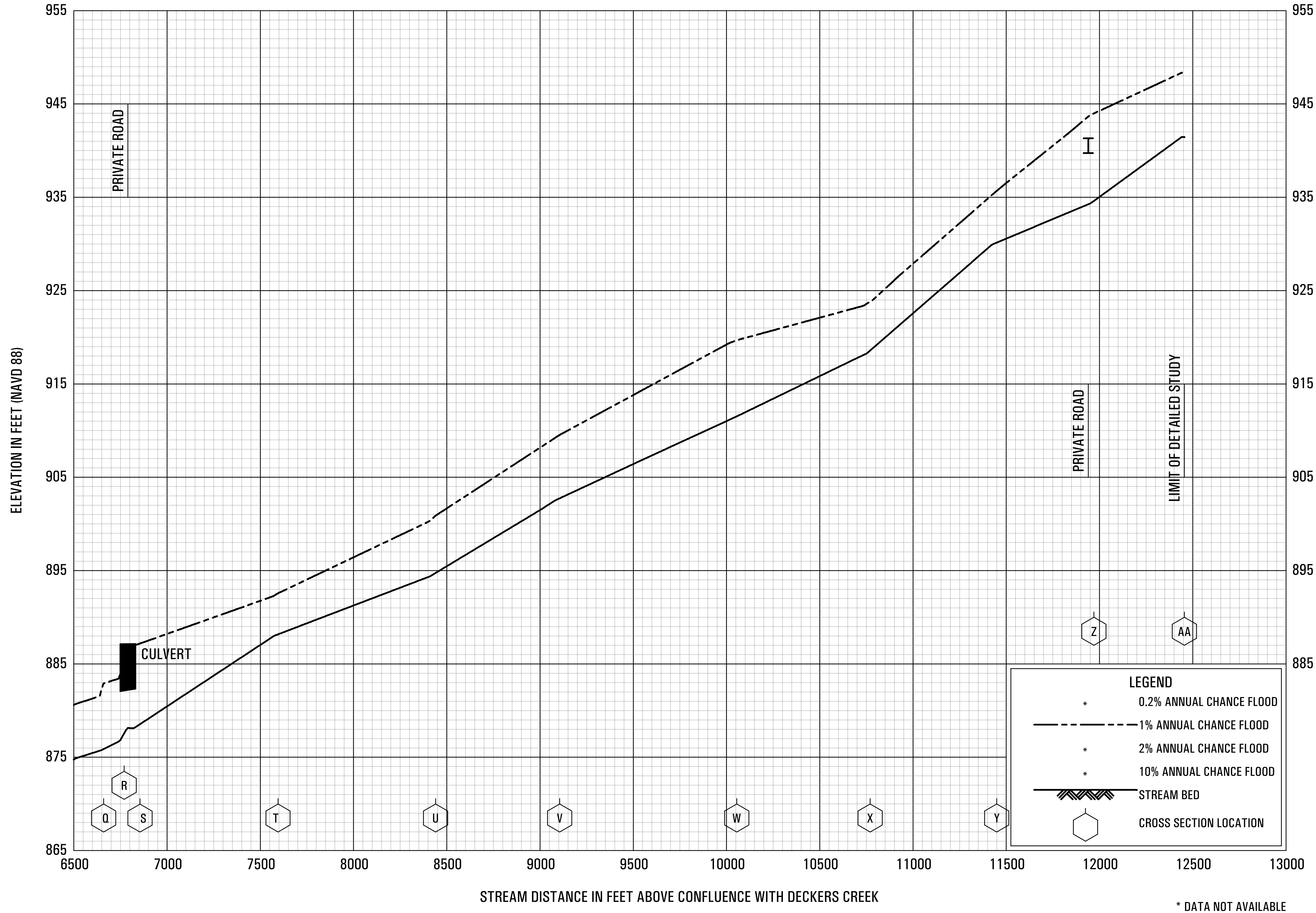

FLOOD PROFILES

AARON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS

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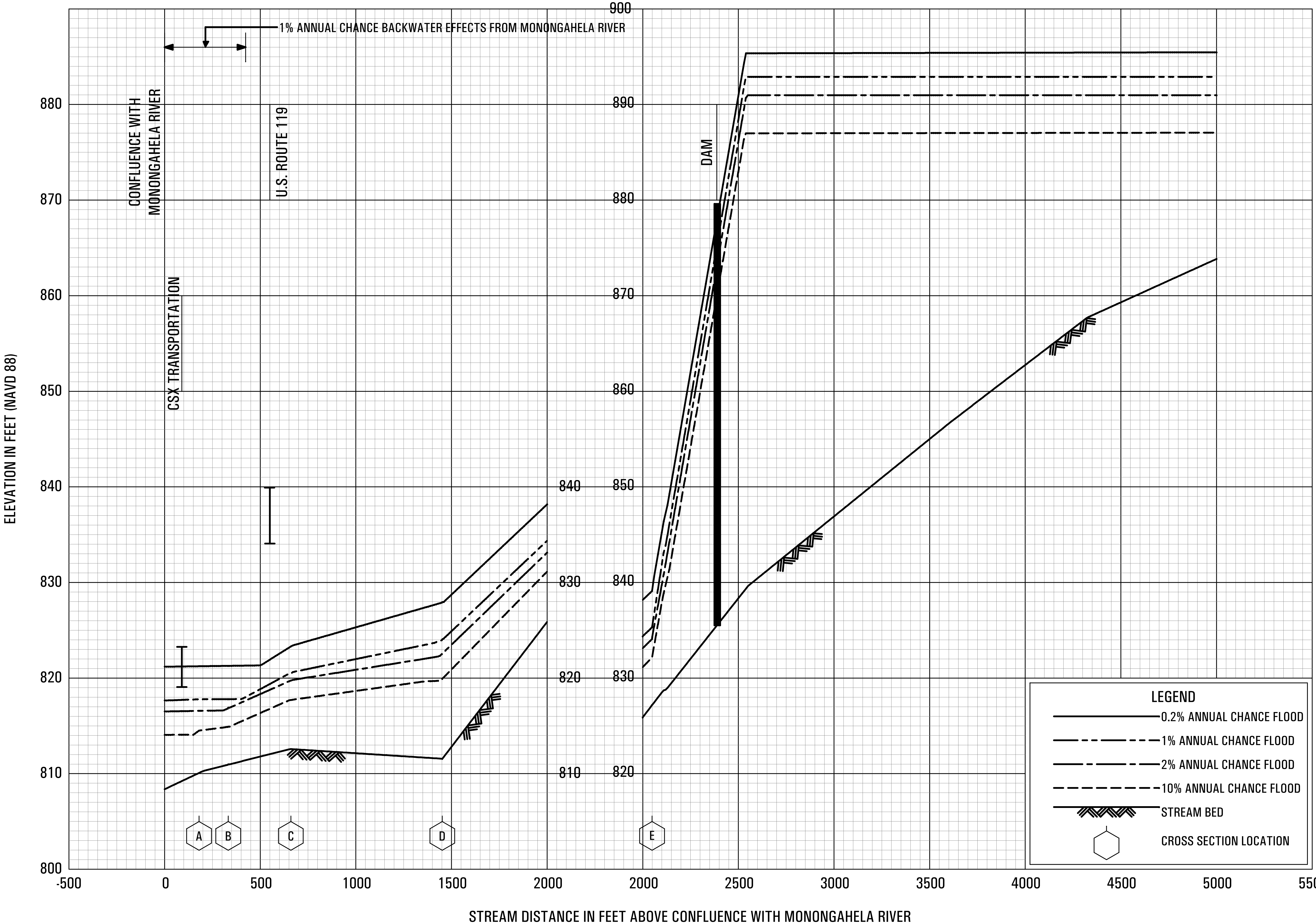

FLOOD PROFILES

COBUN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS

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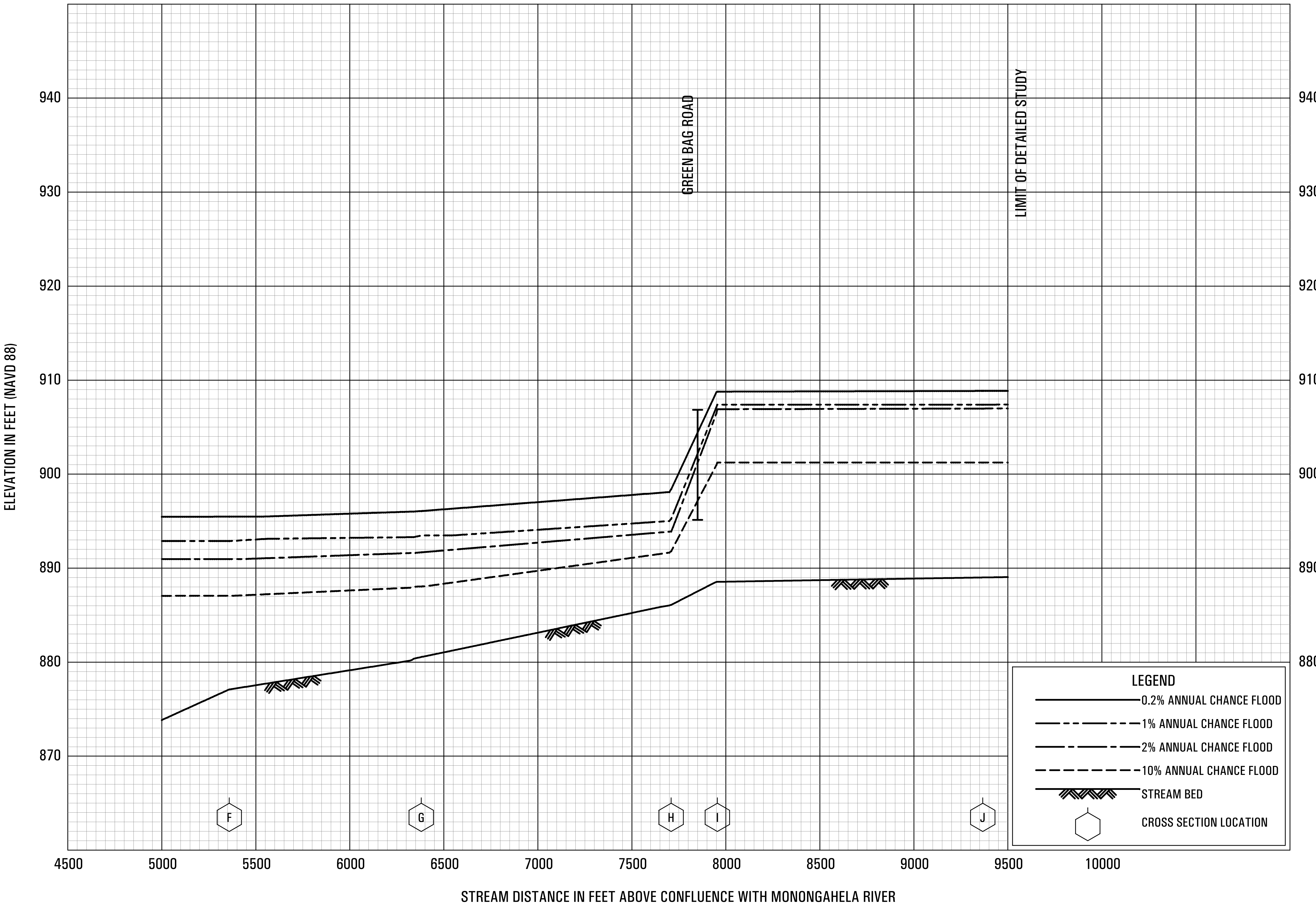


FLOOD PROFILES

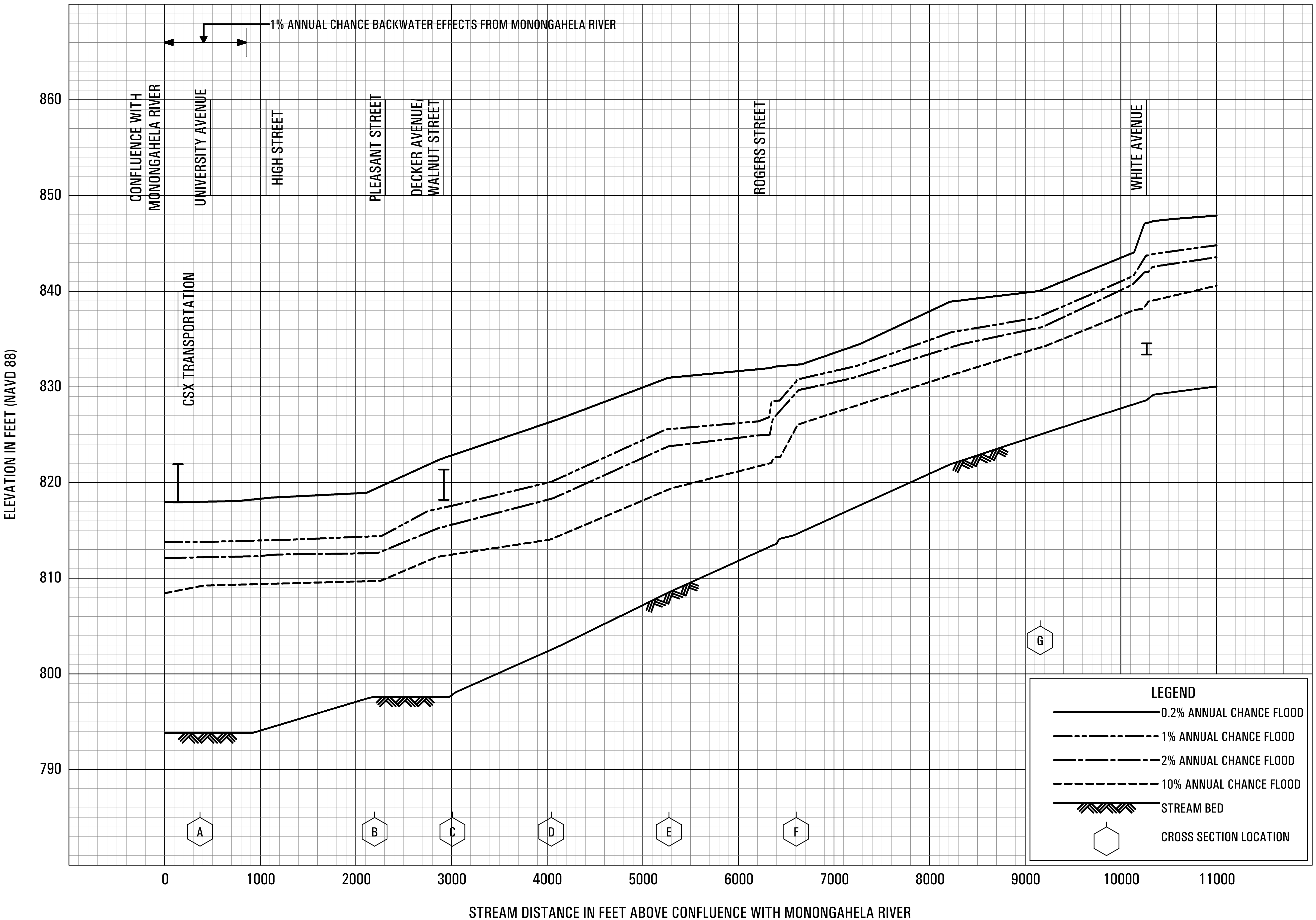
COBUN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS

04P



FLOOD PROFILES

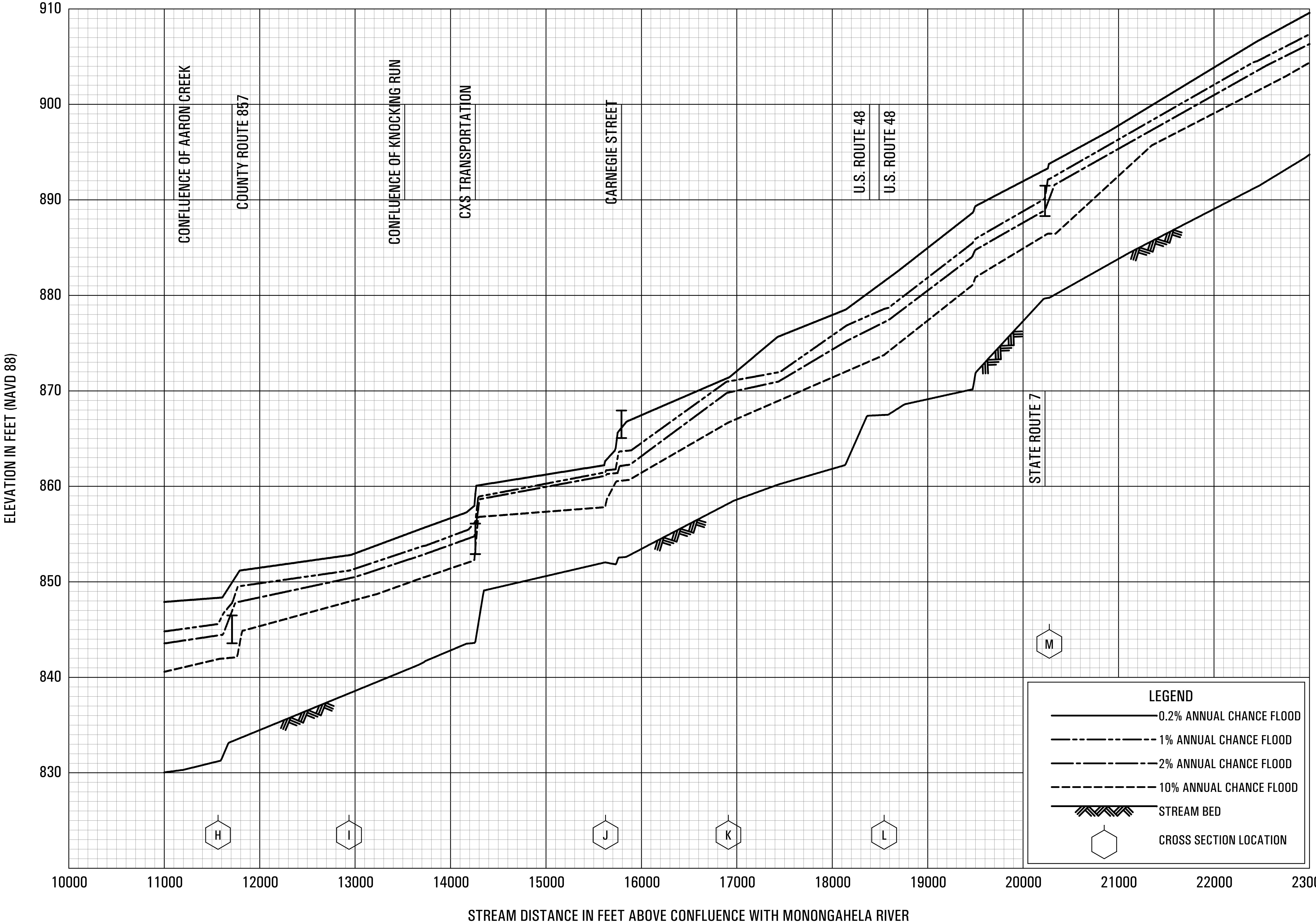
DECKERS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS

05P



FLOOD PROFILES

DECKERS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS

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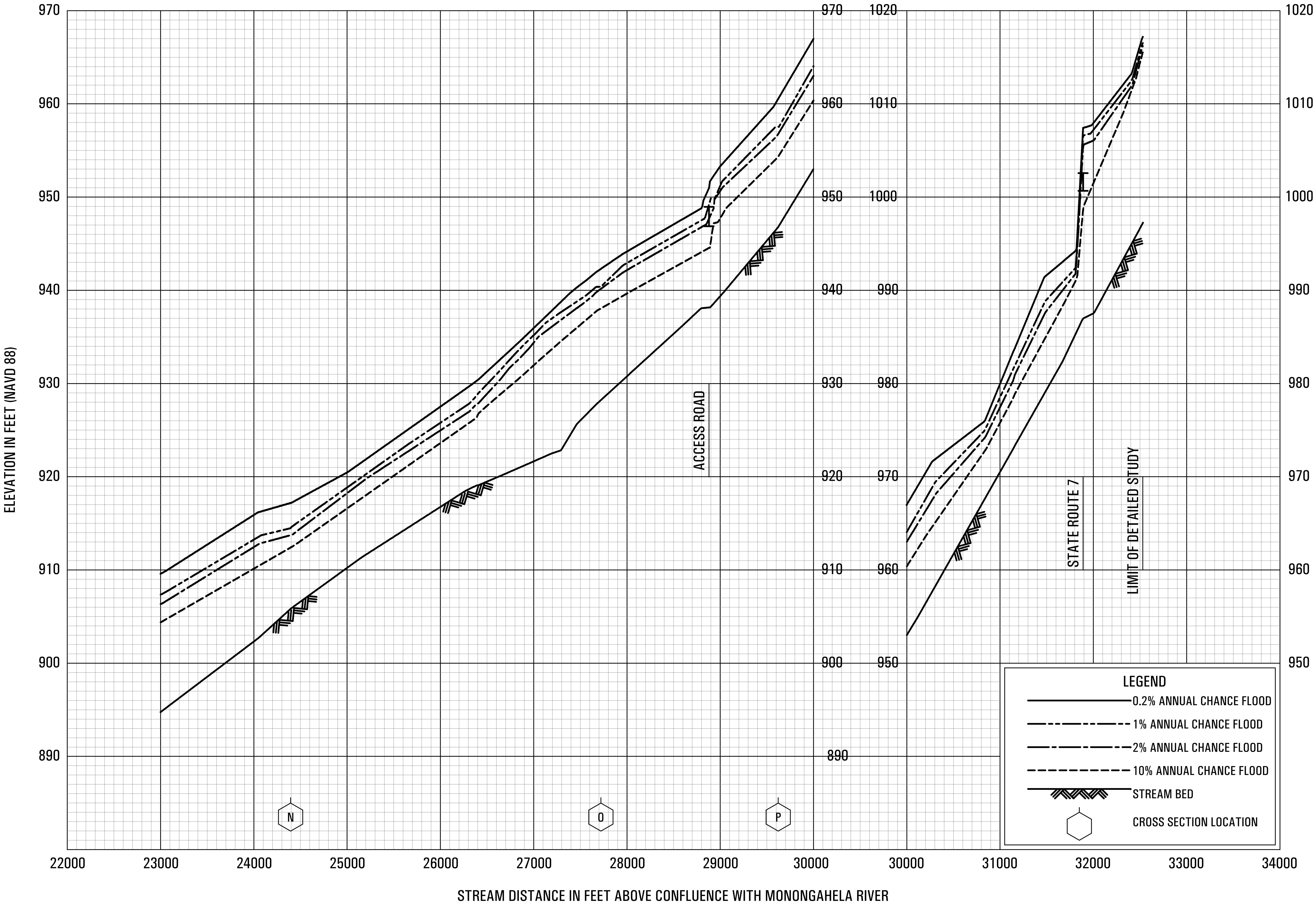

FLOOD PROFILES

DECKERS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS

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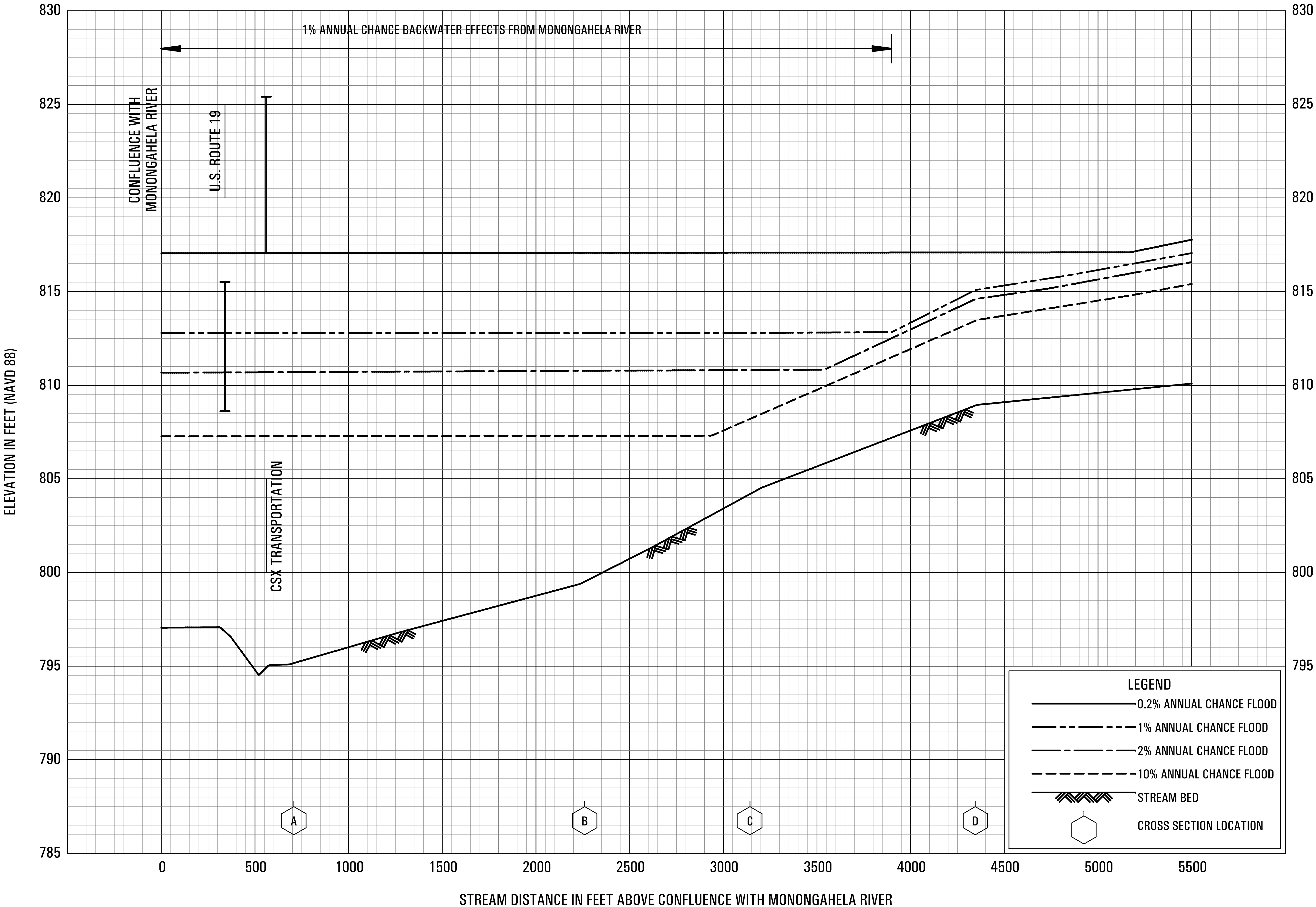


FLOOD PROFILES

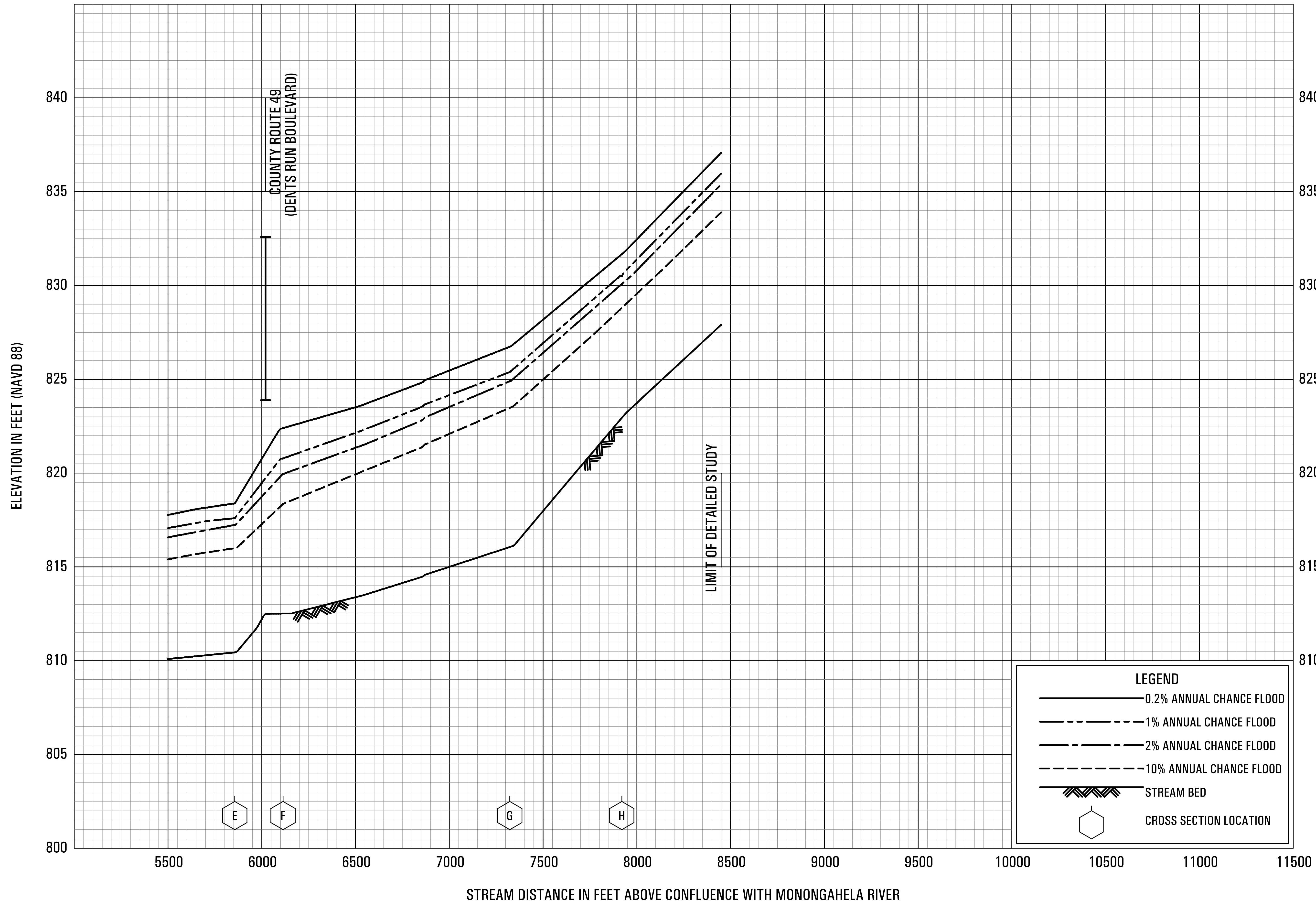
DENTS RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS

08P



FLOOD PROFILES

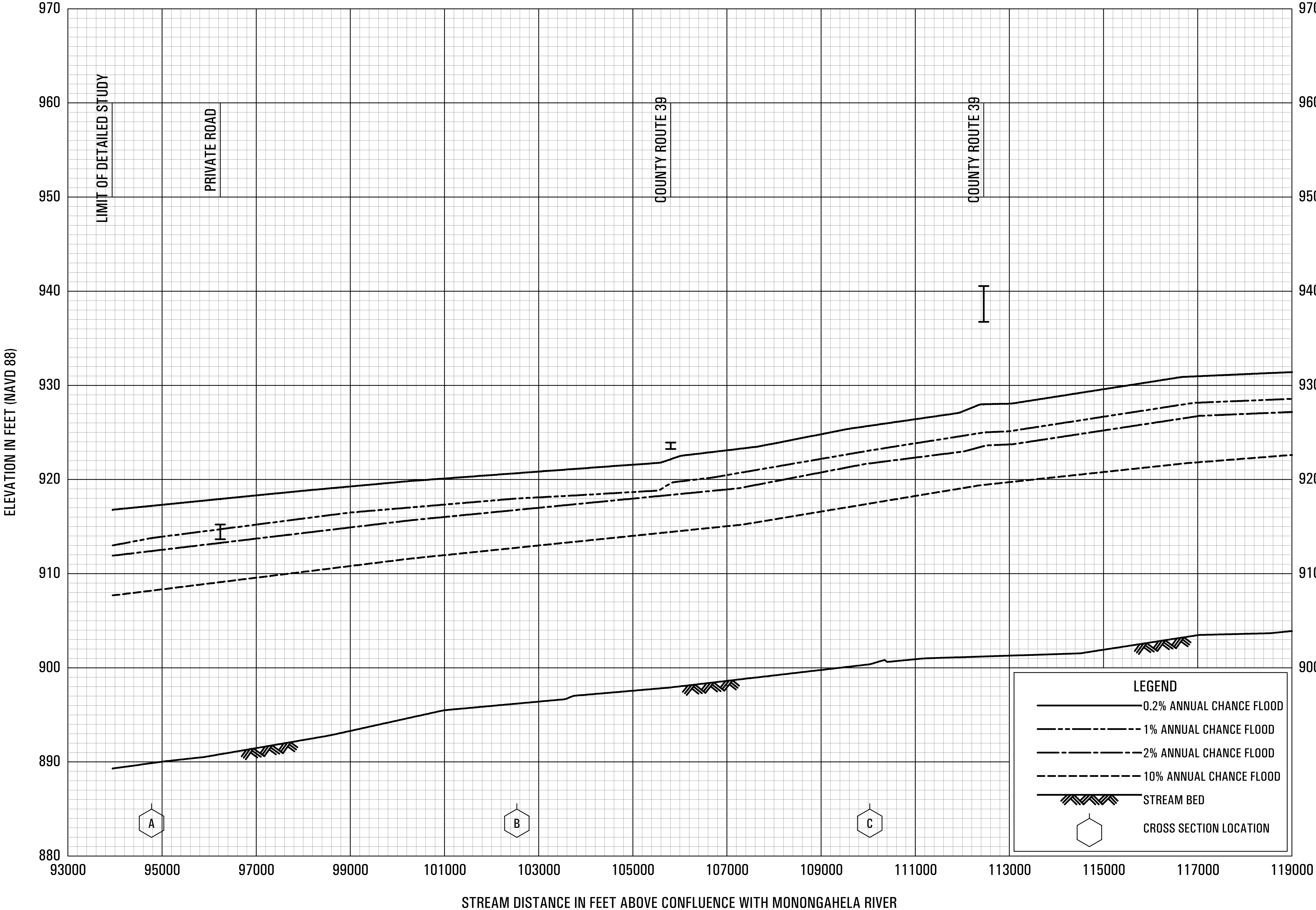
DENTS RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS

09P



FLOOD PROFILES

DUNKARD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS

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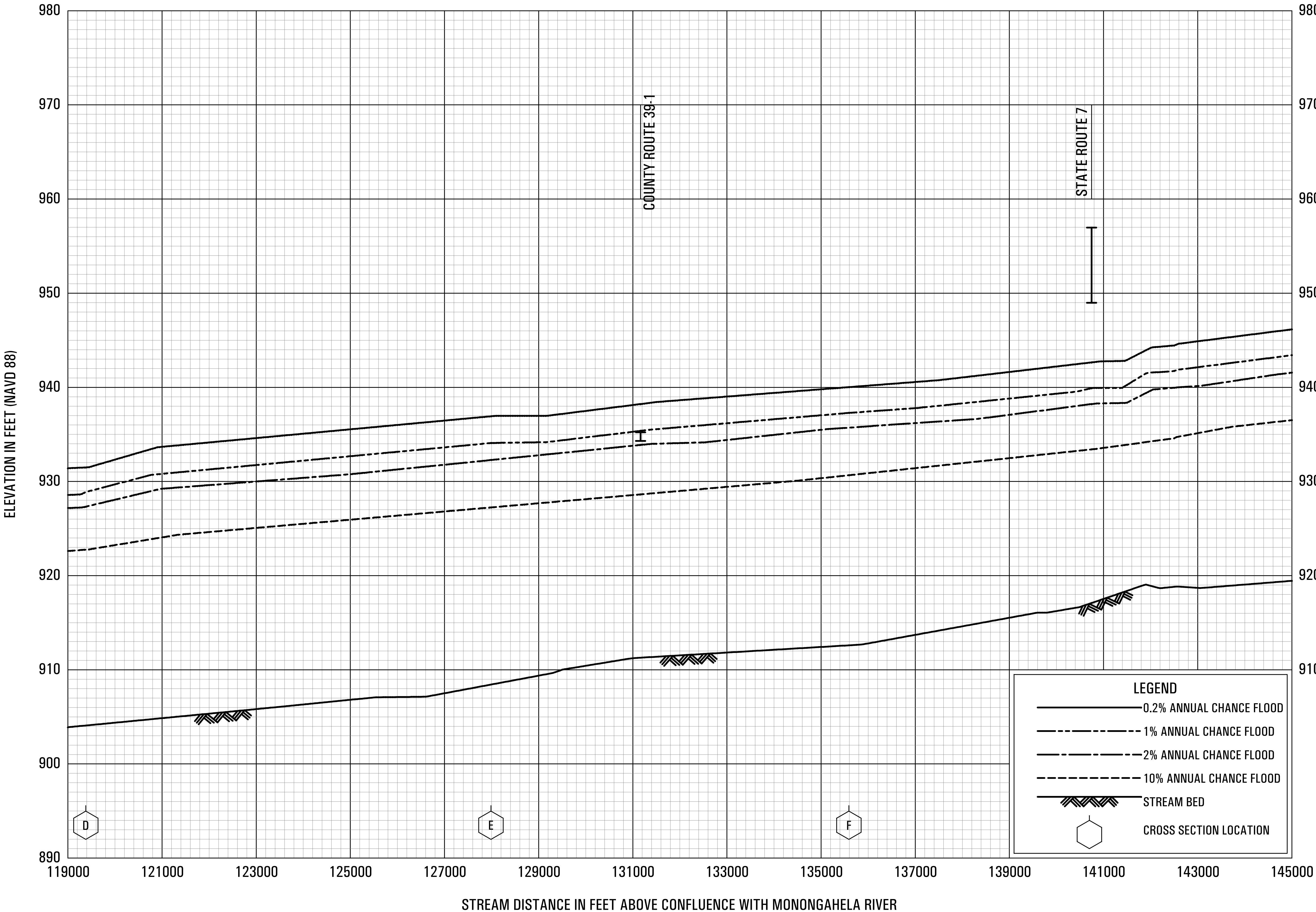


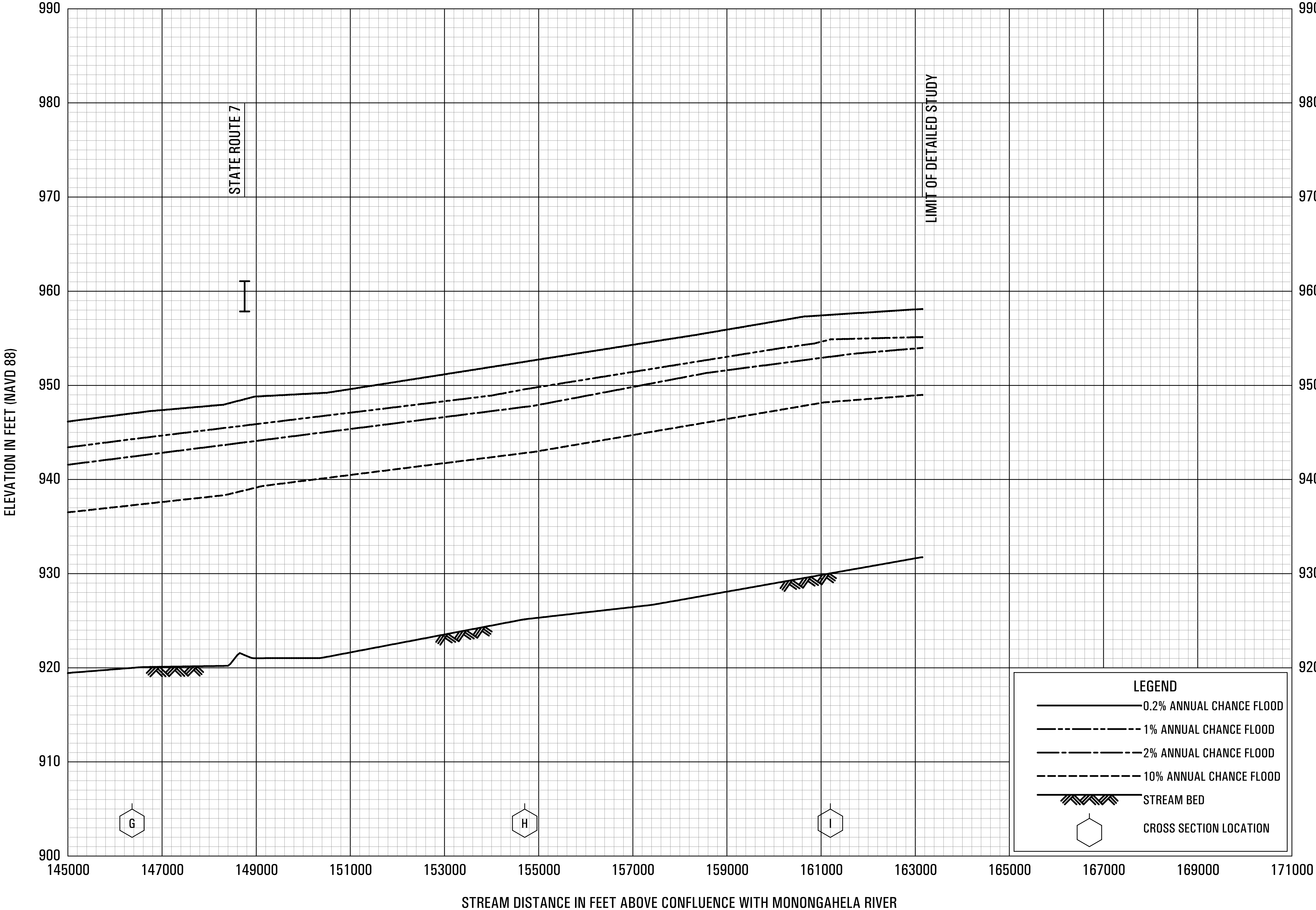
FLOOD PROFILES

DUNKARD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS



FLOOD PROFILES

DUNKARD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS

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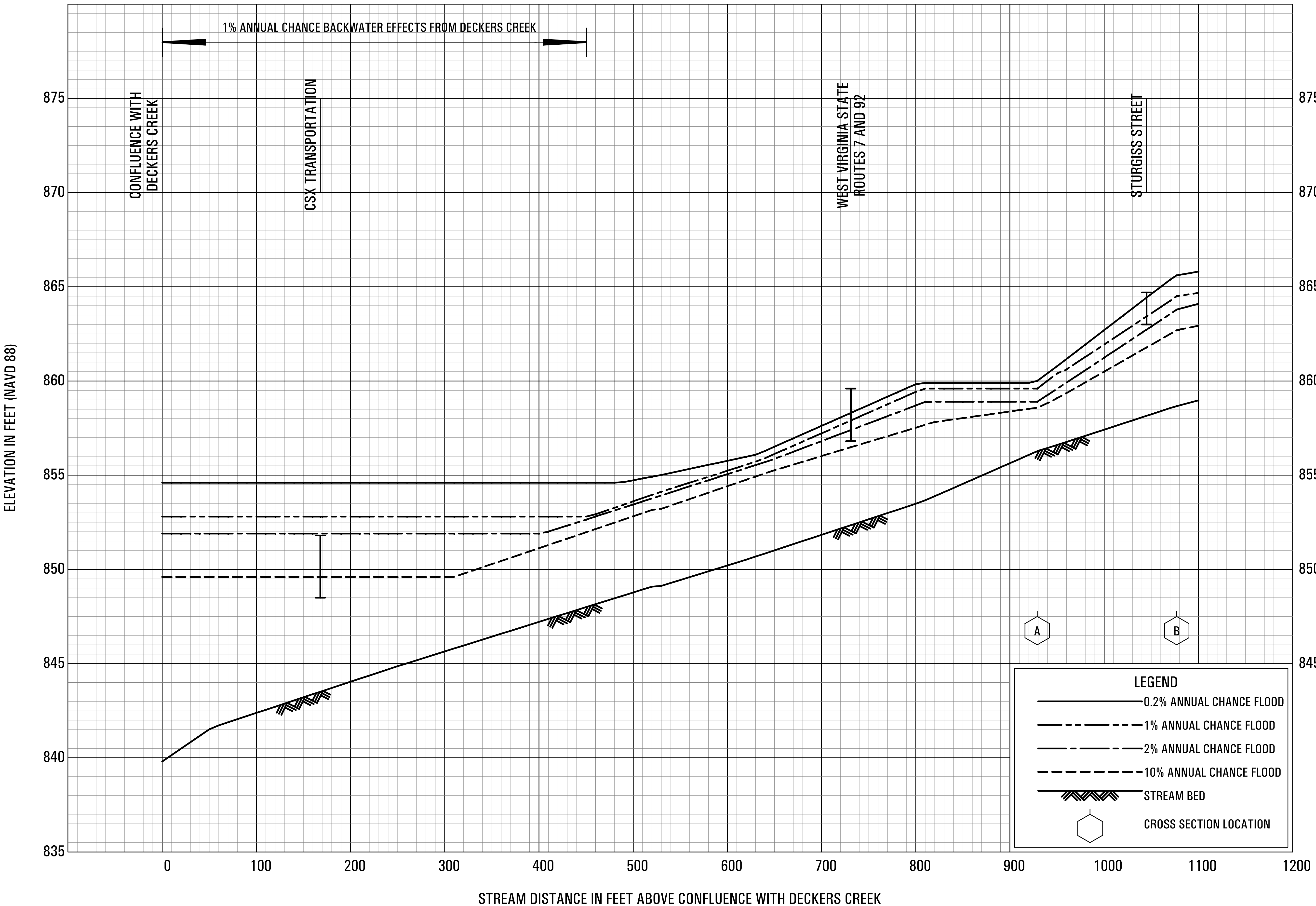


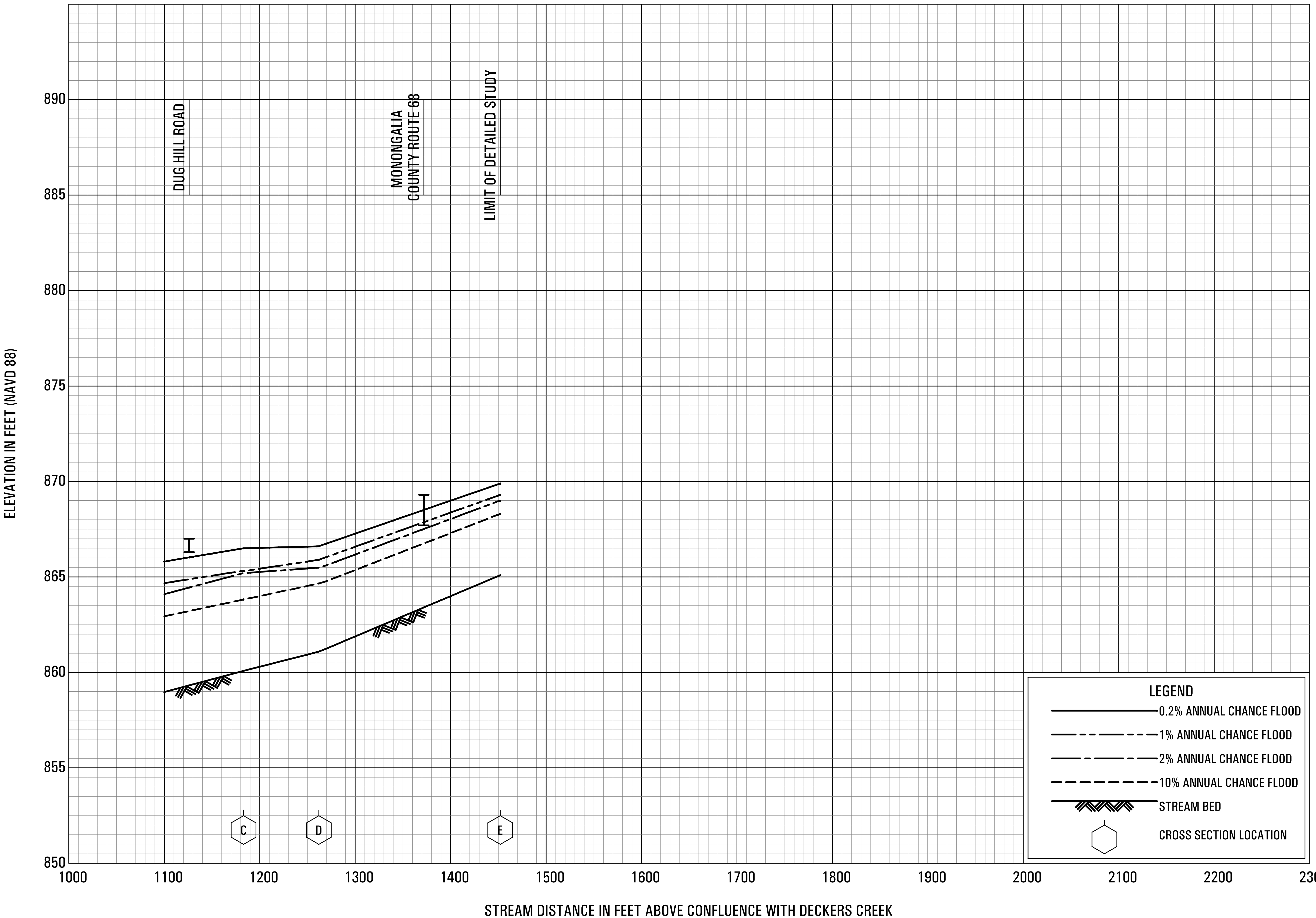
FLOOD PROFILES

KNOCKING RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS



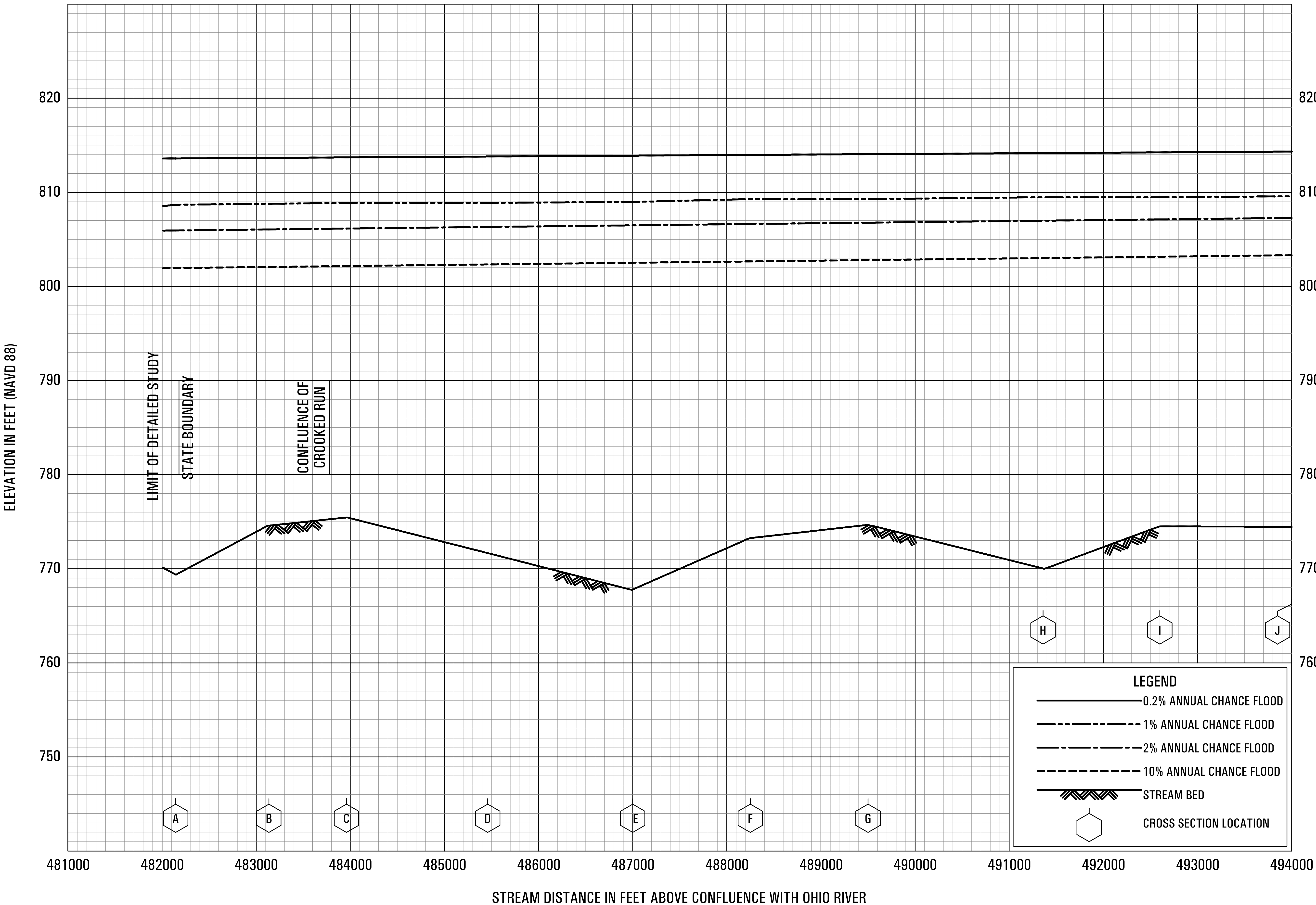
FLOOD PROFILES

KNOCKING RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS



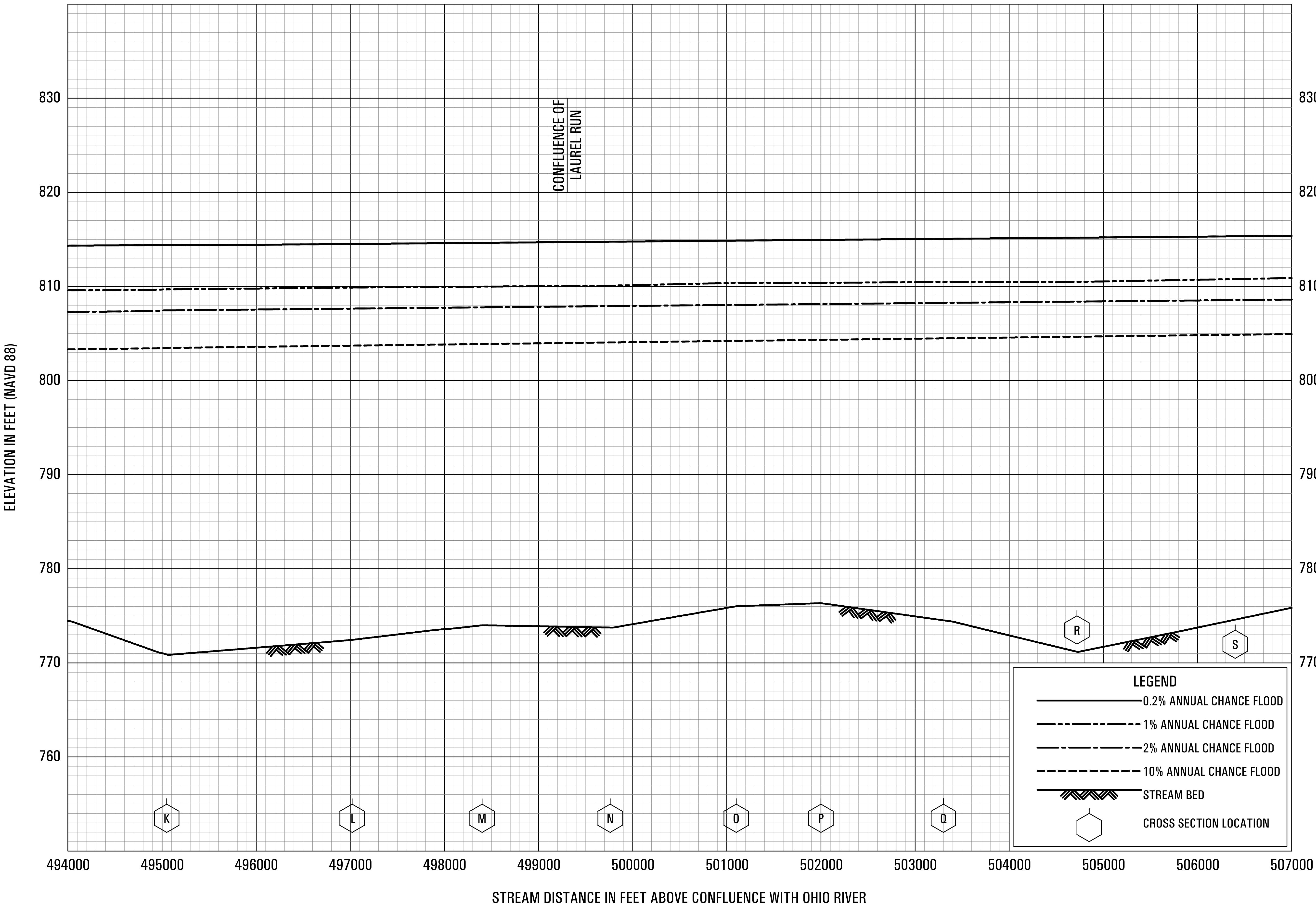
FLOOD PROFILES

MONONGAHELA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS



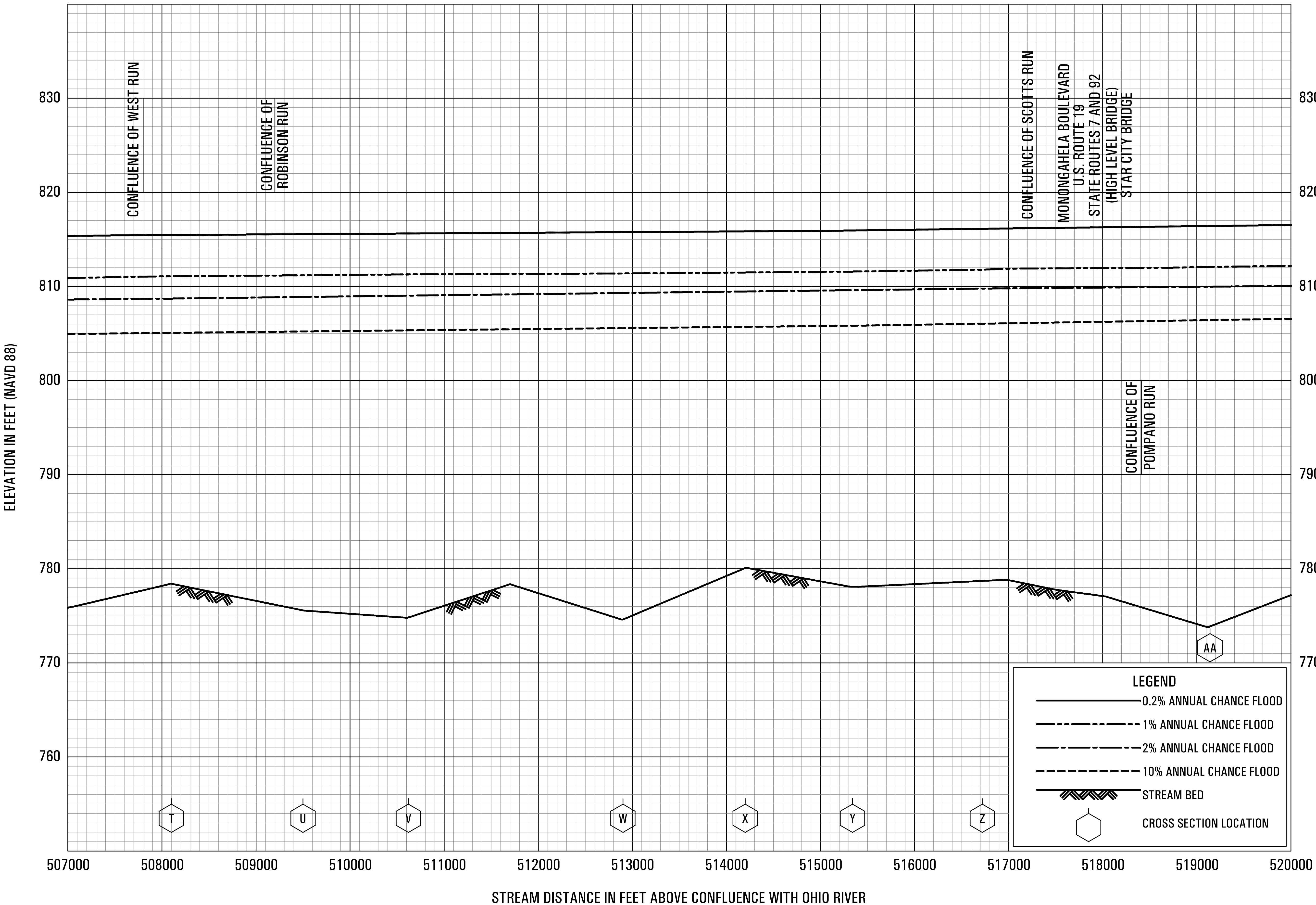
FLOOD PROFILES

MONONGAHELA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS



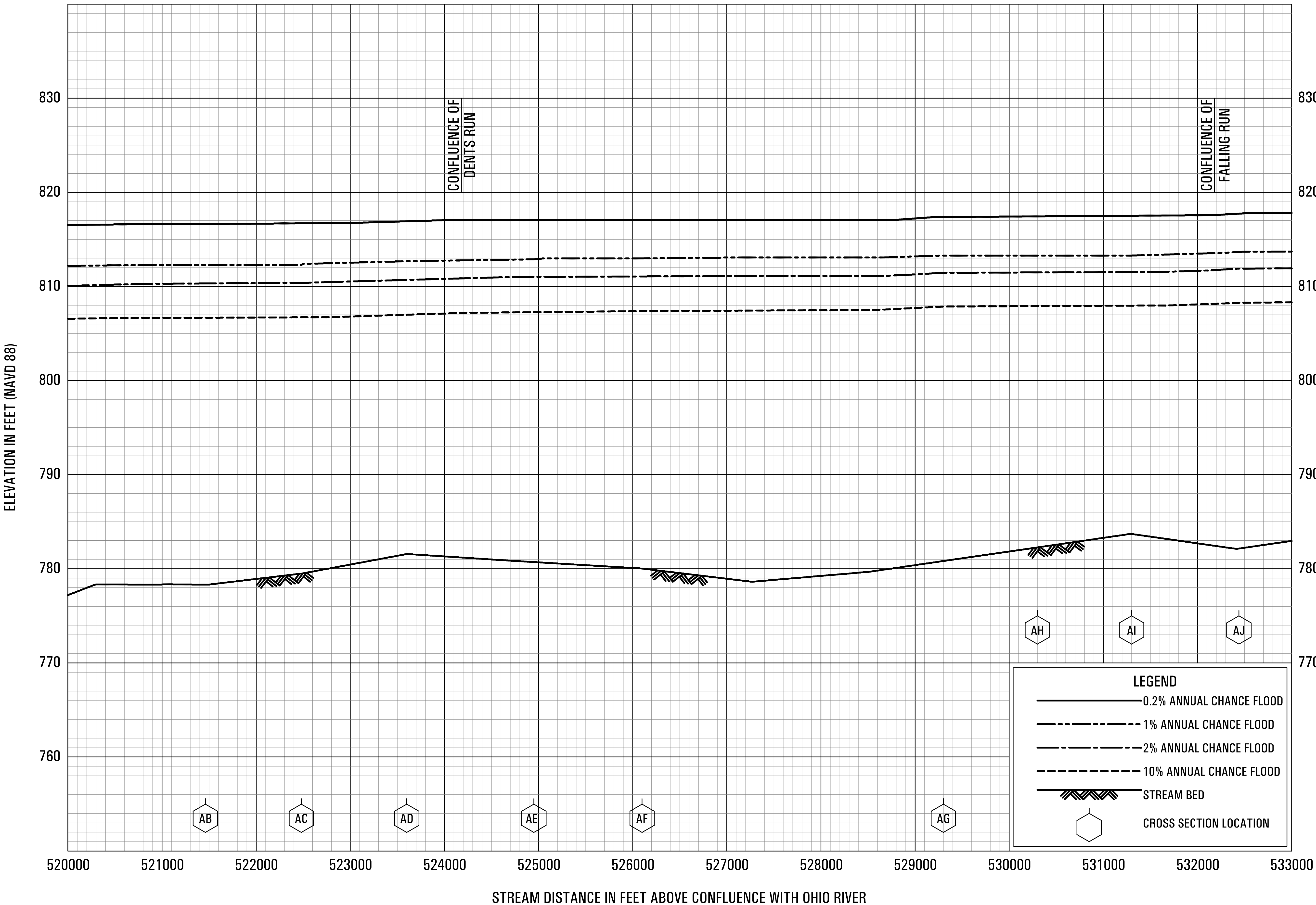
FLOOD PROFILES

MONONGAHELA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS



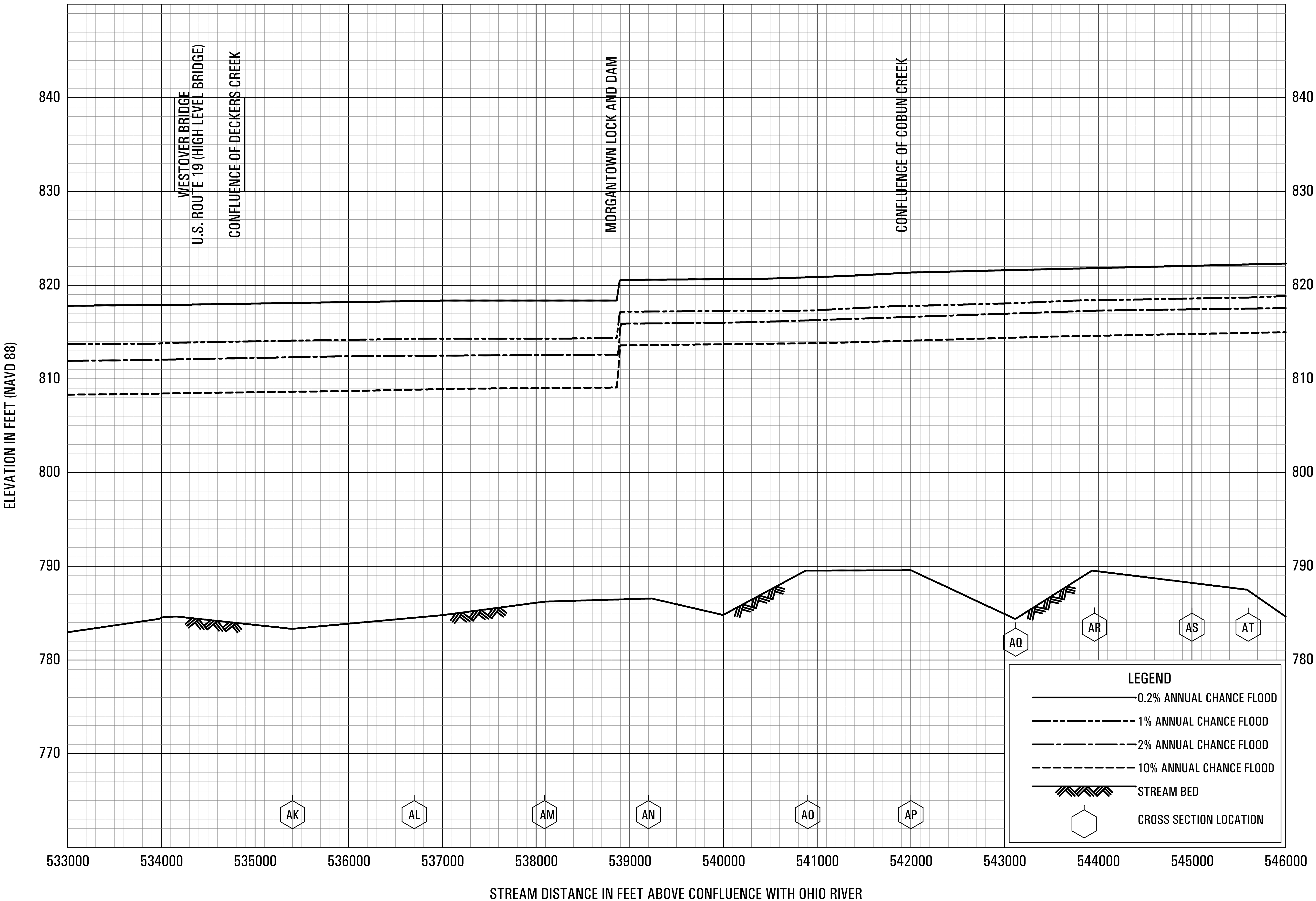
FLOOD PROFILES

MONONGAHELA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS



FLOOD PROFILES

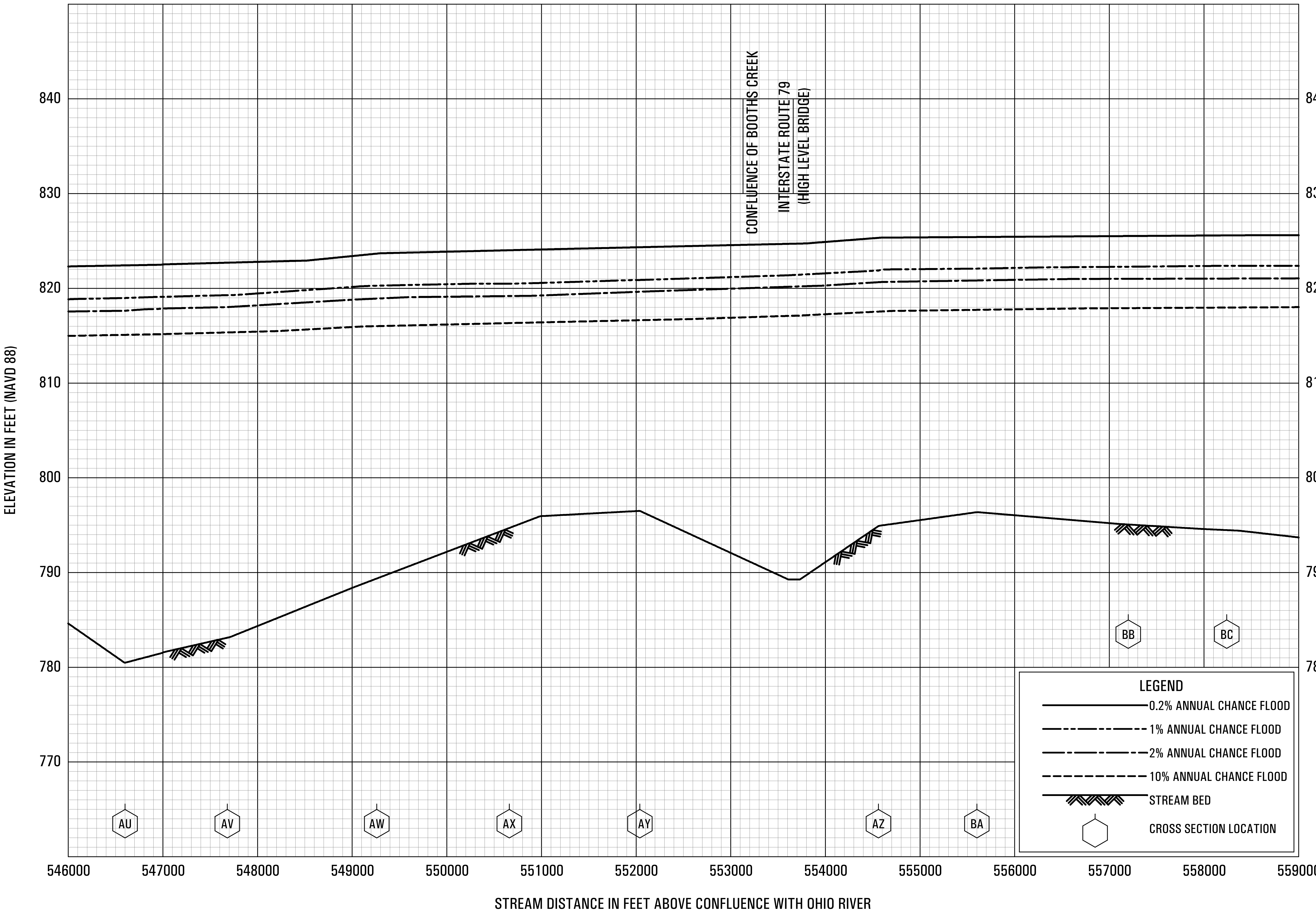
MONONGAHELA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS

19P



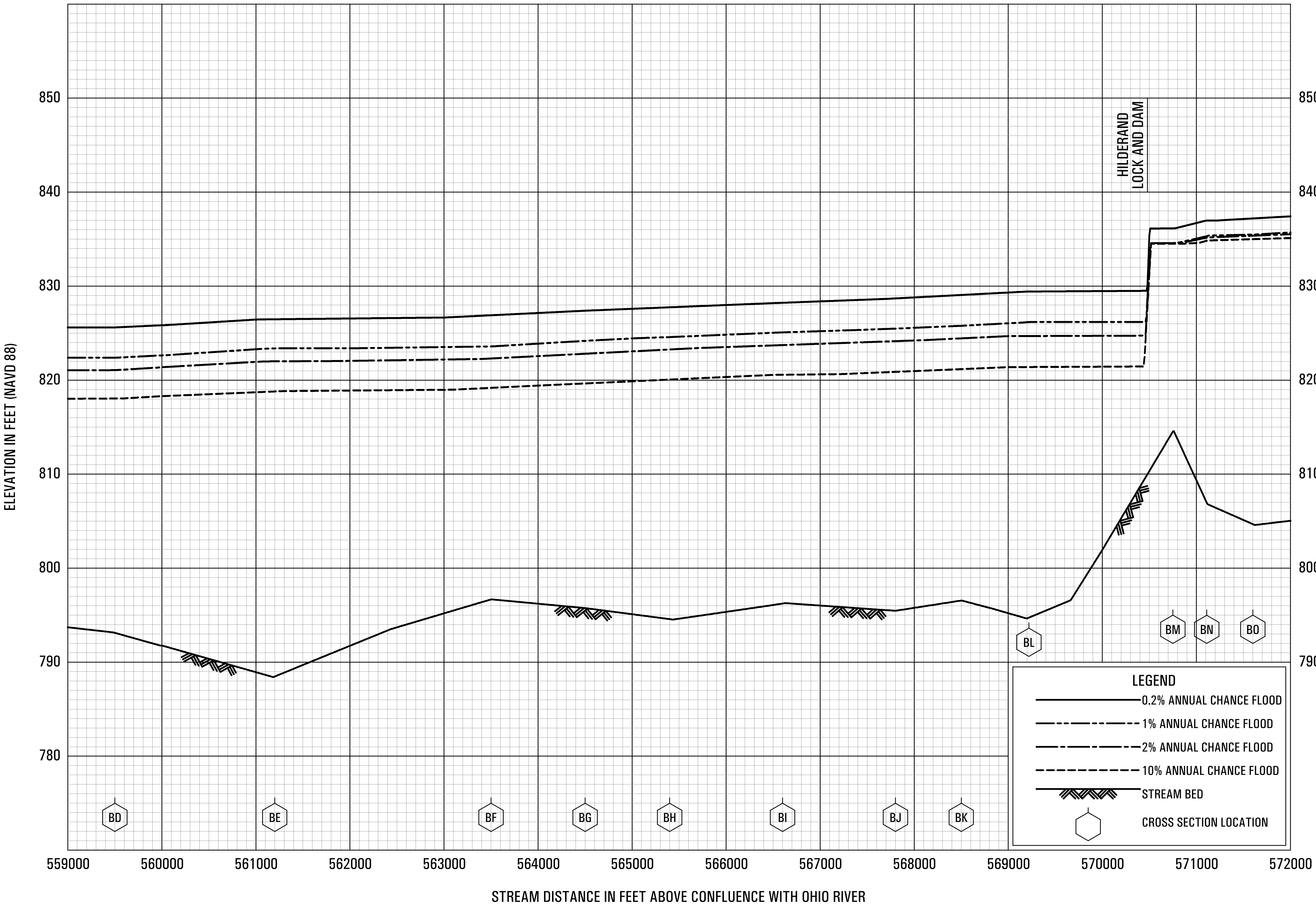
FLOOD PROFILES

MONONGAHELA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS



FLOOD PROFILES

MONONGAHELA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS

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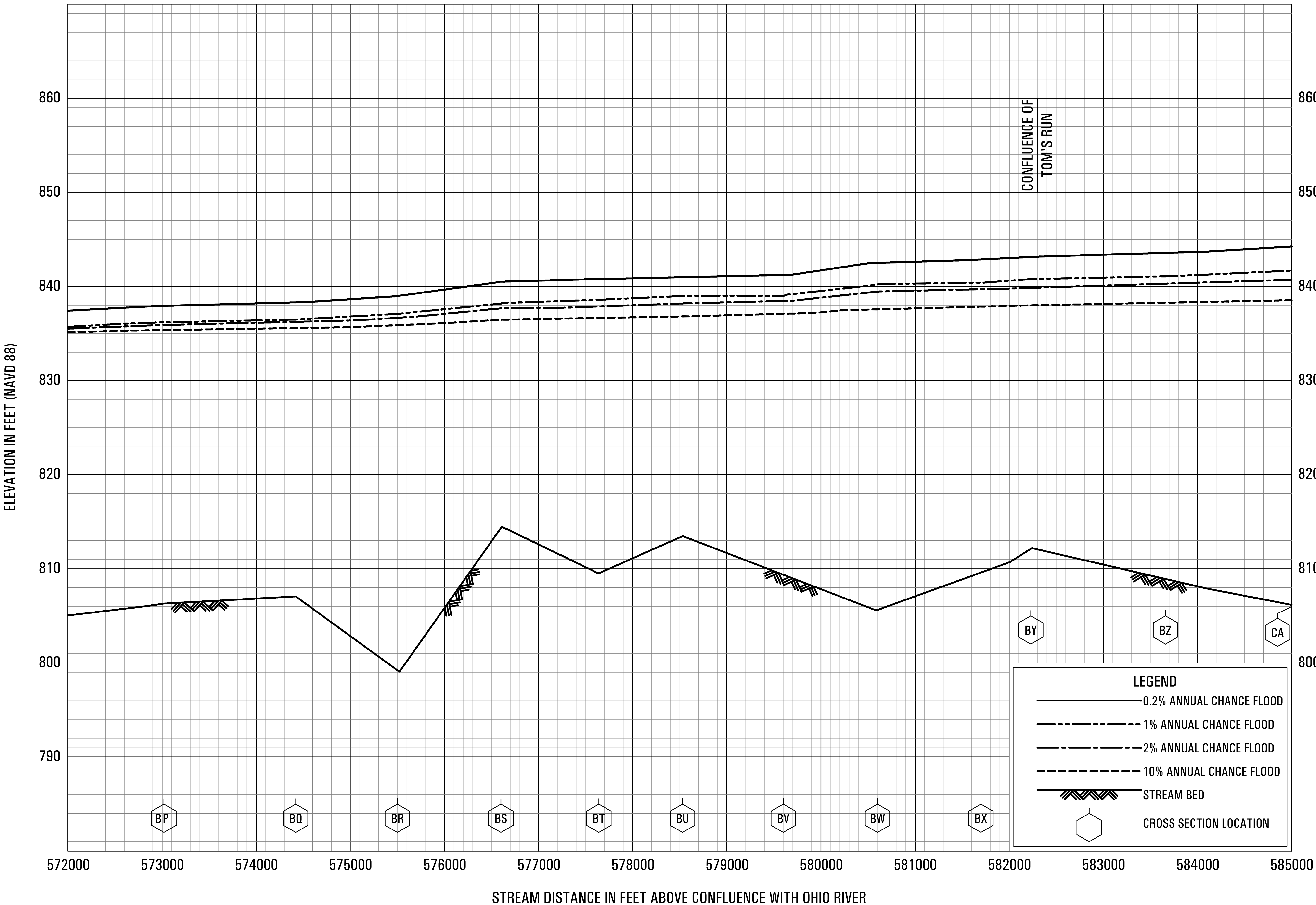


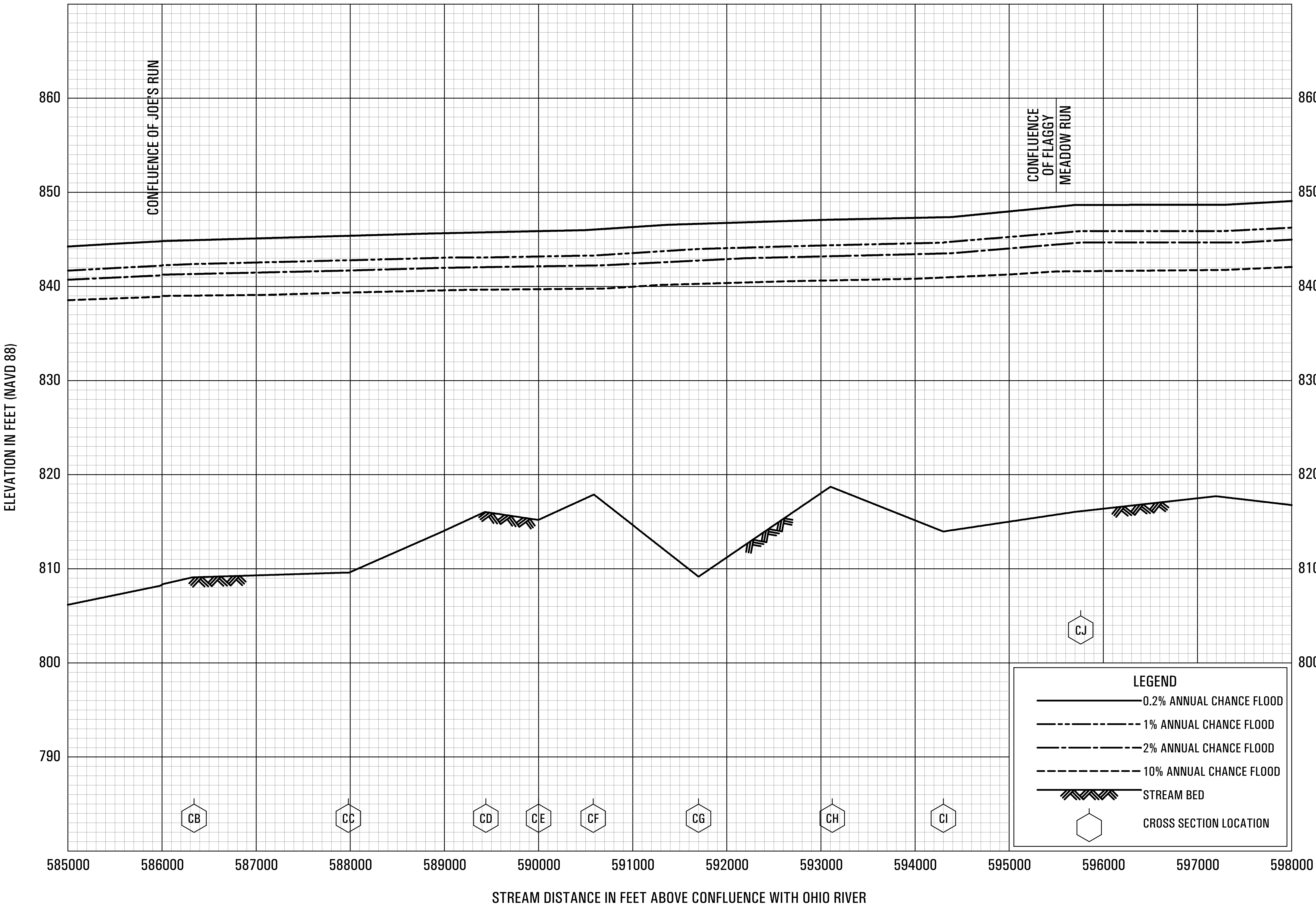
FLOOD PROFILES

MONONGAHELA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS



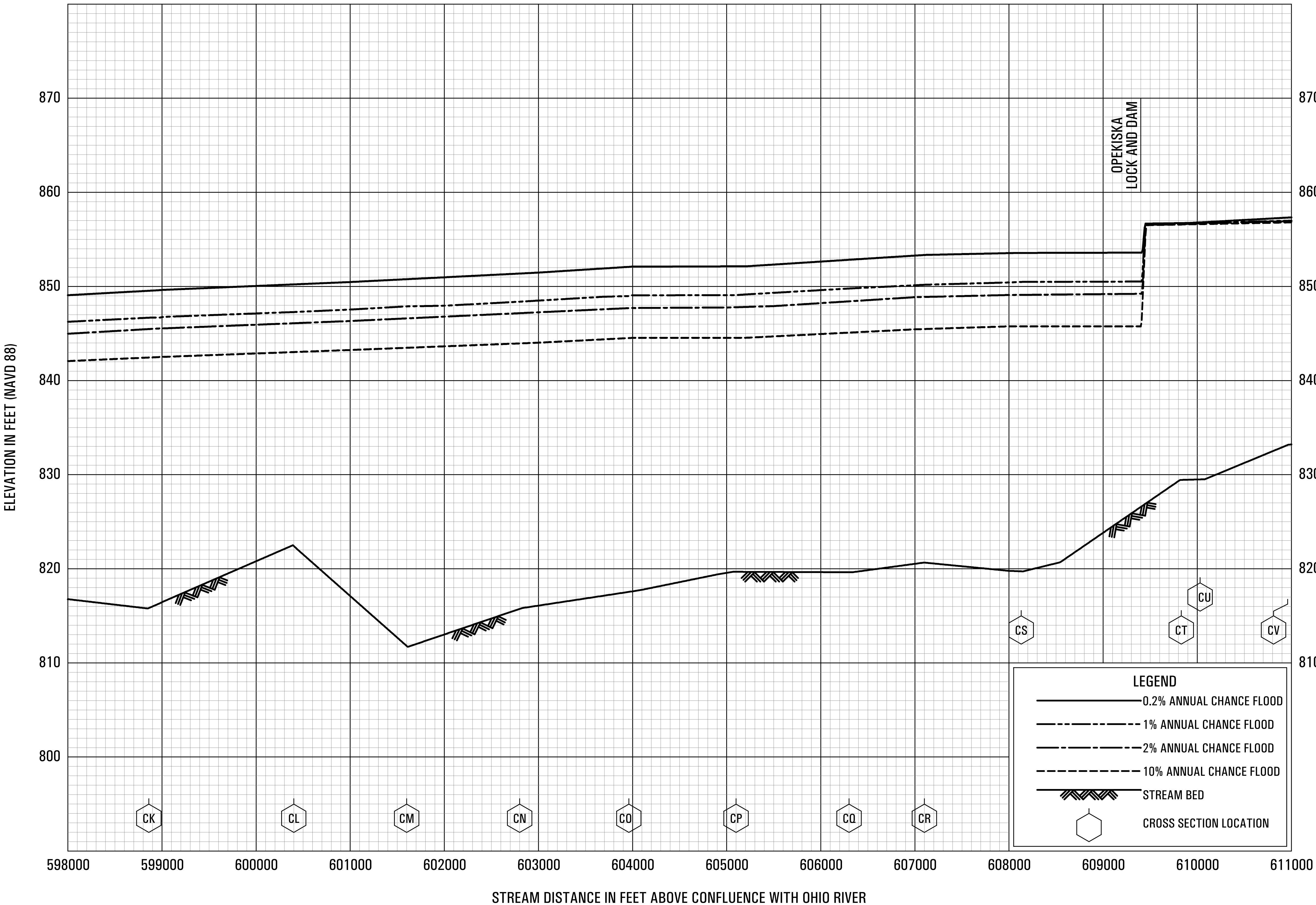
FLOOD PROFILES

MONONGAHELA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

AND INCORPORATED AREAS



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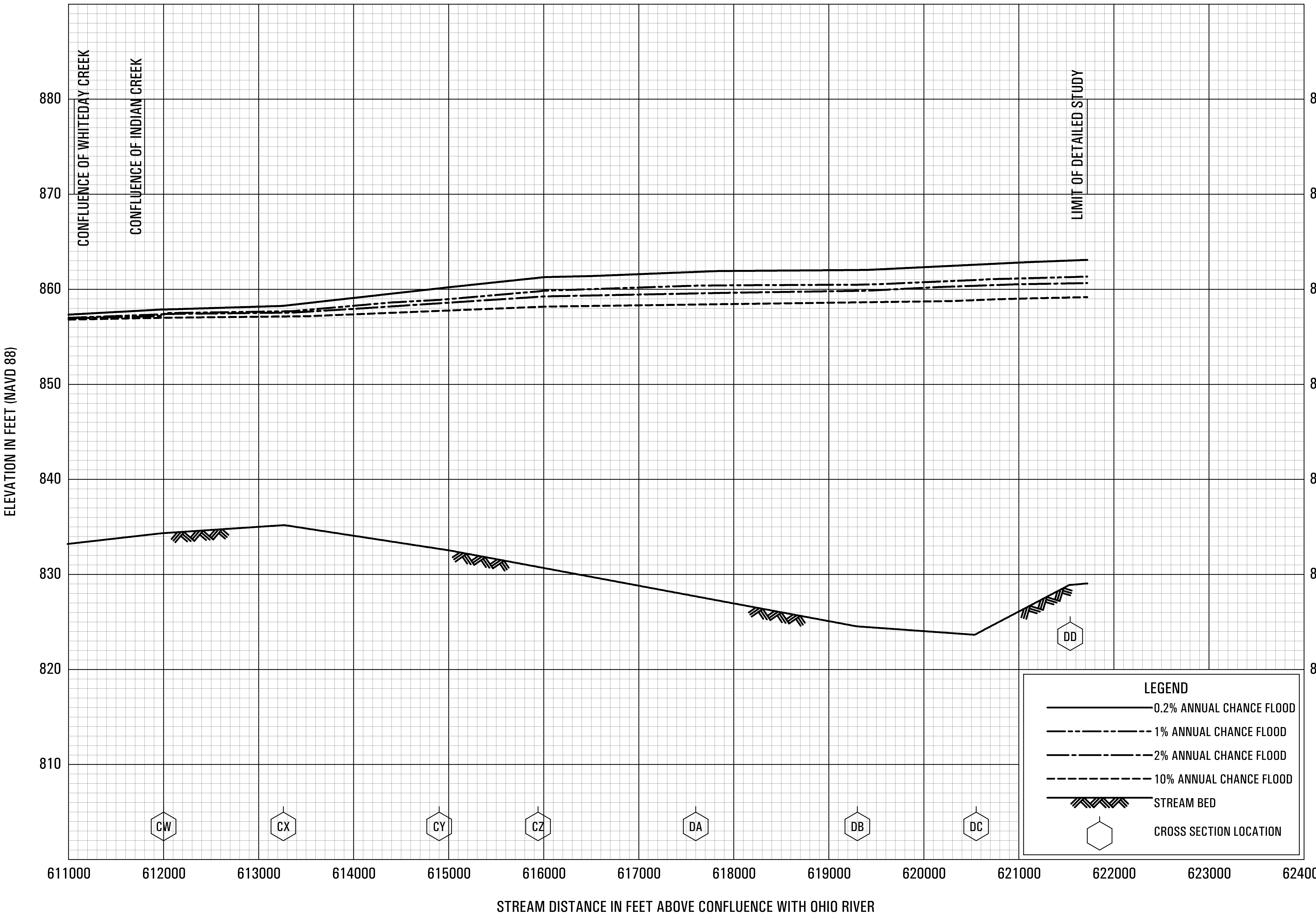

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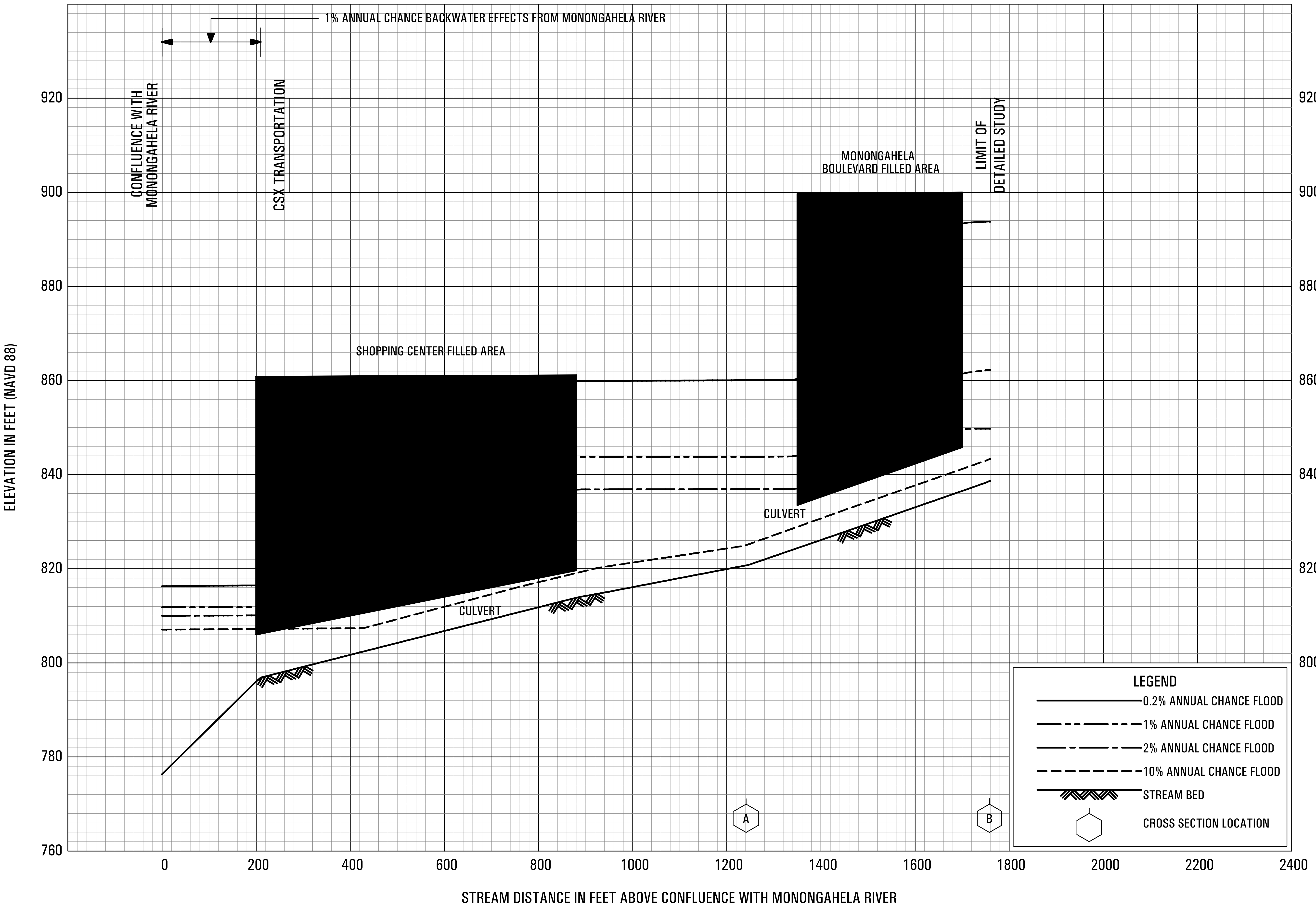

FLOOD PROFILES

POMPANO RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

MONONGALIA COUNTY, WV

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