FLOOD INSURANCE STUDY

CAMDEN COUNTY, MISSOURI
AND INCORPORATED AREAS

Community Name	Community Number
CAMDEN COUNTY UNINCORPORATED AREAS	290789
CAMDENTON, CITY OF	290742
*CLIMAX SPRINGS, VILLAGE OF	290978
FOUR SEASONS, VILLAGE OF	290979
*LAURIE, CITY OF	290976
LINN CREEK, CITY OF	290053
MACKS CREEK, VILLAGE OF	290054
OSAGE BEACH, CITY OF	290671
SUNRISE BEACH, CITY OF	290977

*Non-Floodprone Community

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
29029CV000B

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 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 Flood Insurance Study may be revised and republished at any time. In addition, part of this Flood Insurance Study may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the Flood Insurance Study. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current Flood Insurance Study components. A listing of the Community Map Repositories can be found on the Index Map.

Selected Flood Insurance Rate Maps panels for this community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways, cross-sections). In addition, former flood hazard zone designations have been changed as follows:

Old Zone(s)	New Zone
A1 through A30	AE
V1 through V30	VE
B	X
C	X

Initial Countywide FIS Effective Date: June 16, 2011
Revised Countywide FIS Date: TBD – Revised to change Special Flood Hazard Areas and updated topographic information

TABLE OF CONTENTS

VOLUME 1

FIGURES

TABLES

TABLE OF CONTENTS (*Continued*)

EXHIBITS

FLOOD INSURANCE STUDY
CAMDEN COUNTY, MISSOURI AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 PURPOSE OF STUDY

This countywide Flood Insurance Study (FIS) revises previous FISs/Flood Insurance Rate Maps (FIRMS) for the geographic area of Camden County, Missouri, including the Cities of Camdenton, Laurie, Linn Creek, Osage Beach, and Sunrise Beach, the Villages of Climax Springs, Four Seasons, and Macks Creek, and the unincorporated areas of Camden County (hereinafter referred to collectively as Camden County). This FIS aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates. This information will also be used by Camden County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

Please note that the City of Laurie and the Village of Climax Springs have no flood hazard areas identified. The City of Osage Beach is located in Camden and Miller Counties; the City of Sunrise Beach located in Camden and Morgan Counties. The Cities of Osage Beach and Sunrise Beach are included in their entirety in this FIS report. The City of Laurie is geographically located in Camden and Morgan Counties. Only the portion within Camden County is included in this FIS. The City of Lake Ozark is located in Camden and Miller Counties; the City of Richland is located in Camden, Laclede, and Pulaski Counties. Information for the Cities of Lake Ozark and Richland is not included in this FIS report.

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.

For this countywide FIS, the hydrologic and hydraulic analyses were prepared by USACE for FEMA, under Inter-Agency Agreement No. HSFE07-05-X-0016, Project Requisition No. K5907014. This work was completed in January 2007.

Base map files were provided by the National Agriculture Imagery Program (NAIP) in the form of 7.5-Minute Series Digital Orthophoto Quarter Quadrangles (DOQQs). The DOQQs utilized are grayscale images with a 1-meter ground resolution. The DOQQs are referenced to the North American Datum of 1983 (NAD83) and cast on the Universal Transverse Mercator (UTM) projection, Zone 15 North in Meters.

For this Physical Map Revision FIS, the hydrologic and hydraulic analyses were prepared by STARR2. These analyses were completed on November 13, 2015. Under Contract Number HSFE60-15-D-0005, Task Order HSFE60-15-J-0002.

1.3 COORDINATION

An initial Consultation Coordination Officer's (CCO) meeting is held with representatives of the communities, FEMA, and USACE, the study contractor, to explain the nature and purpose of the FIS, and to identify the streams to be studied by detailed methods. A final CCO meeting is held with representatives of the communities, FEMA, and the study contractors to review the results of the study.

For this countywide FIS, an initial CCO meeting will be TBD.

2.0 AREA STUDIED

2.1 SCOPE OF STUDY

This countywide FIS covers the geographic area of Camden County, Missouri. All or portions of the following flooding sources were studied by detailed methods: Lake of the Ozarks (Osage River), Grand Glaize Creek, Linn Creek, the Niangua River and the Little Niangua River. Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and/or on the FIRM (Exhibit 2). 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.

All or portions of the following flooding sources with watersheds of one square mile or more were studied by approximate methods: Bank Branch, Bollinger Creek, Brumley Creek, Brush Creek, Fiery Fork, Grand Glaize arm, Lick Creek, Linn Creek (North and South Forks), Little Niangua River, Mack's Creek, Mill Creek, Prairie Hollow, Rainy Creek, Wet Glaize Creek and Woolsey Creek. These watersheds added 710 square miles of new approximate study to Camden County. 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 Camden County.

2.2 COMMUNITY DESCRIPTION

Camden County is located in central Missouri, and is largely rural, except for rapid development along the shoreline of Lake of the Ozarks and its arms. Camden County has a total land area within the county limits of approximately 710 square miles, where 655 square miles is land and 54 square miles is water. The county is bordered by Morgan County to the north, Miller County to the northeast, Pulaski County to the east, Laclede County to the southeast, Dallas County to the southwest, Hickory County to the west, and Benton County to the northwest. In the 2000 census, Camden County had a population of 37,051 (Reference 1).

The principal flooding source, the Osage River, is a right bank tributary of the Missouri River. The Osage River is the largest stream in the county and is controlled by two large hydropower dam projects that operate to meet peak power need of the state. These dams are Bagnell Dam located at the lower end in Camden County and Harry S. Truman Dam located upstream of Warsaw, Missouri in Benton County.

In the area surrounding the major streams, the topography consists mainly of steeply sloped hillsides that tend to produce flash flooding. Soils in Camden County are generally stony, and tend to consist of lean, silty, and fat clays and loams that are very erodible and have high runoff potential (Reference 2).

Most of the unincorporated areas are devoted to agriculture, with scattered residential development and numerous state parks. Accordingly, vegetation in the area ranges between forest, cropland, and pastureland. Tourism and commercial development are prevalent along the shore of the Lake of the Ozarks. Camden County is served by U.S. Route 54, Route 5, and Route 7.

The climate of Camden County is a humid continental climate. Weather changes in this area between summer and winter are generally subtle rather than extreme. However this climate can have very unpredictable fluctuations in temperature, precipitation, and humidity. Variable weather patterns and a large seasonal temperature variance can be as great as 55-70 degrees Fahrenheit. In the summer, the average high temperature is 90 degrees F with a low temperature of 68 degrees F. In the winter, the average high temperature is 40 degrees with a low temperature of 18 degrees F. The warmest month is July with the highest recorded temperature of 108 degrees F in 1986. The coldest month is January with the lowest recorded temperature of -20 degrees F in 1989. The maximum average precipitation occurs usually in May with over 5 inches of rain. Rainfall totals average 40.38 inches annually (Reference 3).

2.3 PRINCIPAL FLOOD PROBLEMS

Flood problems in Camden County can be attributed to high releases from the Harry S. Truman Reservoir dam or by high-intensity, short-duration rainfalls. Pool levels in the Lake of the Ozarks will only reach flood levels on rare occasions, especially when Harry S. Truman dam is making high releases. Harry S. Truman Reservoir acts as a buffer and is the major source of flood protection for the Lake of the Ozarks. Other flood protection reservoirs upstream of Harry S. Truman Reservoir include Stockton, Pomme De Terre, Hillsdale, Pomona, and Melvern. By contrast flooding on smaller streams is caused by high-intensity, short-duration rainfalls.

Normal rainfall patterns are greatest during two distinct periods: 1) during spring from April through June, and 2) during the fall months of September through November. Rainfall during the spring months is caused primarily from southward moving cold fronts weakening and becoming stationary over the area. Warm tropical air moving north from

the Gulf of Mexico will cause periods of intense rainfall both in duration and quantity along and near the stationary cold front. During the fall months, slow and southward moving cold air from Canada will interact with an existing warm and humid air mass causing another period of potentially heavy rain.

2.4 FLOOD PROTECTION MEASURES

FEMA specifies that all levees must have a minimum of three foot of freeboard against the 100-year flooding to be considered for FEMA certification. No levees are indicated within Camden County.

Federal and State funded protection measures are being employed in Camden County with the construction of the Harry S. Truman Reservoir dam.

3.0 ENGINEERING METHODS

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

3.1 HYDROLOGIC ANALYSES

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

The following steps were taken to complete the hydrology for the streams studied by detailed hydraulic methods:

a. The HEC ArcHydro program was utilized to delineate 57 sub-basins that flow into the Lake of the Ozarks. Area and slope were by HEC-GeoHMS for each sub-basin (Reference 4).
b. Areas and slopes from Step "a" were used to calculate the 10-, 2-, 1-, and 0.2-percent chance discharges at various locations in the basins using USGS regression equations (Reference 5).
c. Soil Conservation Service (SCS) Dimensionless Unit Hydrographs were then developed for the mainstem and each major tributary, and the resulting peaks are shown below:

Mainstem Unit Hydrograph Peaks, 1-percent Annual Chance Discharge

Upper Osage	85,000 cfs @ 28 hrs

Middle Osage	8,200 cfs @ 8 hrs
Lower Osage	13,000 cfs @ 11 hrs

d. USACE, Kansas City District Water Management Section determined that the 1-percent annual chance release for Harry S Truman Reservoir Dam under typical flood conditions would be 80,000 cfs. Therefore, a base flow of 80,000 cfs was used for all model runs on the Osage River below Harry S. Truman Reservoir Dam.

e. A Flood Frequency Analysis (FFA) was performed for the St. Thomas gauge just downstream of Bagnell Dam as a way of double checking the flows at the dam. Gauge records were obtained for the years 1932 through 1997. Regulated flows were used for the pre-Harry S Truman Reservoir era (before 1976), and actual flows were used for the post-Harry S Truman Reservoir time period, or 1977 and after. Ten-percent annual chance discharges at the dam were determined to be 81,300-cfs, 125,000 cfs for the 2-percent annual chance, and the 1-percent annual chance discharge was confirmed at 150,000 cfs.

Peak discharge-drainage area relationships for streams studied by detailed methods are shown in Table 1, "Summary of Discharges."

The 1-percent annual chance discharge was calculated as follows for all watersheds with drainage areas greater than one square mile for all streams studied by approximate hydraulic methods:

The hydrologic analysis for the approximate zones of the study used USGS regression equations for central Missouri to estimate the 1-percent annual chance (Reference 6). The main equation used is shown below.

$Q100 = 170 * A^{0.794} * S^{0.471}$

The drainage areas and slopes used to populate this equation were calculated using ArcHydro in GIS. Starting from the raw 10-meter DEMs, the tools within ArcHydro were used to delineate basins, define all streams with drainage areas one square mile or greater, calculate subbasin areas, locate the longest flow path for each basin or flow change location, and calculate the applicable slope between the 10 and 85% points on the longest flow path. The slopes and areas generated through this process were then imported into spreadsheets and used to populate the 1-percent annual chance discharge equation for each flow change location.

Table 1: Summary of Discharges

Flooding Source and Location	Peak Discharges (cfs) 10-percent	2-percent	1-percent	0.2-percent
GRAND GLAIZE CREEK				
Mile 0.0 – 3.0	45,000	72,000	84,000	104,000
Mile 3.0 – 7.0	44,000	71,000	83,000	103,000
Mile 7.0 – 11.0	43,000	68,000	80,000	102,000
Mile 11.0 – 14.0	42,000	67,000	78,000	100,000
Mile 14.0 – 17.0	41,000	65,000	77,000	99,000
LINN CREEK				
Mile 0.0 – 2.0	6,200	9,700	11,200	15,000
Mile 2.0 – 3.0	5,500	8,500	9,800	13,000
Mile 3.0 – 4.0	4,100	6,300	7,300	9,900
LINN CREEK NORTH FORK				
Mile 0.0 – 1.0	3,900	6,014	6,940	9,400
LINN CREEK SOUTH FORK				
Mile 0.0 – 1.0	2,300	3,000	4,300	5,600
LITTLE NIANGUA RIVER				
Mile 0.0 – 3.0	33,000	52,000	60,000	83,000
Mile 3.0 – 7.0	32,000	50,000	58,000	80,000
Mile 7.0 – 10.0	30,000	48,000	56,000	78,000

Table 1: Summary of Discharges (Continued)

Flooding Source and Location	Peak Discharges (cfs) 10-percent	2-percent	1-percent	0.2-percent
NIANGUA RIVER				
Mile 0.0 – 4.0	80,000	131,000	155,000	216,000
Mile 4.0 – 7.0	79,000	130,000	154,000	212,000
Mile 7.0 – 14.0	60,000	97,000	114,000	165,000
Mile 14.0 – 16.0	56,000	91,000	107,000	155,000
Mile 16.0 – 20.0	55,000	90,000	105,000	153,000
Mile 20.0 – 23.0	53,000	86,000	103,000	152,000
Mile 23.0 – 38.0	52,000	85,000	100,000	150,000
OSAGE RIVER				
Mile 0.0 – 6.2	81,300	125,000	150,000	190,000
Mile 6.2 – 8.8	81,000	125,000	149,000	190,000
Mile 8.8 – 31.2	81,000	114,000	137,000	190,000
Mile 31.2 – 40.0	80,000	80,000	88,000	112,000
Mile 40.0 – 50.0	80,000	80,000	81,000	108,000
Mile 50.0 – 60.0	80,000	80,000	80,000	85,000
Mile 60.0 – 70.0	80,000	80,000	80,000	84,000
Mile 70.0 – 80.0	80,000	80,000	80,000	83,000
Mile 80.0 -92.0	80,000	80,000	80,000	81,000

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (Feet NAVD88)			
CROSS SECTION	DISTANCE[1,5]	WIDTH (Feet)	SECTION AREA (Square Feet)	MEAN VELOCITY (FEET / SECOND)	REGULATORY[2]	WITHOUT [3] FLOODWAY	WITH [3] FLOODWAY	INCREASE
A-AA[4]								
AB	11.00	1,090	8,348	5.9	664.5	660.5	660.5	0.0
AC	11.22	844	7,926	6.3	664.9	661.8	661.8	0.0
AD	11.45	1,118	13,362	3.7	665.4	662.8	662.9	0.1
AE	11.67	767 / 1,248[6]	13,817	3.6	665.5	663.2	663.2	0.0
AF	11.83	134 / 1,613[6]	15,480	3.2	665.7	663.5	663.5	0.0

[1]Miles above confluence with Osage River
[2]Elevation computed based on a starting elevation at the 1-percent annual chance flood elevation for the Osage River Arm of the Lake of the Ozarks
[3]Elevations computed based on normal depth
[4]Floodway data not computed
[5]Cross section distances are rounded to the nearest hundredth of a mile
[6]Width within county limits/Width

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MISSOURI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: GRAND GLAIZE CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (Feet NAVD88)			
CROSS SECTION	DISTANCE[1,5]	WIDTH (Feet)	SECTION AREA (Square Feet)	MEAN VELOCITY (FEET / SECOND)	REGULATORY[2]	WITHOUT [3] FLOODWAY	WITH [3] FLOODWAY	INCREASE
A-E[4]								
F	2.52	437	2,058	5.3	664.0	658.7	658.8	0.1
G	2.68	236	1,154	6.9	664.1	660.2	660.0	0.0
H	2.83	323	1,385	5.8	664.3	662.3	662.8	0.5
I	2.86	406	1,624	4.9	664.3	663.4	664.4	1.0
J	2.86	309	1,514	5.3	664.6	664.6	665.2	0.6
K	3.02	201	1,295	6.2	667.0	667.0	667.7	0.7
L	3.32	72	825	9.7	671.3	671.3	672.2	0.9
M	3.56	116	956	8.4	674.7	674.7	675.4	0.7

[1]Stream distance in miles above confluence with Osage River

[2]Elevation computed based on a starting elevation at the 1-percent annual chance flood elevation for the Osage River Arm of the Lake of the Ozarks

[3]Elevations computed based on normal depth

[4]Floodway data not computed

[5]Cross section distances are rounded to the nearest hundredth of a mile

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MISSOURI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: LINN CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (Feet NAVD88)			
CROSS SECTION	DISTANCE[1,2]	WIDTH (Feet)	SECTION AREA (Square Feet)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	0.10	98	654	9.2	677.3	677.3	677.7	0.4
B	0.24	76	602	10.0	683.2	683.2	683.2	0.0
C	0.29	73	773	7.8	685.2	685.2	685.3	0.1
D	0.40	87	851	7.0	685.8	685.8	686.7	0.9
E	0.90	89	762	7.9	692.6	692.6	693.5	0.9

1Stream distance in miles above confluence with Linn Creek South Fork

[2]Cross section distances are rounded to the nearest hundredth of a mile

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MISSOURI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: LINN CREEK NORTH FORK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (Feet NAVD88)			
CROSS SECTION	DISTANCE[1,3]	WIDTH (Feet)	SECTION AREA (Square Feet)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A-M [2]								
N	3.69	215	1,021	3.9	677.7	677.7	678.0	0.3
O	3.80	100	585	6.8	683.8	683.8	683.8	0.0
P	3.87	100	542	7.4	685.8	685.8	685.8	0.0
Q	3.94	74	673	5.9	695.0	695.0	696.0	1.0
R	4.40	115	557	7.2	711.0	711.0	711.0	0.0
S	4.66	101	776	5.2	716.2	716.2	716.8	0.6

[1]Stream distance in miles above confluence with Osage River
[2]Floodway not computed
[3]Cross section distances are rounded to the nearest hundredth of a mile

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MISSOURI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: LINN CREEK SOUTH FORK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (Feet NAVD88)			
CROSS SECTION	DISTANCE[1,5]	WIDTH (Feet)	SECTION AREA (Square Feet)	MEAN VELOCITY (FEET / SECOND)	REGULATORY[2]	WITHOUT[3] FLOODWAY	WITH[3] FLOODWAY	INCREASE
A-J[4]								
K	5.34	893	9,082	4.7	664.9	660.4	660.4	0.0
L	6.18	914	9,485	4.5	665.5	661.9	662.0	0.1
M	6.73	1,202	12,427	3.5	666.0	663.2	663.2	0.0
N	7.12	1,087	11,928	3.4	666.3	663.8	663.8	0.0
O	7.74	907	12,798	3.2	666.7	664.5	664.5	0.0
P	8.15	1,061	9,825	4.2	667.0	665.0	665.0	0.0
Q	8.59	533	6,863	6.0	668.1	667.0	667.6	0.6
R	9.08	247	4,611	8.9	669.8	669.1	669.8	0.7
S	9.40	328	6,464	6.3	671.1	670.6	671.5	0.9
T	9.42	328	6,478	6.3	671.1	670.6	671.6	1.0

[1]Stream distance in miles above confluence with Niangua River
[2]Elevation computed based on a starting elevation at the 1-percent annual chance flood elevation for the Osage River Arm of the Lake of the Ozarks
[3]Elevations computed based on normal depth
[4]Floodway data not computed
[5]Cross section distances are rounded to the nearest hundredth of a mile

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MISSOURI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: LITTLE NIANGUA RIVER

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (Feet NAVD88)			
CROSS SECTION	DISTANCE[1,5]	WIDTH (Feet)	SECTION AREA (Square Feet)	MEAN VELOCITY (FEET / SECOND)	REGULATORY[2]	WITHOUT[3] FLOODWAY	WITH[3] FLOODWAY	INCREASE
A-AG[4]								
AH	11.49	1,143	22,964	2.5	664.9	660.2	660.2	0.0
AI	11.76	885	17,546	3.2	664.9	660.3	660.3	0.0
AJ	11.96	885	13,735	4.1	665.0	660.4	660.5	0.1
AK	12.17	1,002	16,817	3.3	665.2	660.8	660.8	0.0
AL	12.34	1,043	16,825	3.3	665.2	661.0	661.0	0.0
AM	12.50	1,092	16,039	3.5	665.3	661.1	661.2	0.1
AN	12.68	964	16,209	3.5	665.4	661.4	661.4	0.0
AO	12.94	1,009	14,821	3.8	665.6	661.7	661.7	0.0
AP	13.02	110	17,923	3.3	665.6	661.8	661.9	0.1
AQ	13.22	1,185	18,341	3.1	665.8	662.1	662.1	0.0
AR	13.50	1,313	17,624	3.2	665.9	662.4	662.4	0.0
AS	13.70	1,613	16,000	3.5	666.0	662.7	662.7	0.0
AT	13.93	1,001	13,684	4.1	666.2	663.1	663.2	0.1
AU	14.13	724	10,428	5.4	666.4	663.5	663.6	0.1
AV	14.48	569	9,992	5.6	666.9	664.4	664.5	0.1
AW	14.82	1,020	14,619	3.9	667.5	665.4	665.5	0.1
AX	15.14	987	14,231	4.0	667.9	665.9	666.0	0.1

[1]Stream distance in miles above confluence with Osage River

[2]Elevation computed based on a starting elevation at the 1-percent annual chance flood elevation for the Osage River Arm of the Lake of the Ozarks

[3]Elevations computed based on starting elevation of 646

[4]Floodway data not computed

[5]Cross section distances are rounded to the nearest hundredth of a mile

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MISSOURI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: NIANGUA RIVER

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (Feet NAVD88)			
CROSS SECTION	DISTANCE[1,5]	WIDTH (Feet)	SECTION AREA (Square Feet)	MEAN VELOCITY (FEET / SECOND)	REGULATORY[2]	WITHOUT[3] FLOODWAY	WITH[3] FLOODWAY	INCREASE
AY	15.40	1,761	14,877	3.8	668.2	666.4	666.5	0.1
AZ	15.63	830	13,487	4.2	668.4	666.7	666.8	0.1
BA	15.92	892	13,820	4.0	668.7	667.2	667.3	0.1
BB	16.16	1,284	18,170	3.0	669.0	667.6	667.8	0.2
BC	16.41	1,270	17,372	3.2	669.2	667.9	668.0	0.1
BD	16.66	324	9,689	5.7	669.5	668.2	668.4	0.2
BE	16.94	682	9,808	5.6	670.1	669.0	669.3	0.3
BF	17.11	686	8,972	6.1	670.6	669.7	670.2	0.5
BG	17.35	824	10,688	5.1	671.7	671.1	671.7	0.6
BH	17.66	691	11,771	4.7	673.1	672.7	673.5	0.8
BI	17.84	652	10,560	5.2	673.6	673.2	674.1	0.9
BJ	18.14	792	12,855	4.3	674.7	674.4	675.4	1.0
BK	18.38	826	14,149	3.9	675.5	675.3	676.2	0.9
BL	18.54	661	11,022	5.0	676.1	675.8	676.7	0.9
BM	18.82	572	9,956	5.5	677.7	677.6	678.4	0.8
BN	19.28	771	16,512	3.3	679.5	679.4	680.2	0.8
BO	19.47	679	14,188	3.9	680.0	679.9	680.7	0.8
BP	19.68	516	10,281	5.3	680.8	680.7	681.6	0.9
BQ	19.96	757	14,667	3.7	681.9	681.9	682.8	0.9
BR	20.26	1,098	16,897	3.3	683.0	683.0	684.0	1.0
BS	20.52	778	14,111	3.9	684.1	684.1	685.1	1.0

[1]Stream distance in miles above confluence with Osage River
[2]Elevation computed based on a starting elevation at the 1-percent annual chance flood elevation for the Osage River Arm of the Lake of the Ozarks
[3]Elevations computed based on starting elevation of 646
[4]Floodway data not computed
[5]Cross section distances are rounded to the nearest hundredth of a mile

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MISSOURI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: NIANGUA RIVER

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (Feet NAVD88)			
CROSS SECTION	DISTANCE[1,5]	WIDTH (Feet)	SECTION AREA (Square Feet)	MEAN VELOCITY (FEET / SECOND)	REGULATORY[2]	WITHOUT[3] FLOODWAY	WITH[3] FLOODWAY	INCREASE
BT	21.02	670	13,380	4.1	686.7	686.7	687.6	0.9
BU	21.27	643	13,347	4.1	687.7	687.7	688.6	0.9
BV	21.59	827	16,582	3.3	689.0	689.0	689.9	0.9
BW	21.85	911	16,372	3.4	689.9	689.9	690.8	0.9
BX	22.08	774	15,188	3.6	690.5	690.5	691.4	0.9
BY	22.31	830	13,269	4.1	691.2	691.2	692.2	1.0
BZ	22.68	642	13,258	4.1	692.4	692.4	693.3	0.9
CA	23.00	615	14,070	3.9	693.3	693.3	694.2	0.9
CB	23.28	712	15,927	3.5	694.4	694.4	695.3	0.9
CC	23.55	678	15,257	3.6	695.3	695.3	696.3	1.0
CD	23.74	540	12,613	4.4	695.6	695.6	696.6	1.0
CE	23.99	859	16,380	3.4	696.4	696.4	697.4	1.0
CF	24.18	1,240	24,774	2.2	696.8	696.8	697.9	1.1
CG	24.34	1,266	21,692	2.5	697.0	697.0	698.0	1.0
CH	24.57	572	11,058	5.0	697.4	697.4	698.3	0.9
CI	24.74	442	7,980	6.9	697.6	697.6	698.7	1.1
CJ	24.92	680	9,888	5.6	698.7	698.7	699.6	0.9
CK	25.23	1,261	21,151	2.6	700.8	700.8	701.8	1.0
CL	25.50	1,270	21,092	2.6	701.2	701.2	702.3	1.1
CM	25.74	791	13,623	4.0	701.6	701.6	702.6	1.0
CN	26.03	563	10,127	5.4	702.4	702.4	703.4	1.0

[1]Stream distance in miles above confluence with Osage River
[2]Elevation computed based on a starting elevation at the 1-percent annual chance flood elevation for the Osage River Arm of the Lake of the Ozarks
[3]Elevations computed based on starting elevation of 646
[4]Floodway data not computed
[5]Cross section distances are rounded to the nearest hundredth of a mile

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MISSOURI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: NIANGUA RIVER

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (Feet NAVD88)			
CROSS SECTION	DISTANCE[1,5]	WIDTH (Feet)	SECTION AREA (Square Feet)	MEAN VELOCITY (FEET / SECOND)	REGULATORY[2]	WITHOUT[3] FLOODWAY	WITH[3] FLOODWAY	INCREASE
CO	26.39	510	12,370	4.8	704.4	704.4	705.3	0.9
CP	26.64	643	16,183	3.4	705.8	705.8	706.8	1.0
CQ	26.82	572	14,367	3.8	706.3	706.3	707.3	1.0
CR	26.95	722	15,605	3.5	707.0	707.0	708.0	1.0
CS	27.18	1,107	21,125	2.6	707.7	707.7	708.7	1.0
CT	27.52	789	14,568	3.8	708.3	708.3	709.3	1.0
CU	27.83	773	14,732	3.7	709.8	709.8	710.7	0.9
CV	27.89	910	14,626	3.8	709.9	709.9	711.0	1.1
CW	27.96	926	15,104	3.6	710.8	710.8	711.7	0.9
CX	28.18	730	13,852	4.0	711.6	711.6	712.4	0.8
CY	28.42	751	16,026	3.4	713.0	713.0	714.1	1.1
CZ	29.04	669	13,014	4.2	715.4	715.4	716.4	1.0
DA	29.28	721	18,280	3.0	716.6	716.6	717.7	1.1
DB	29.58	669	13,828	4.0	717.2	717.2	718.3	1.1
DC	29.92	655	12,488	4.4	717.9	717.9	718.9	1.0
DD	29.96	488	12,644	4.3	718.6	718.6	719.5	0.9
DE	30.12	1,058	24,364	2.3	728.2	728.2	728.4	0.2
DF	30.32	1,354	28,585	1.9	728.3	728.3	728.4	0.1
DG	30.48	1,167	24,867	2.2	728.3	728.3	728.5	0.2
DH	30.75	1,216	25,122	2.2	728.4	728.4	728.6	0.2
DI	31.03	881	19,061	2.9	728.5	728.5	728.6	0.1

[1]Stream distance in miles above confluence with Osage River
[2]Elevation computed based on a starting elevation at the 1-percent annual chance flood elevation for the Osage River Arm of the Lake of the Ozarks
[3]Elevations computed based on starting elevation of 646
[4]Floodway data not computed
[5]Cross section distances are rounded to the nearest hundredth of a mile

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MISSOURI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: NIANGUA RIVER

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (Feet NAVD88)			
CROSS SECTION	DISTANCE[1,5]	WIDTH (Feet)	SECTION AREA (Square Feet)	MEAN VELOCITY (FEET / SECOND)	REGULATORY[2]	WITHOUT[3] FLOODWAY	WITH[3] FLOODWAY	INCREASE
DJ	31.25	675	14,931	3.7	728.6	728.6	728.7	0.1
DK	31.45	1,209	23,117	2.4	728.8	728.8	729.0	0.2
DL	31.68	1,377	25,254	2.2	728.9	728.9	729.1	0.2
DM	31.94	653	12,020	4.6	729.0	729.0	729.2	0.2
DN	32.18	659	10,725	5.1	729.6	729.6	729.8	0.2
DO	32.41	928	17,050	3.2	730.9	730.9	731.5	0.6
DP	32.69	857	15,488	3.6	731.4	731.4	732.0	0.6
DQ	33.08	719	13,991	3.9	732.1	732.1	732.7	0.6
DR	33.28	883	15,055	3.7	732.6	732.6	733.3	0.7
DS	33.47	895	15,719	3.5	733.3	733.3	734.0	0.7
DT	33.65	1,030	17,988	3.1	733.7	733.7	734.5	0.8
DU	33.85	982	18,441	3.0	734.0	734.0	734.9	0.9
DV	34.07	1,018	19,469	3.0	734.4	734.4	735.2	0.8
DW	34.33	808	15,384	3.6	734.8	734.8	735.7	0.9
DX	34.62	519	9,184	6.0	735.8	735.8	736.7	0.9
DY	34.85	291	6,413	9.0	736.6	736.6	737.6	1.0
DZ	35.12	550	11,047	5.0	738.9	738.9	739.8	0.9
EA	35.42	479	9,334	5.9	740.3	740.3	741.2	0.9
EB	35.64	260	5,861	9.4	740.6	740.6	741.6	1.0
EC	35.88	258	6,241	8.8	742.7	742.7	743.6	0.9
ED	36.09	449	9,720	5.7	744.2	744.2	745.1	0.9

[1]Stream distance in miles above confluence with Osage River
[2]Elevation computed based on a starting elevation at the 1-percent annual chance flood elevation for the Osage River Arm of the Lake of the Ozarks
[3]Elevations computed based on starting elevation of 646
[4]Floodway data not computed
[5]Cross section distances are rounded to the nearest hundredth of a mile

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MISSOURI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: NIANGUA RIVER

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (Feet NAVD88)			
CROSS SECTION	DISTANCE[1,5]	WIDTH (Feet)	SECTION AREA (Square Feet)	MEAN VELOCITY (FEET / SECOND)	REGULATORY[2]	WITHOUT[3] FLOODWAY	WITH[3] FLOODWAY	INCREASE
EE	36.54	727	13,642	4.0	745.5	746.1	747.0	0.9
EF	36.70	1,035	1,228	4.5	746.2	746.2	747.2	1.0
EG	36.93	998	13,429	4.1	747.6	747.6	748.6	1.0

[1]Stream distance in miles above confluence with Osage River
[2]Elevation computed based on a starting elevation at the 1-percent annual chance flood elevation for the Osage River Arm of the Lake of the Ozarks
[3]Elevations computed based on starting elevation of 646
[4]Floodway data not computed
[5]Cross section distances are rounded to the nearest hundredth of a mile

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MISSOURI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: NIANGUA RIVER

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. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

The U.S. Army Corps of Engineers' Hydrologic Engineering Center, River Analysis System (HEC-RAS) hydraulic model was utilized to perform the detailed hydraulic analysis (Reference 7). Cross-sectional data for all streams studied were obtained both from GIS mapping and a survey conducted by the USACE, Kansas City District. A hydrographic survey was utilized to obtain data for portions of the cross sections below Lake of the Ozarks elevation 656-ft. GIS mapping and GPS survey methods were utilized to obtain cross-sectional data above the 656-ft contour. Cross sections were located at close intervals upstream and downstream of bridges and culverts in order to compute the possible backwater effect of these structures.

In order to obtain starting water surface elevations, historic records of Bagnell dam releases were analyzed for the years 1932-1997. Elevations for floods of the selected recurrence intervals for Bagnell Dam are shown in Table 2, "Summary of Stillwater Elevations."

Table 2: Summary of Stillwater Elevations

Flooding Source	Elevation (Feet NAVD)			
	10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Bagnell Dam	662.17	663.12	663.88	64.21

Pool elevations in Table 2 were used for starting water surface at Bagnell Dam, except for the 1-percent annual chance floodway computations on tributary streams where a starting elevation of 658.5-ft was used for each tributary. The tributary floodways were started at the lower elevation so that the floodways could be mapped to represent the 1-percent annual chance discharge on the tributary when the lake was at a normal pool level. This results in a floodway that extends farther downstream.

A Digital Terrain Model (DTM) was created from USGS 10 meter topographic data for all areas to be studied using approximate methods. Cross sections were created from DTM at one half to one mile intervals along streams to be studied and contour lines with a 10 foot contour interval were created to assist in placing the cross sections and evaluating the accuracy of the DTMs. A simplified HEC-RAS model was developed for each stream.

Roughness factors, or Manning's "n" values, were determined by field inspection, aerial photography, and calibration. Roughness coefficients from streams restudied by detailed methods can be found in Table 3, "Summary of Roughness Coefficients."

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the FIRM (Exhibit 2).

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.

Table 3: Summary of Roughness Coefficients

Flooding Source	Roughness Coefficients	
	Channel	Overbanks
Grand Glaize Creek	0.035	0.07 – 0.10
Linn Creek	0.035	0.07 – 0.10
Little Niangua River	0.035	0.07 – 0.10
Niangua River	0.04	0.069 – 0.138
Osage River	0.026	0.045

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

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. Some of the data used in this revision were taken from the prior effective FIS reports and FIRMs and adjusted to NAVD88.

For information regarding conversion between the NGVD and NAVD, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3242

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.

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

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS report provides 1-percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent-annual-chance flood elevations; delineations of the 1- 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 community. For each stream studied by detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles and Floodway Data Table. Between cross-sections, the boundaries were interpolated using topographic maps at various scales (Reference 8).

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, AE, AH, and AO), 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 (Exhibit 2).

4.2 FLOODWAYS

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of

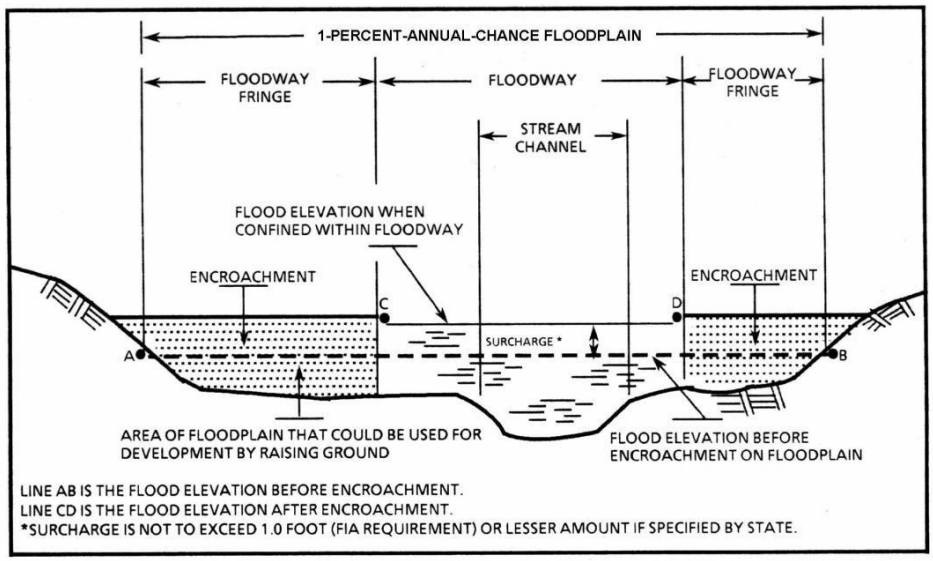
the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the base flood can be carried without substantial increases in flood heights. Minimum Federal 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 study were computed for certain stream segments on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (see Table 4, "Floodway Data Table" of this FIS report). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown. A floodway was not computed for Osage River.

At some locations on the smaller streams along very crooked channels, the floodways' limits were drawn to encompass the banks of the stream along the direction of the overbank flow. In all instances along the smaller streams, when computed floodway widths were not significantly different along a reach of stream, the approximate average of theses widths were used throughout the reach as the assumptions used in the HEC-2 program cannot justify the use of such smaller differences.

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 (WSEL) of the base flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

Figure 1: Floodway Schematic



5.0 INSURANCE APPLICATION

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

Zone A

Zone A is the flood insurance 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 AH

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

Zone AO

Zone AO is the flood insurance rate zone that corresponds to areas of 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole foot depths derived from the detailed hydraulic analyses are shown 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, 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 Camden County. Previously, separate Flood Hazard Boundary Maps and/or FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood-prone. This countywide FIRM also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community are presented in Table 5, "Community Map History."

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Camden County (Unincorporated Areas)	April 19, 1983	May 1, 1994	June 16, 2011	-
Camdenton, City of	June 16, 2011	-	June 16, 2011	-
*Climax Springs, Village of	N/A	-	N/A	-
Four Seasons, Village of	June 16, 2011	-	June 16, 2011	-
*Laurie, City of	N/A	-	N/A	-
Linn Creek, City of	October 25, 1974	November 28, 1975	June 16, 2011	-
Macks Creek, Village of	October 18, 1974	November 28, 1975	June 16, 2011	-
Osage Beach, City of	July 30, 1976	-	June 16, 2011	-
Sunrise Beach, City of	June 16, 2011	-	June 16, 2011	-

*Non-floodprone

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

This FIS report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the NFIP.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting FEMA Region VII, Federal Insurance and Mitigation Division, Federal Office 9221 Ward Parkway, Suite 300, Kansas City, Missouri 64114-3372.

9.0 BIBLIOGRAPHY

1. U.S. Department of Commerce, Bureau of the Census, 2000 Census of Population, Number of Inhabitants, Missouri, Washington, D.C., 2000
2. U.S. Department of Agriculture, Soil Conservation Service, Soil Surveys, for Camden, Morgan, and Benton Counties.
3. Midwestern Regional Climate Center, http://mcc.sws.uiuc.edu
4. U.S. Army Corps of Engineers Hydrologic Engineering Center, HEC-GeoHMS 1.1 Geospatial Hydrologic Modeling Extension, December 2003.
5. U.S. Geological Survey, Technique for Estimating the Magnitude and Frequency of Missouri Floods, 1974.
6. United States Geological Survey, Techniques for Estimating the 2- to 500-Year Flood Discharges on Unregulated Streams in Rural Missouri by the USGS Water-Resources Investigations Report #95-4231 Region II (Ozark Plateaus) 1995.
7. U.S. Army Corps of Engineers Hydrologic Engineering Center, HEC-RAS 3.1 River Analysis System, May 2003.
8. United States Geological Survey, 7.5-Minute Series Digital Orthophoto Quarter Quadrangles (DOQQs), Reference North American Datum of 1983 (NAD83) and cast on the Universal Transverse Mercator (UTM) projection, Zone 15 North in Meters.

10.0 REVISIONS DESCRIPTION

This section has been added to provide information regarding significant revisions made since the original FIS report and FIRM were printed. Future revisions may be made that do not result in the republishing of the FIS report. All users are advised to contact the Community Map Repository at the address below to obtain the most up-to-date flood hazard data provided in Table 6.

Table 6: Map Repositories

Community	Address	City	State	Zip Code
CAMDEN COUNTY	CITY HALL 1000 CITY PARKWAY	OSAGE BEACH	MO	65065
CITY OF CAMDENTON	CITY HALL 16537 MO-5	SUNRISE BEACH	MO	65079
VILLAGE OF CLIMAX SPRINGS	CITY HALL 102 EAST VALLEY DRIVE	LINN CREEK	MO	65052
VILLAGE OF FOUR SEASONS	CITY HALL 19807 HIGHWAY 54 WEST	MACKS CREEK	MO	65786
CITY OF LAURIE	CITY HALL 437 WEST US HIGHWAY 54	CAMDENTON	MO	65020
CITY OF LINN CREEK	COUNTY COURTHOUSE 1 COURT CIRCLE NW	CAMDENTON	MO	65020
VILLAGE OF MACKS CREEK	VILLAGE HALL 133 CHEROKEE ROAD	FOUR SEASONS	MO	65049
CITY OF OSAGE BEACH	COUNTY COURTHOUSE 1 COURT CIRCLE NW	CAMDENTON	MO	65020
CITY OF SUNRISE BEACH	COUNTY COURTHOUSE 1 COURT CIRCLE NW	CAMDENTON	MO	65020

10.1 First Revision (Revised TBD)

a. Acknowledgements
The hydrologic and hydraulic analyses for this revision were completed by STARR under contract with FEMA Contact HSFE60-15-D-0005.

b. Coordination
   i) A Flood Risk Review meeting was held on March XX, 2016 to review the draft result of this study.
   ii) A final CCO meeting was held on May XX, 2016 to review the revisions to the Flood Insurance Study for Camden County, MO.

c. Scope

The revision included revised detail analysis for the Grand Glaize Creek, Linn Creek, Linn Creek North Creek, Linn Creek South Creek, Little Niangua River & Niangua River from the confluence with the Lake of the Ozarks to the county boundary.

d. Hydrologic Analysis

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for floods of the selected recurrence intervals for each flooding source studied. Hydrologic analyses are typically performed at the watershed level. Depending on factors such as watershed size and shape, land use and urbanization, and natural or man-made storage, various models or methodologies may be applied. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

A summary of the discharges is provided in 7. The peak discharges reported in this table are derived from regression equations. Stream gage information is provided in Table 7.

Table 7: Summary of Discharges (Study Revision)

Flooding Source	Location	Drainage Area (Sq Mile)	Peak Discharge (cfs)			
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Grand Glaize Creek	Mile 0.0 - 3.0	444	27,000	43,100	50,000	66,600
Grand Glaize Creek	Mile 3.0 - 7.0	431	26,500	42,700	49,600	66,200
Grand Glaize Creek	Mile 7.0 - 11.0	419	26,500	42,700	49,600	66,200
Grand Glaize Creek	Mile 11.0 - 14.0	407	26,500	42,700	49,600	66,200
Grand Glaize Creek	Mile 14.0 - 17.0	379	25,700	41,300	48,000	64,100
Linn Creek	Mile 0.0 - 2.0	30	6,300	10,600	12,000	16,900
Linn Creek	Mile 2.0 - 3.0	23	5,400	9,000	11,000	14,400

Table 7: Summary of Discharges (Study Revision) - Continued

Flooding Source	Location	Drainage Area (Sq Mile)	Peak Discharge (cfs)			
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Linn Creek	Mile 3.0 - 4.0	17	4,200	7,200	8,000	11,500
Linn Creek North Fork	Mile 0.0 - 1.0	10.6	3,000	5,000	6,000	7,900
Linn Creek South Fork	Mile 0.0 - 1.0	5.6	2,000	3,400	4,000	5,500
Little Niangua	Mile 0.0 - 3.0	328	22,900	36,900	42,900	57,200
Little Niangua	Mile 3.0 - 7.0	324	22,900	36,900	42,900	57,200
Little Niangua	Mile 7.0 - 10.0	297	21,800	35,200	40,900	54,600
Niangua River	Mile 0.0 - 4.0	1,025	44,200	70,000	80,900	107,300
Niangua River	Mile 4.0 - 7.0	1,019	44,200	70,000	80,900	107,300
Niangua River	Mile 7.0 - 14.0	676	31,000	48,700	56,300	74,500
Niangua River	Mile 14.0 - 16.0	670	31,000	48,700	56,300	74,500
Niangua River	Mile 16.0 - 20.0	626	30,000	47,500	55,000	73,100
Niangua River	Mile 20.0 - 23.0	623	30,000	47,500	55,000	73,100
Niangua River	Mile 23.0 - 38.0	572	30,000	47,500	55,000	73,100

Table 8: Stream Gage Information used to Determine Discharges

Flooding Source	Gage Identifier	Agency that Maintains Gage	Site Name	Drainage Area (Square Miles)	Period of Record	
					From	To
Niangua River	06923950	USGS	NIANGUA RIVER AT TUNNEL DAM NEAR MACKS CREEK, MO	598	10/1/2007	7/10/2015
Niangua River	06924000	USGS	NIANGUA RIVER NEAR DECATURVILLE, MO	627	4/1/1930	9/30/1969

e. Hydraulic Analysis

Hydraulic analyses were carried out providing estimates of flooding elevations for the selected recurrence intervals. The 1-percent annual chance floodway computations on tributary streams used a starting pool elevation of 658.5-ft so that the floodway could be mapped to represent the 1-percent annual chance discharge on the tributary when the lake was at a normal pool level. This results in a floodway that extends further downstream.

Roughness factors, or Manning's "n" values, were determined by field inspection, aerial photography, and calibration. Roughness coefficients from streams restudied by detailed methods are summarized in Table 10.

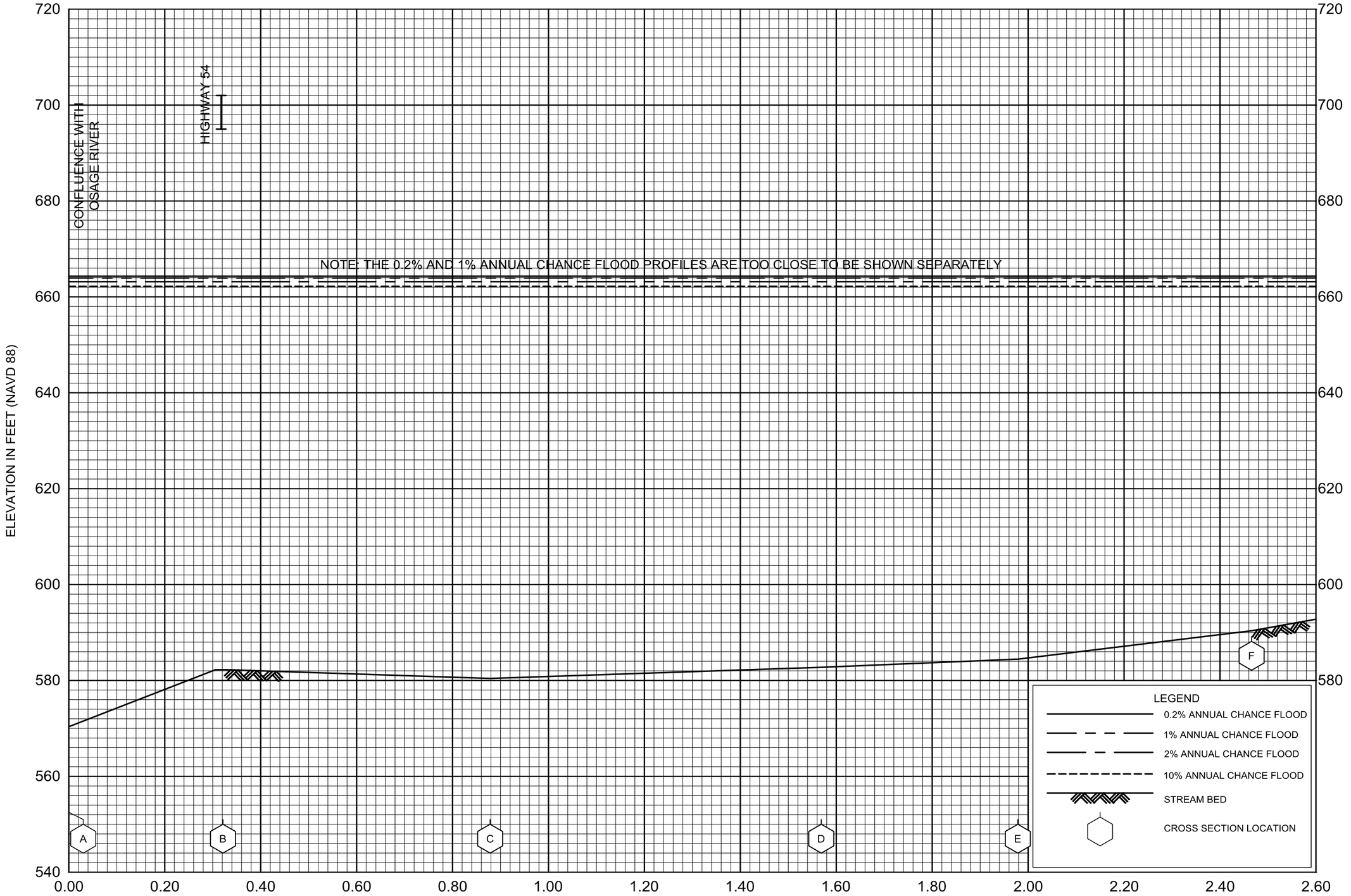
The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail. A summary of stillwater elevations developed for Bagnell Dam is provided in Table 9. Channel roughness coefficients are provided in Table 10.

Table 9: Summary of Stillwater Elevations (Study Revisions)

Flooding Source	Elevation (Feet NAVD)			
	10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Bagnell Dam	662.17	663.12	663.88	664.21

Table 10: Summary of Roughness Coefficients (Study Revisions)

Flooding Source	Roughness Coefficients	
	Channel	Overbanks
Linn Creek	0.035	0.07 – 0.10
Grand Glaize Creek	0.035	0.07 – 0.10
Little Niangua River	0.035	0.07 – 0.10
Niangua River	0.0402	0.069 – 0.138



FLOOD PROFILES

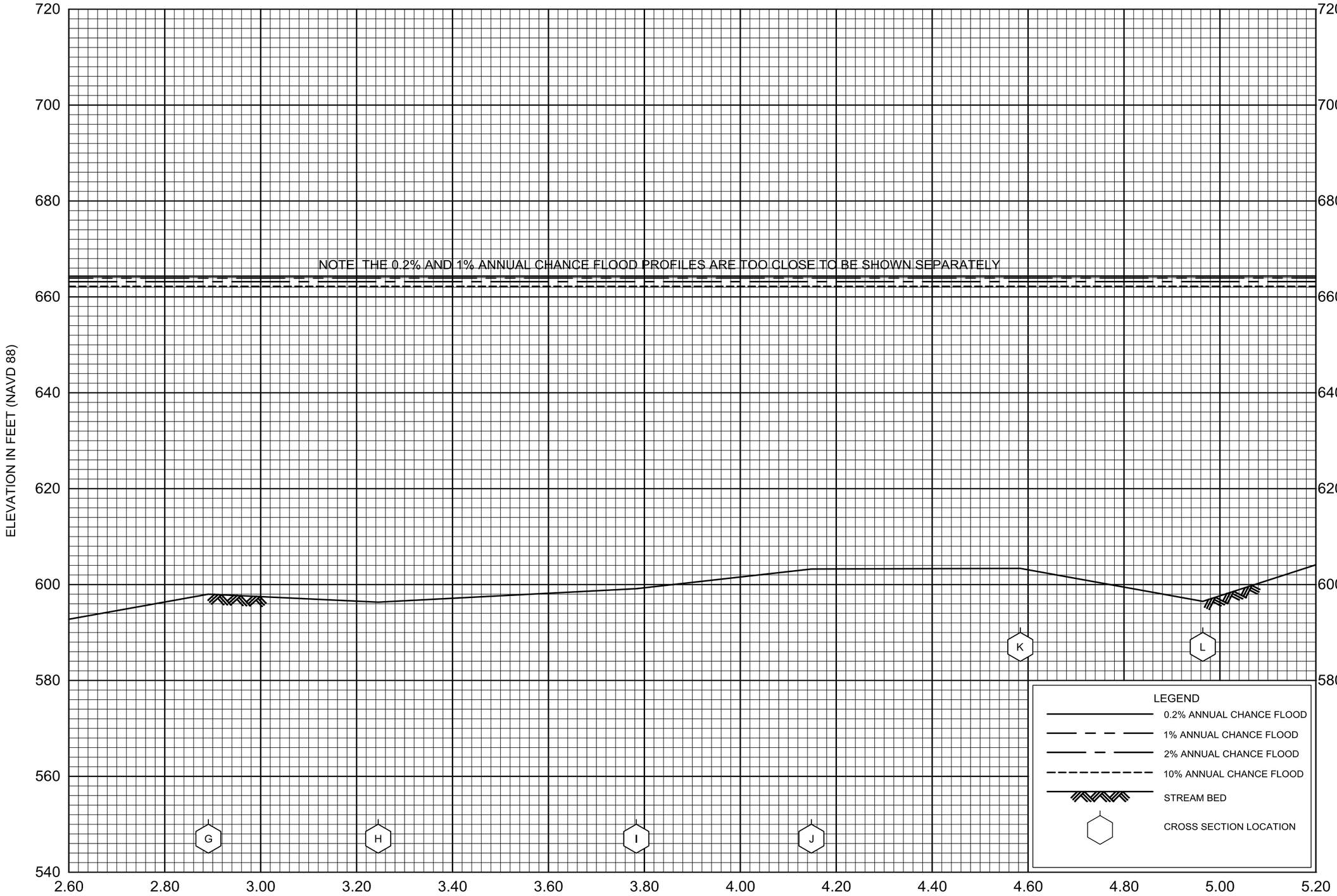
GRAND GLAIZE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

01P



FLOOD PROFILES

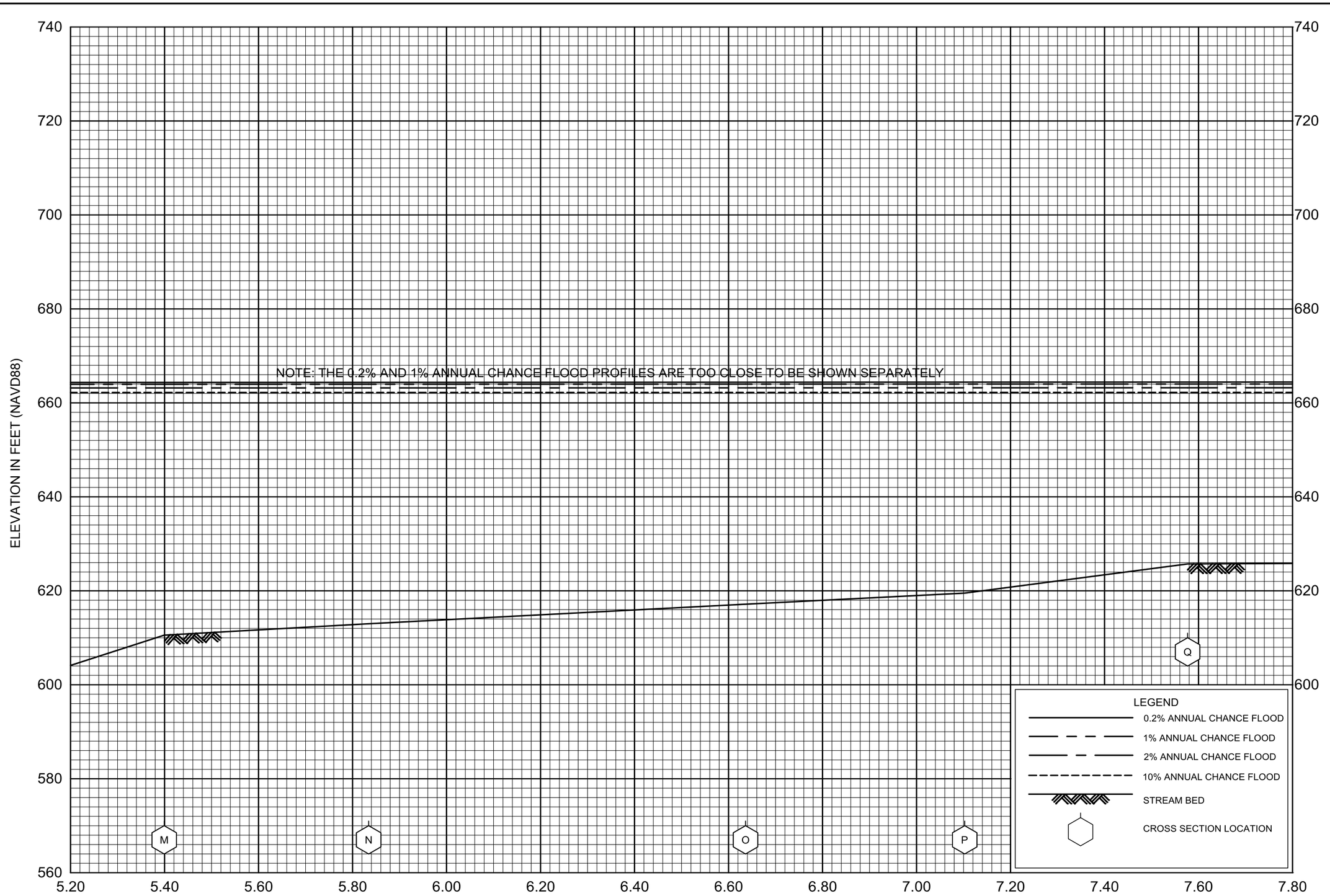
GRAND GLAIZE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

02P



FLOOD PROFILES

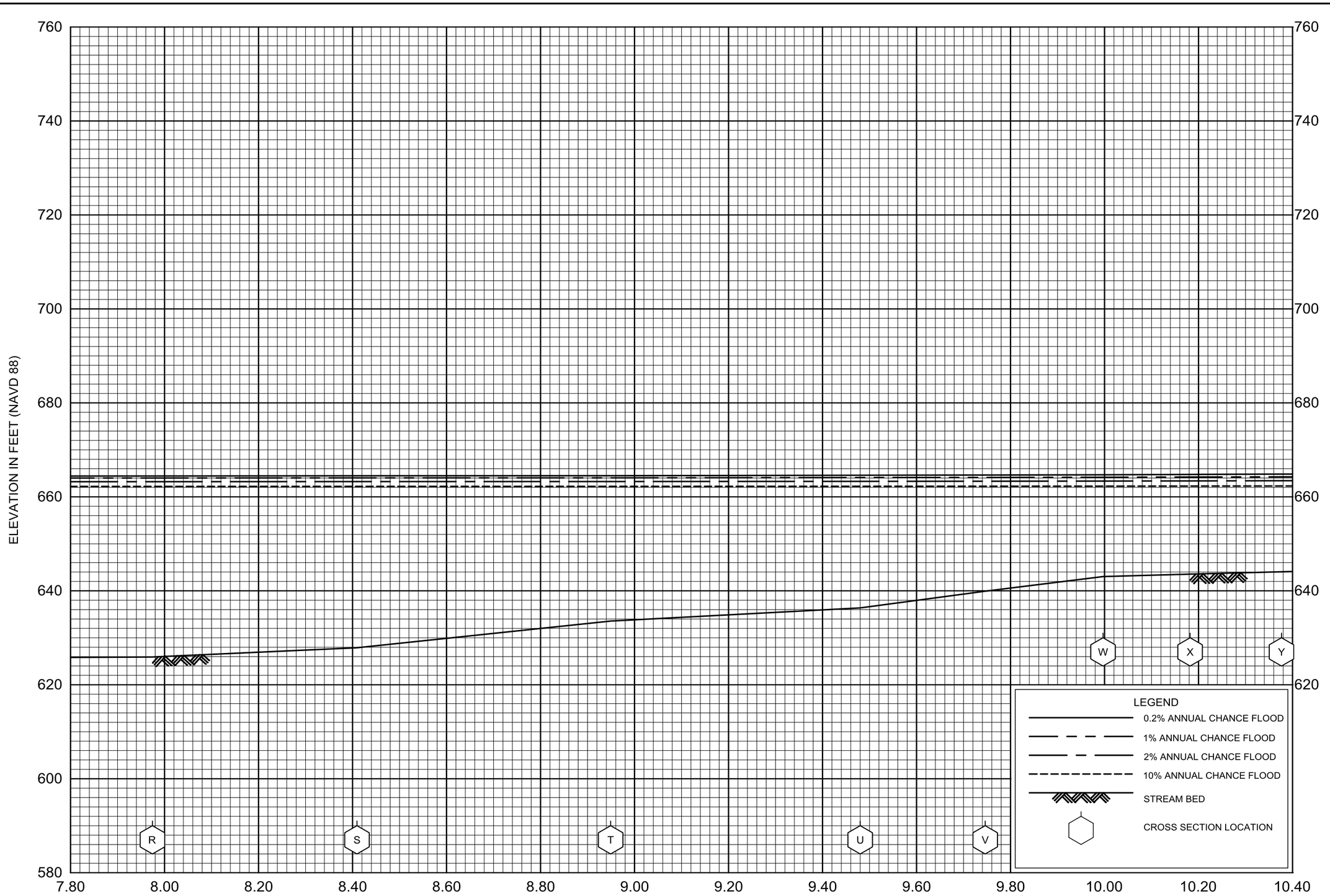
GRAND GLAIZE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

03P



FLOOD PROFILES

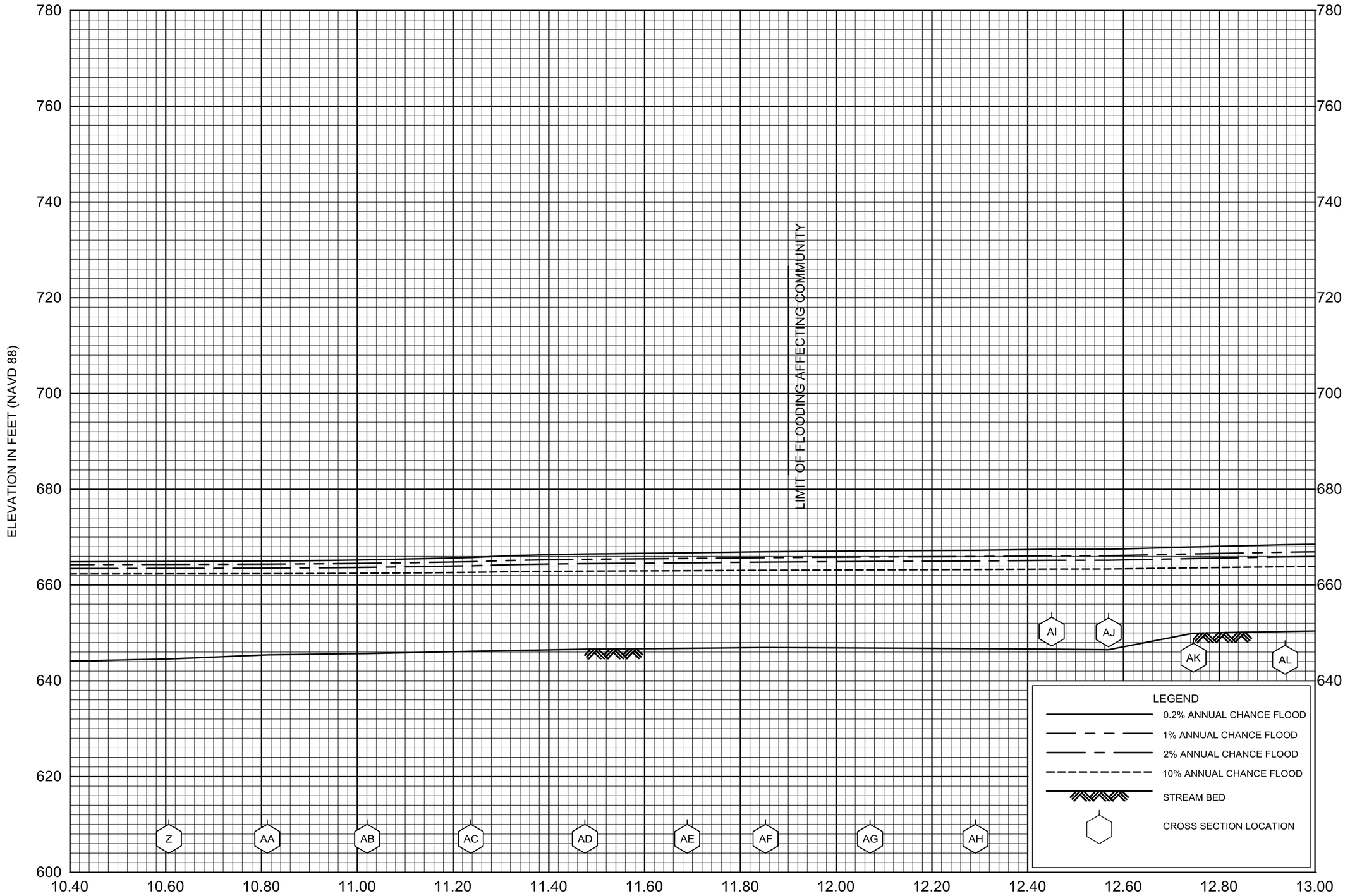
GRAND GLAIZE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

04P



FLOOD PROFILES

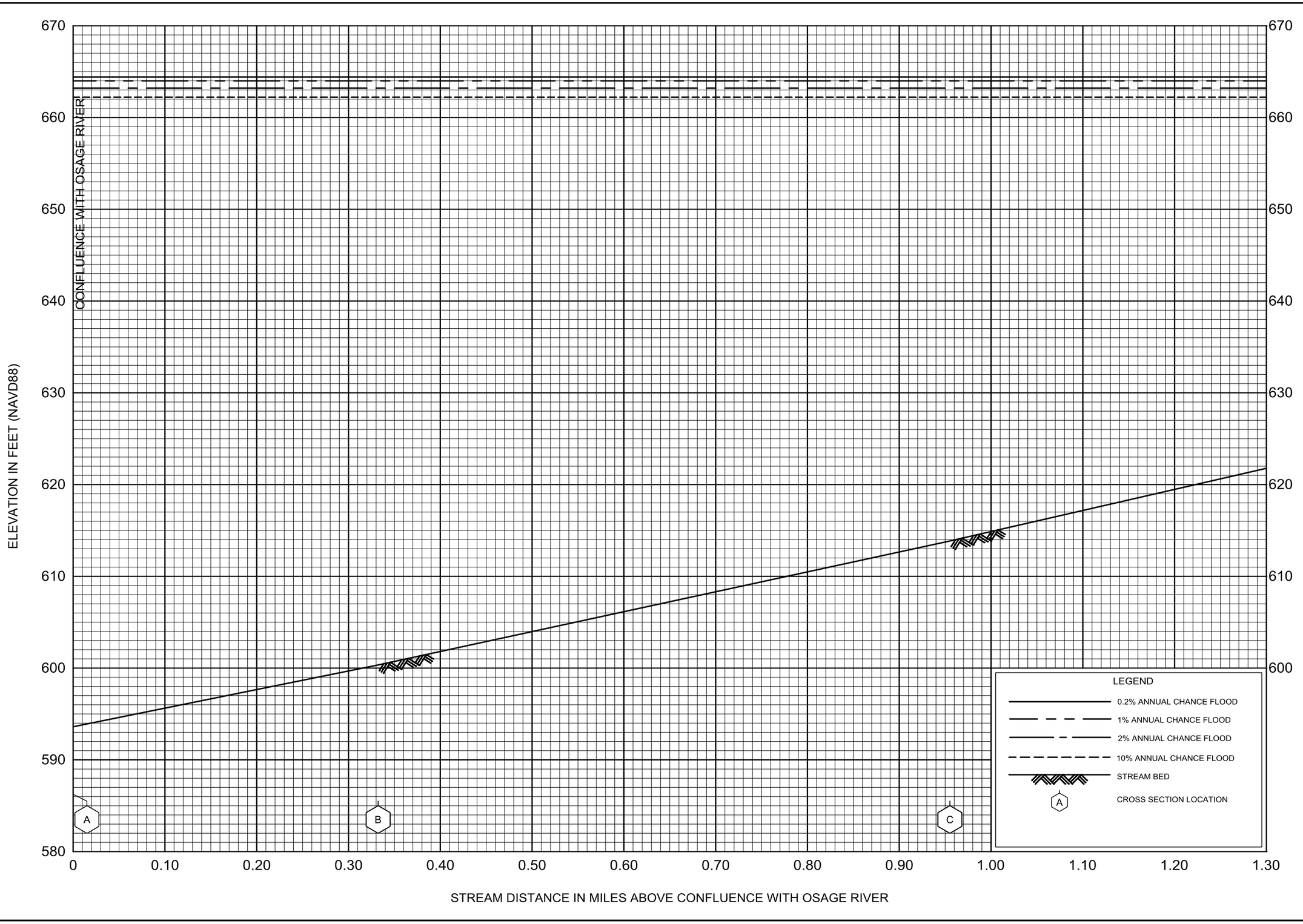
GRAND GLAIZE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

05P



FLOOD PROFILES

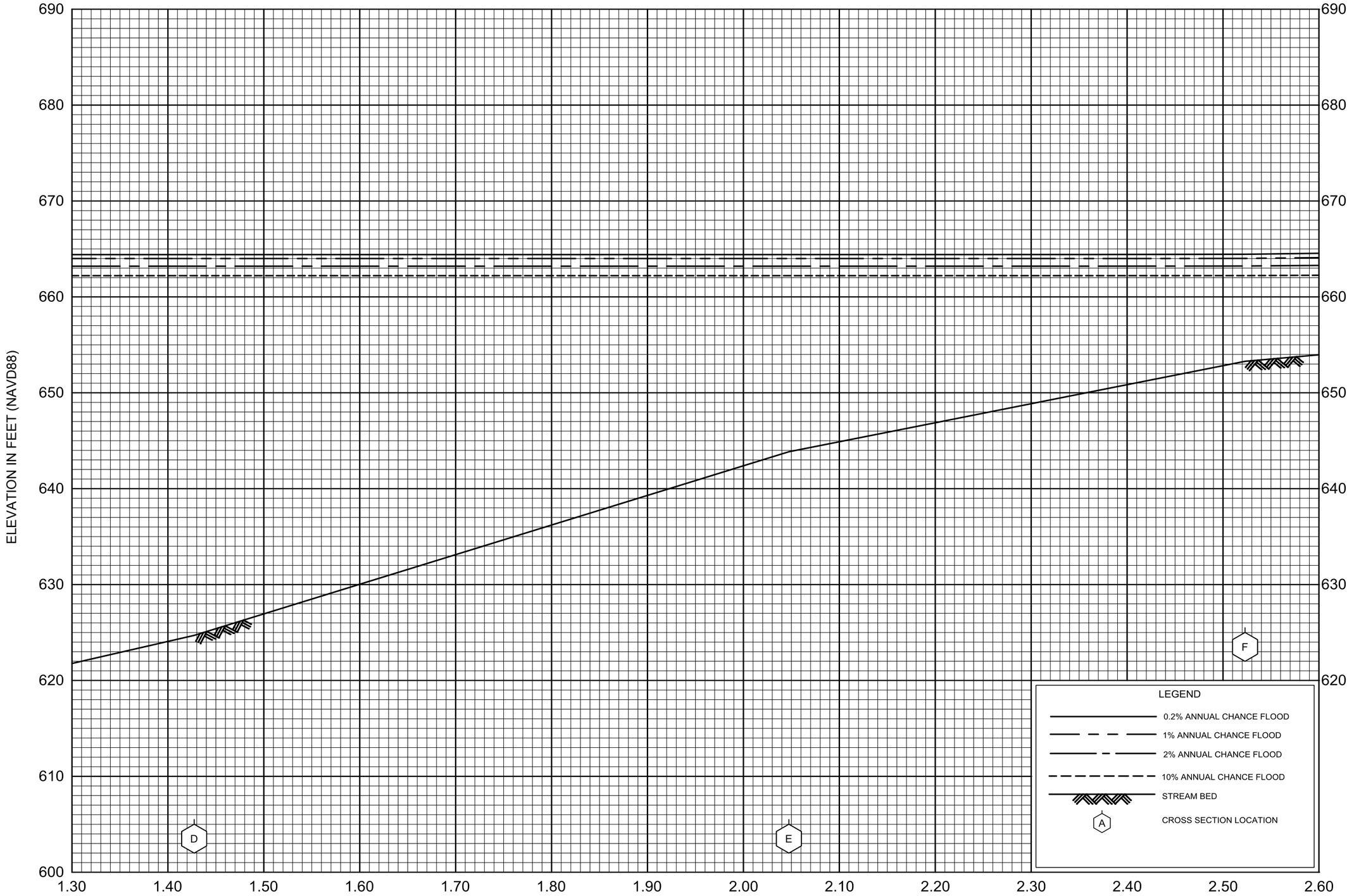
LINN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

06P



FLOOD PROFILES

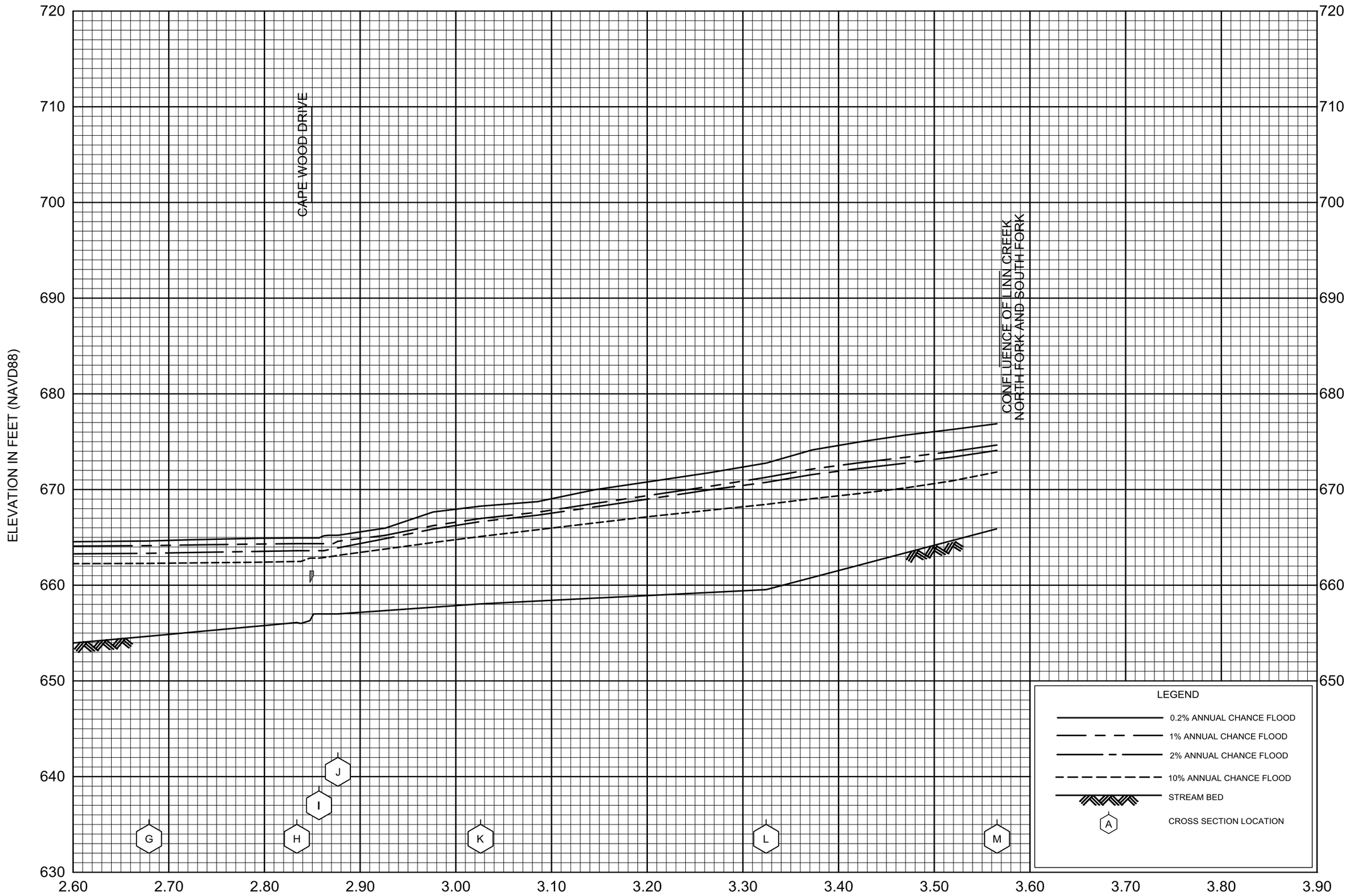
LINN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

07P



FLOOD PROFILES

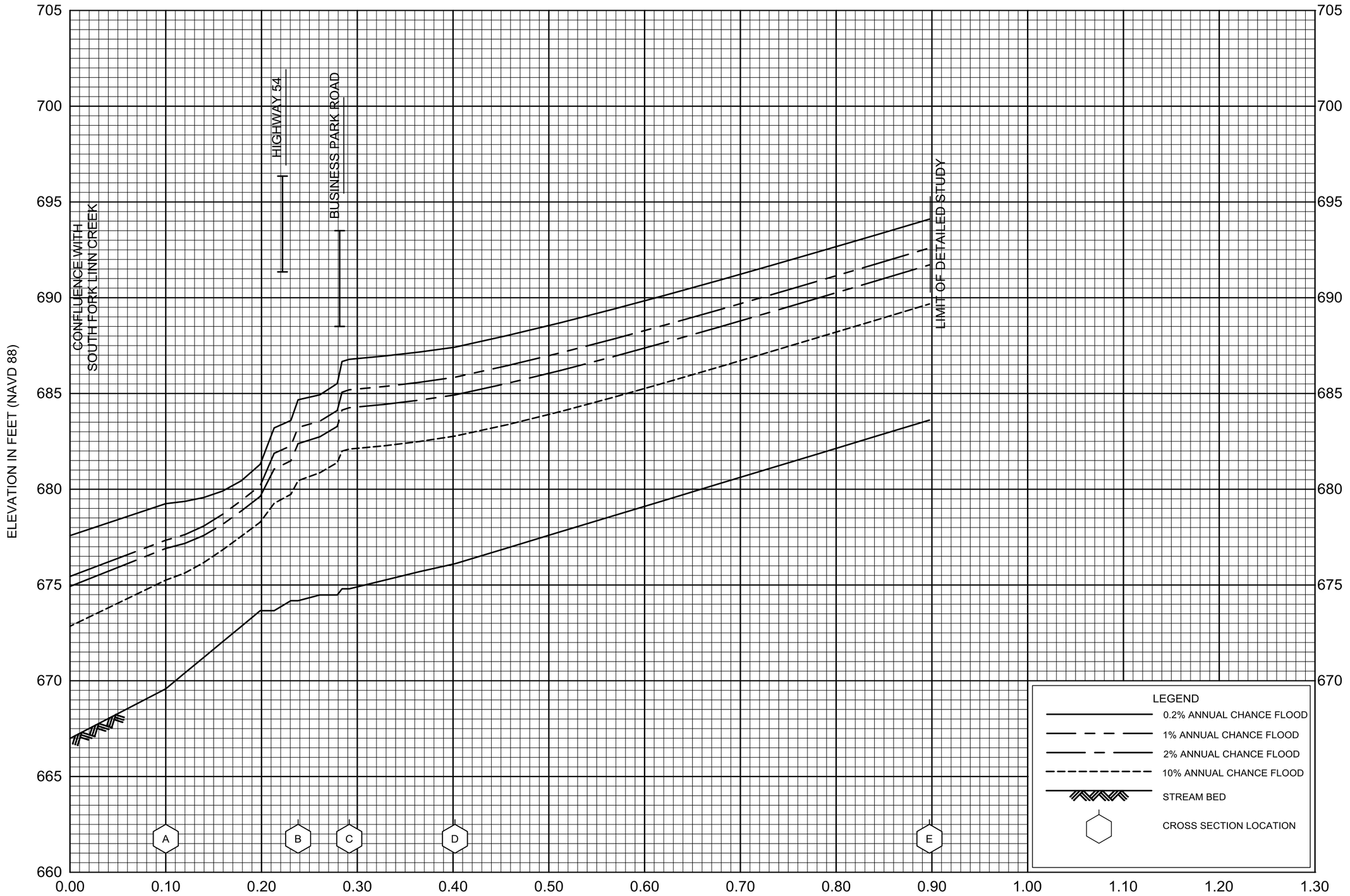
LINN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

08P



FLOOD PROFILES

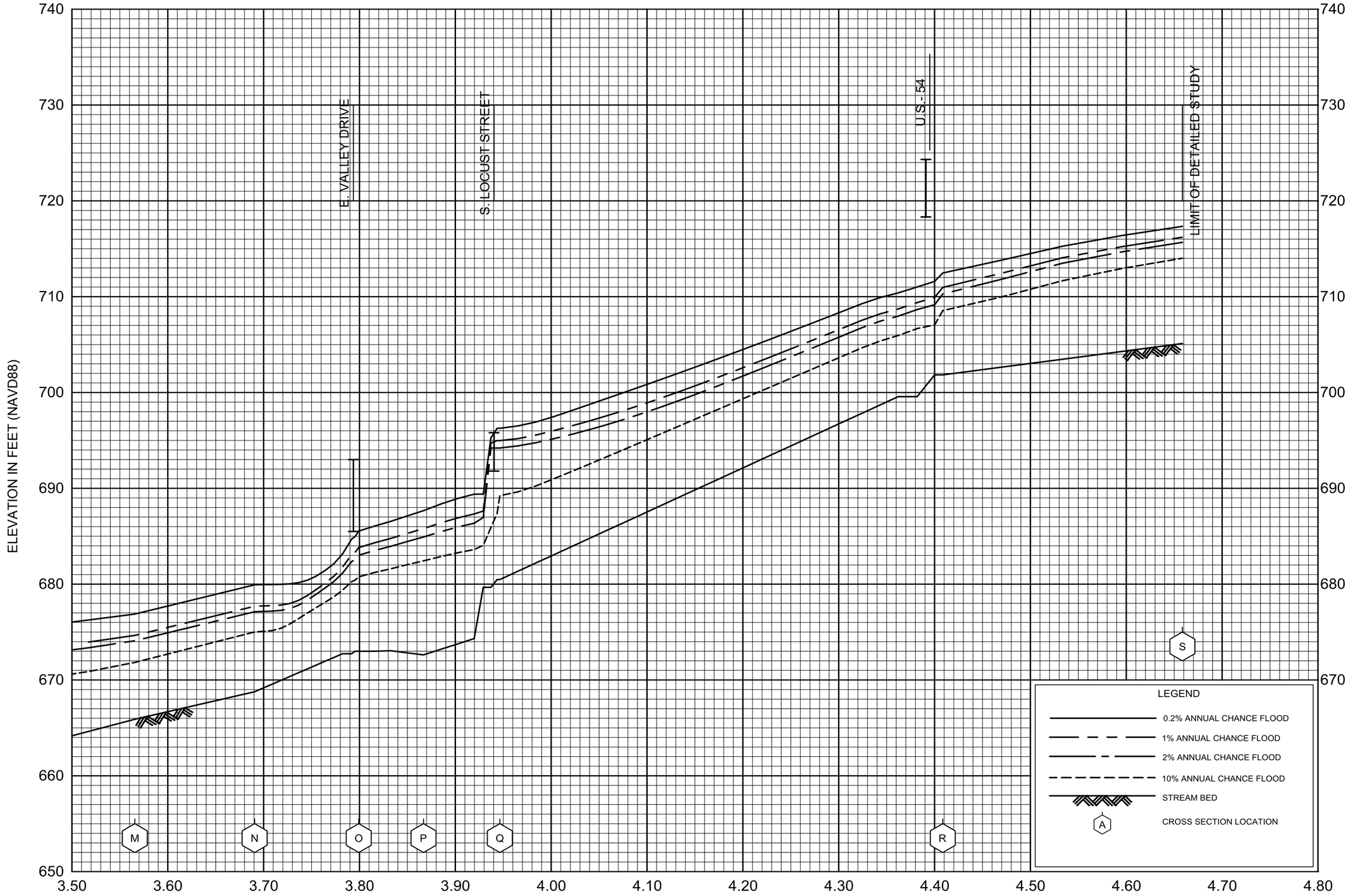
LINN CREEK NORTH FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

09P



FLOOD PROFILES

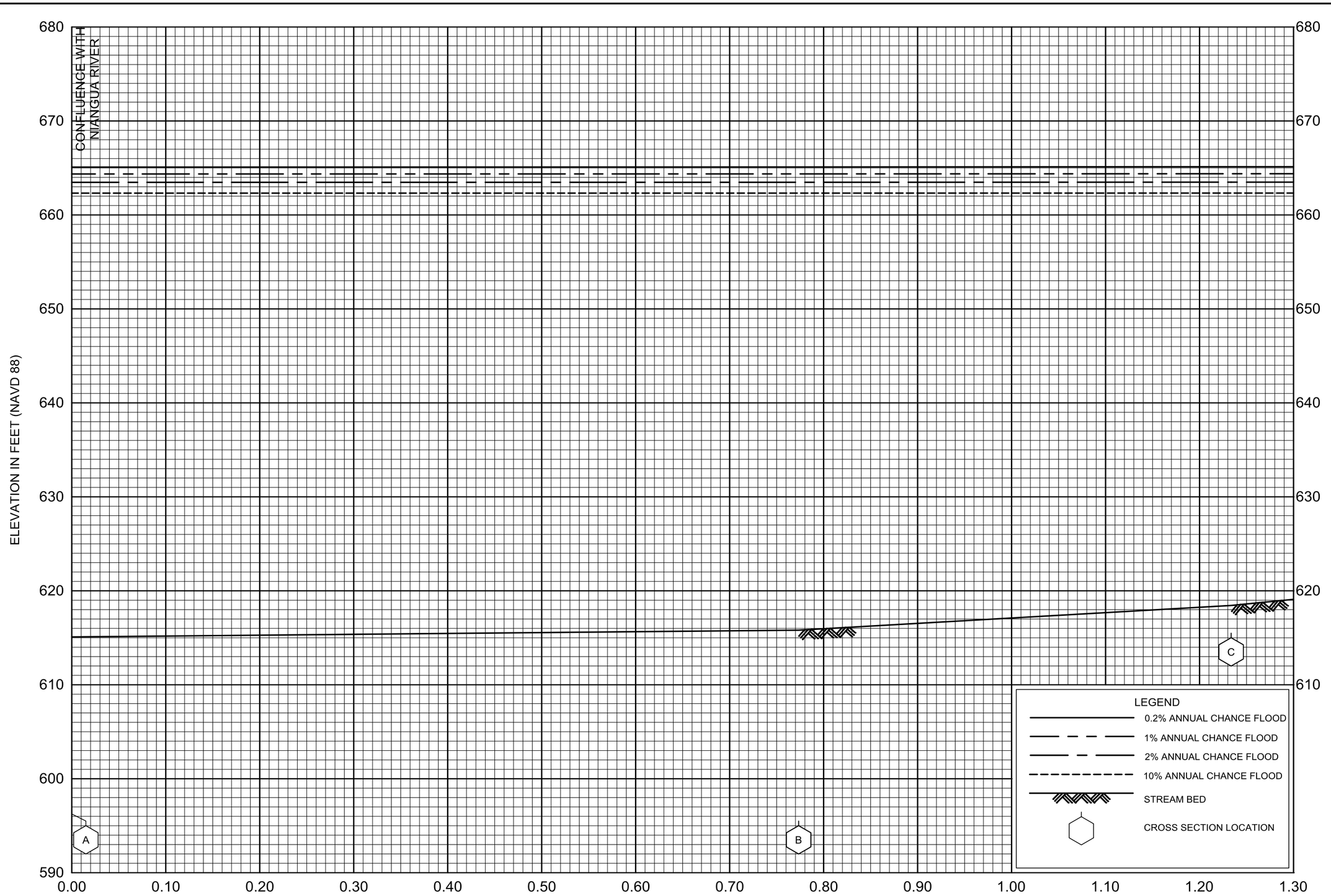
LINN CREEK SOUTH FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

10P



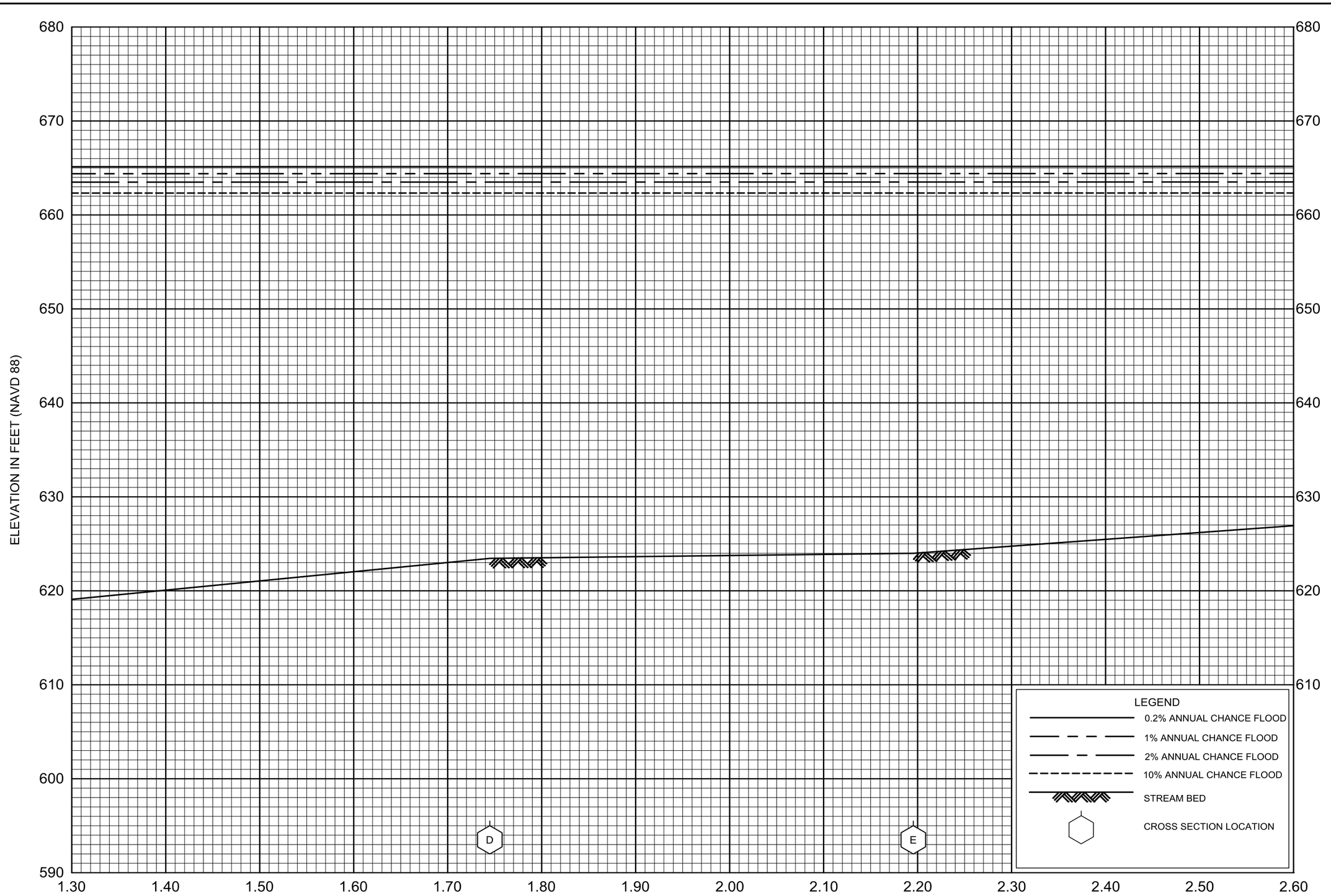
FLOOD PROFILES

LITTLE NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS



FLOOD PROFILES

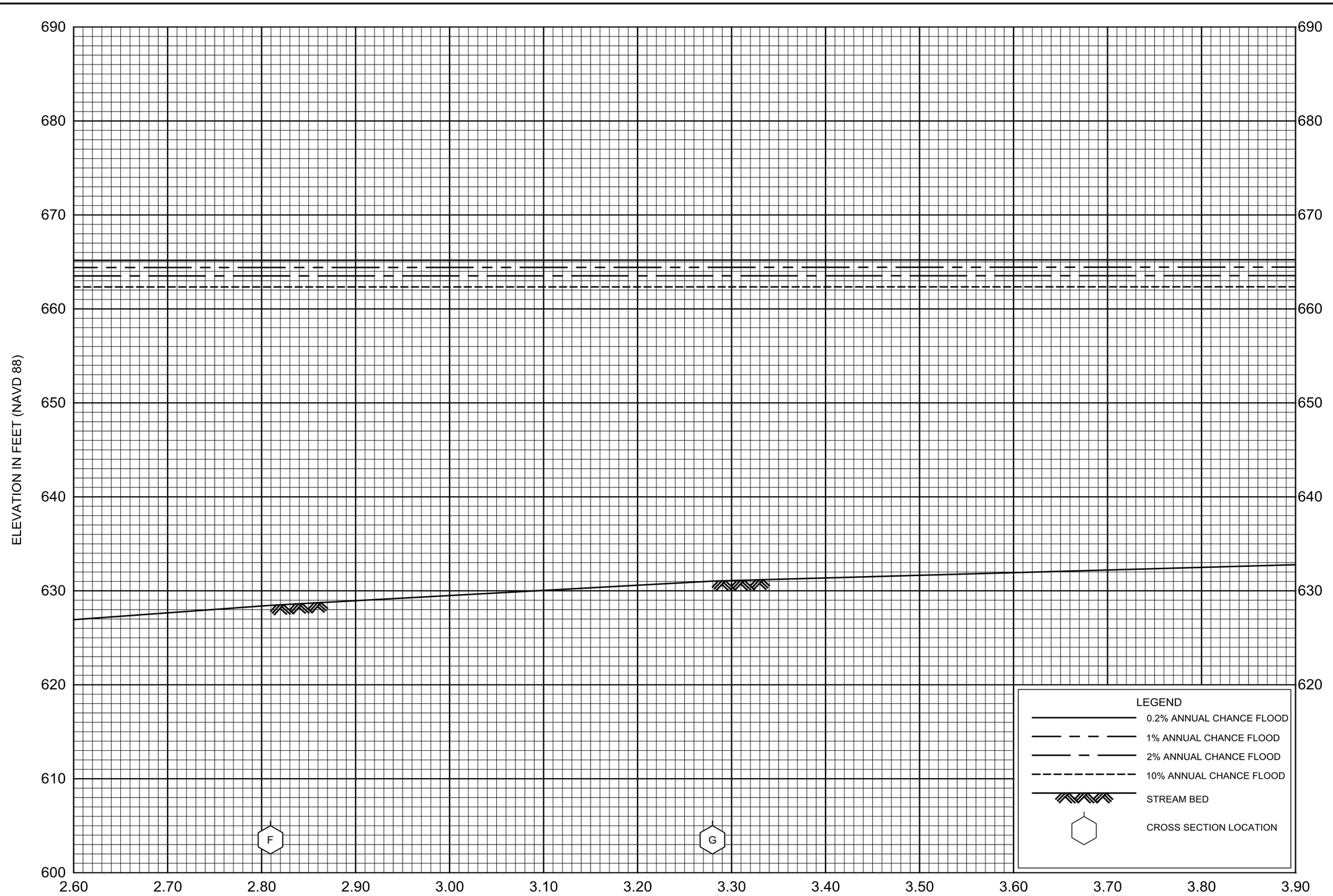
LITTLE NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

12P



FLOOD PROFILES

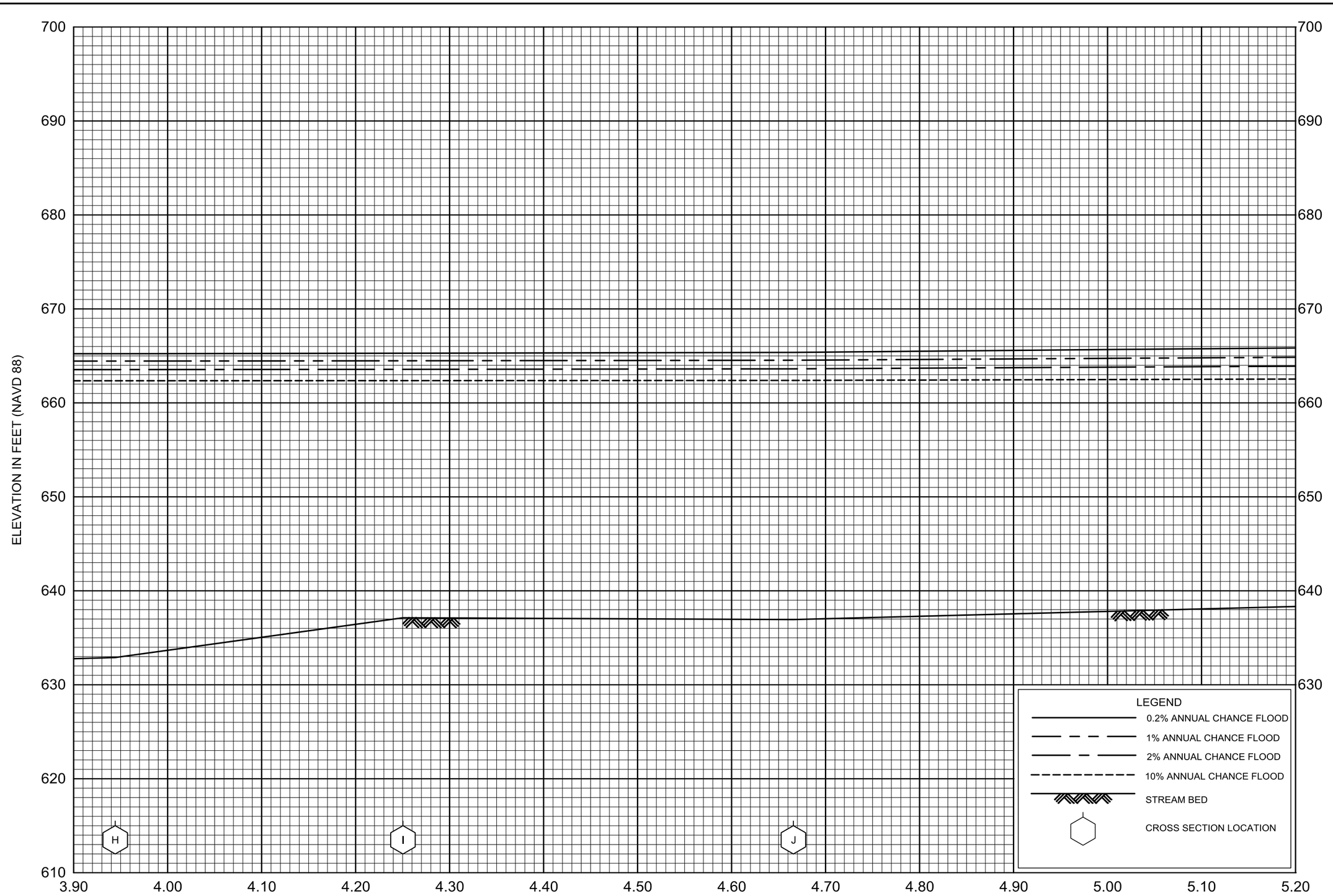
LITTLE NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

13P



FLOOD PROFILES

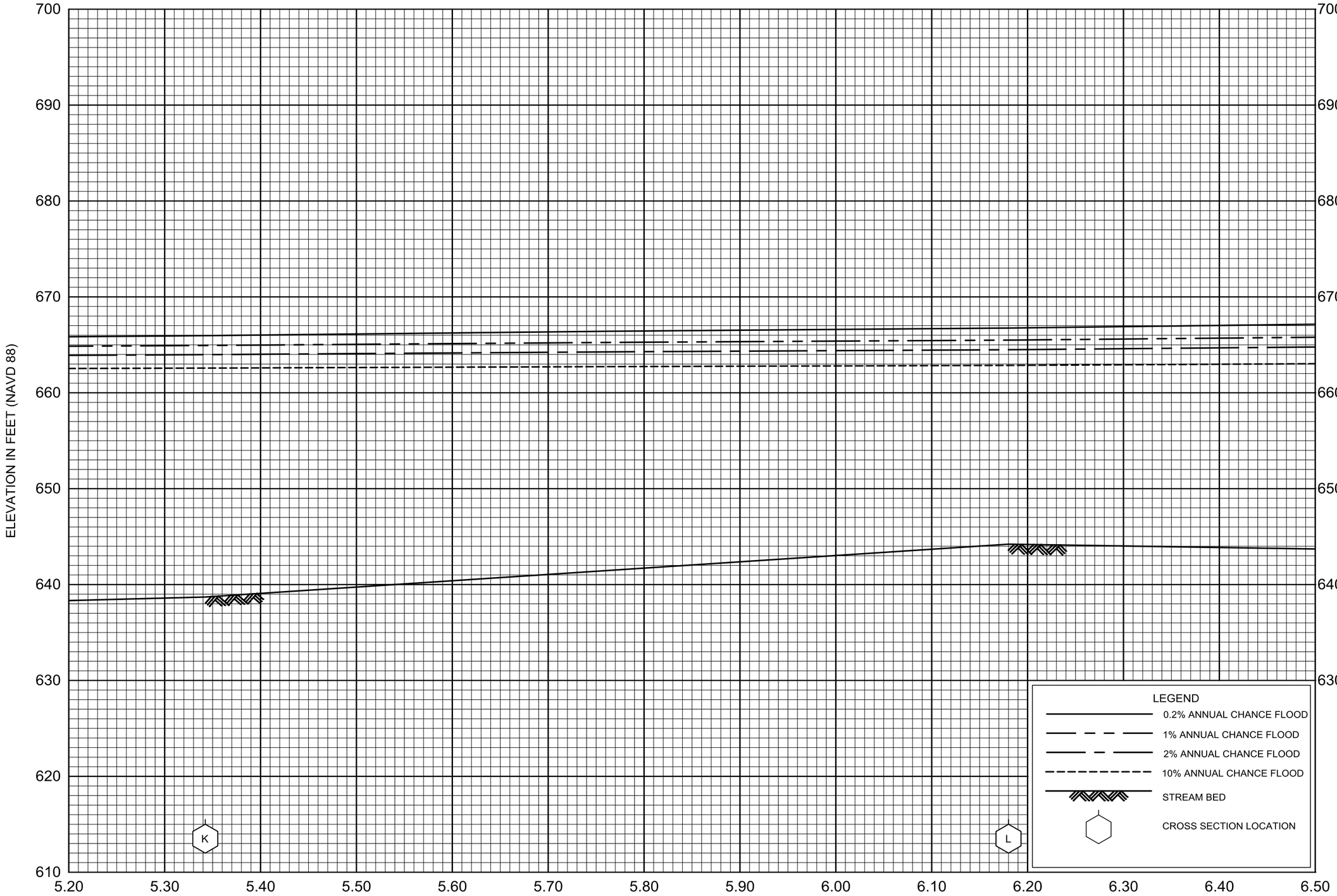
LITTLE NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

14P



FLOOD PROFILES

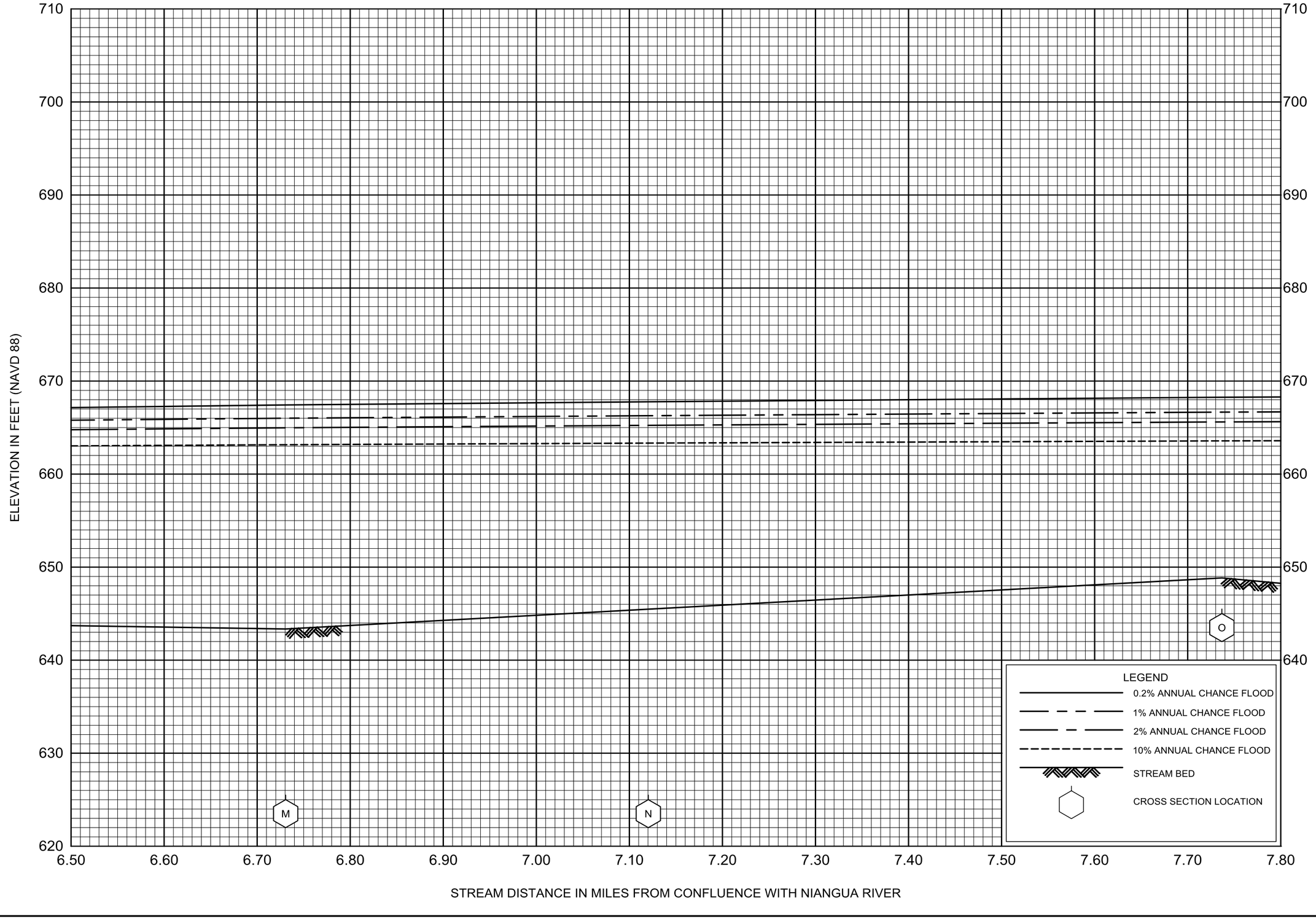
LITTLE NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

15P



FLOOD PROFILES

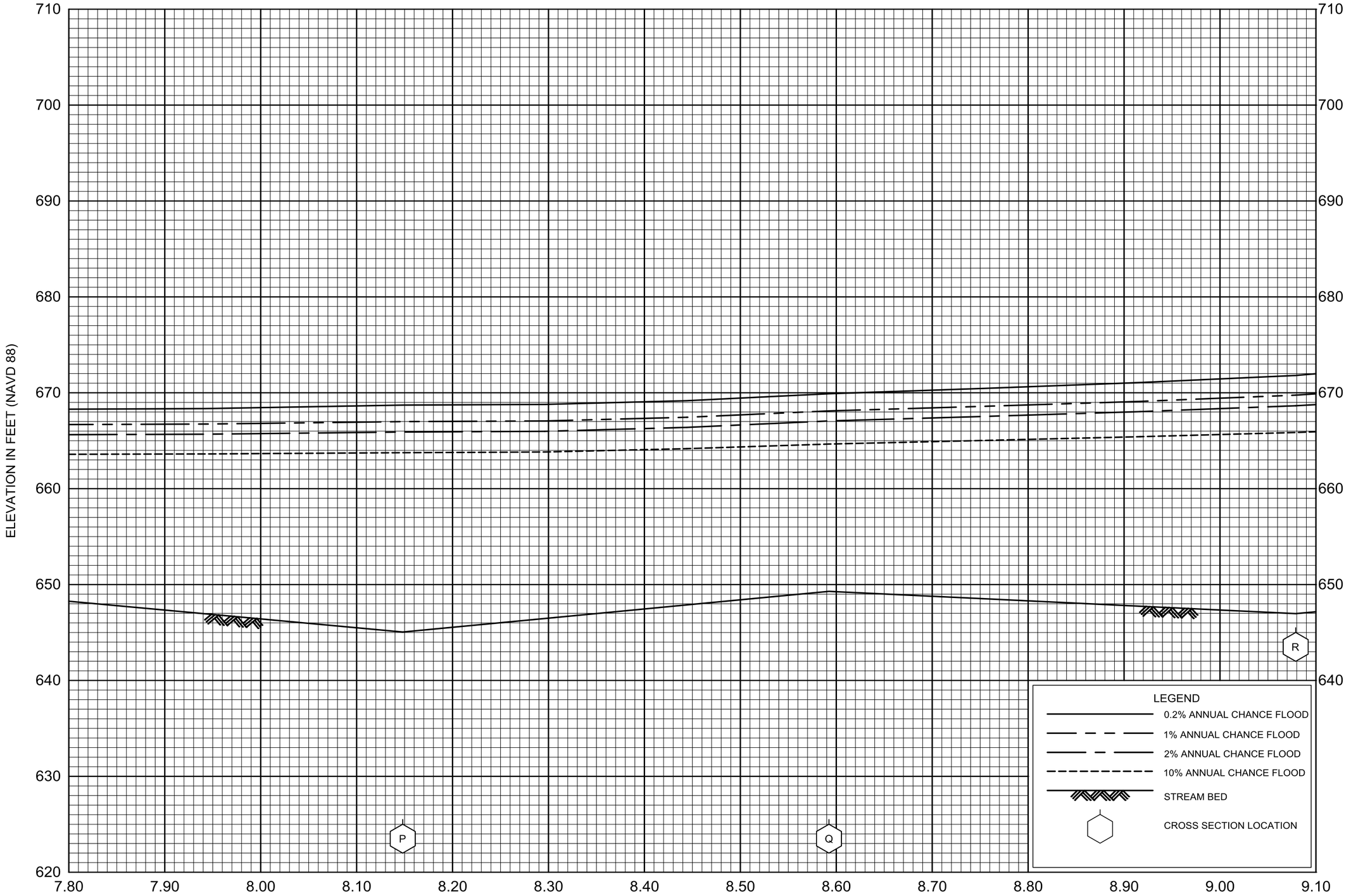
LITTLE NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

16P



FLOOD PROFILES

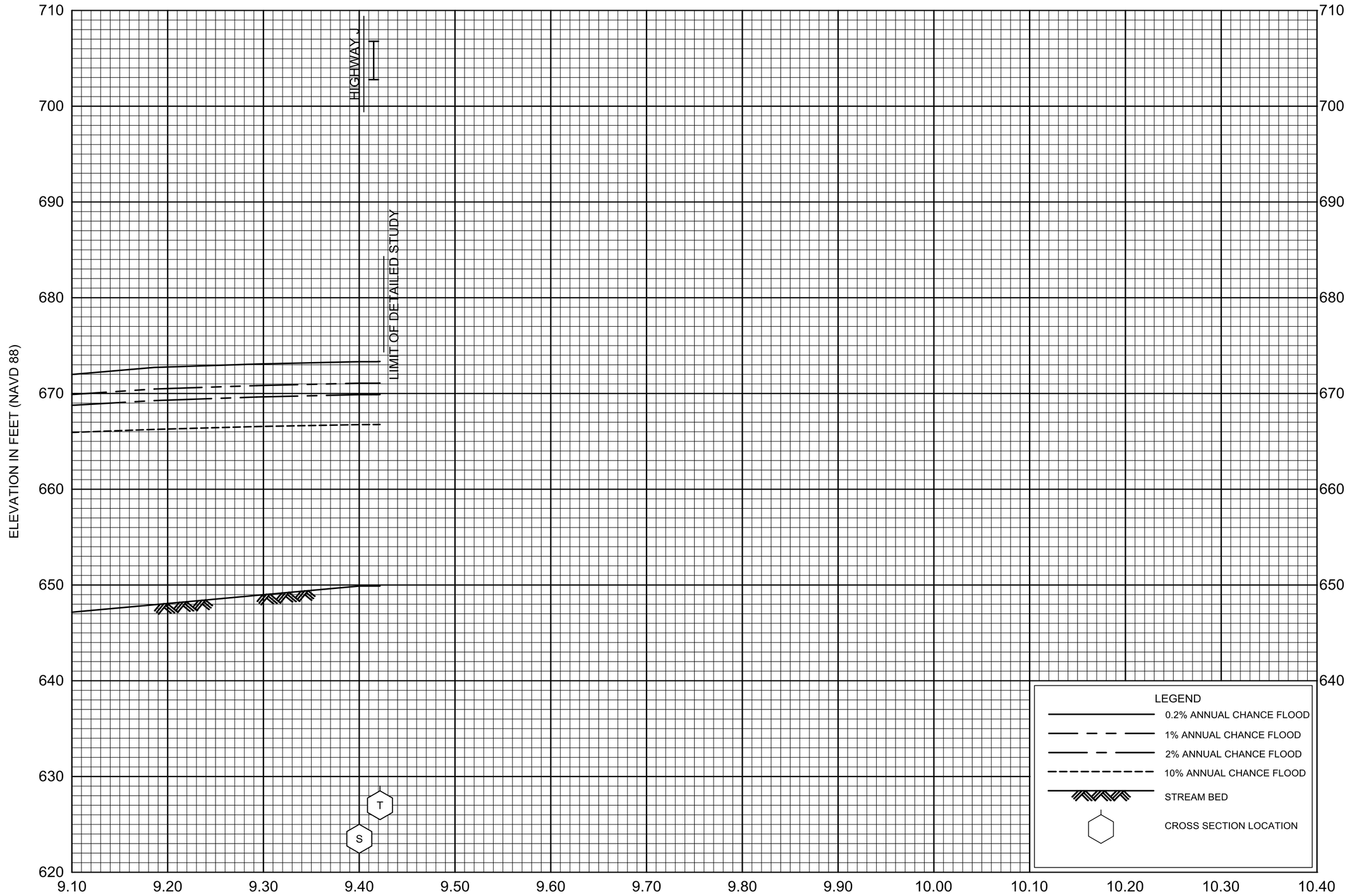
LITTLE NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

17P



FLOOD PROFILES

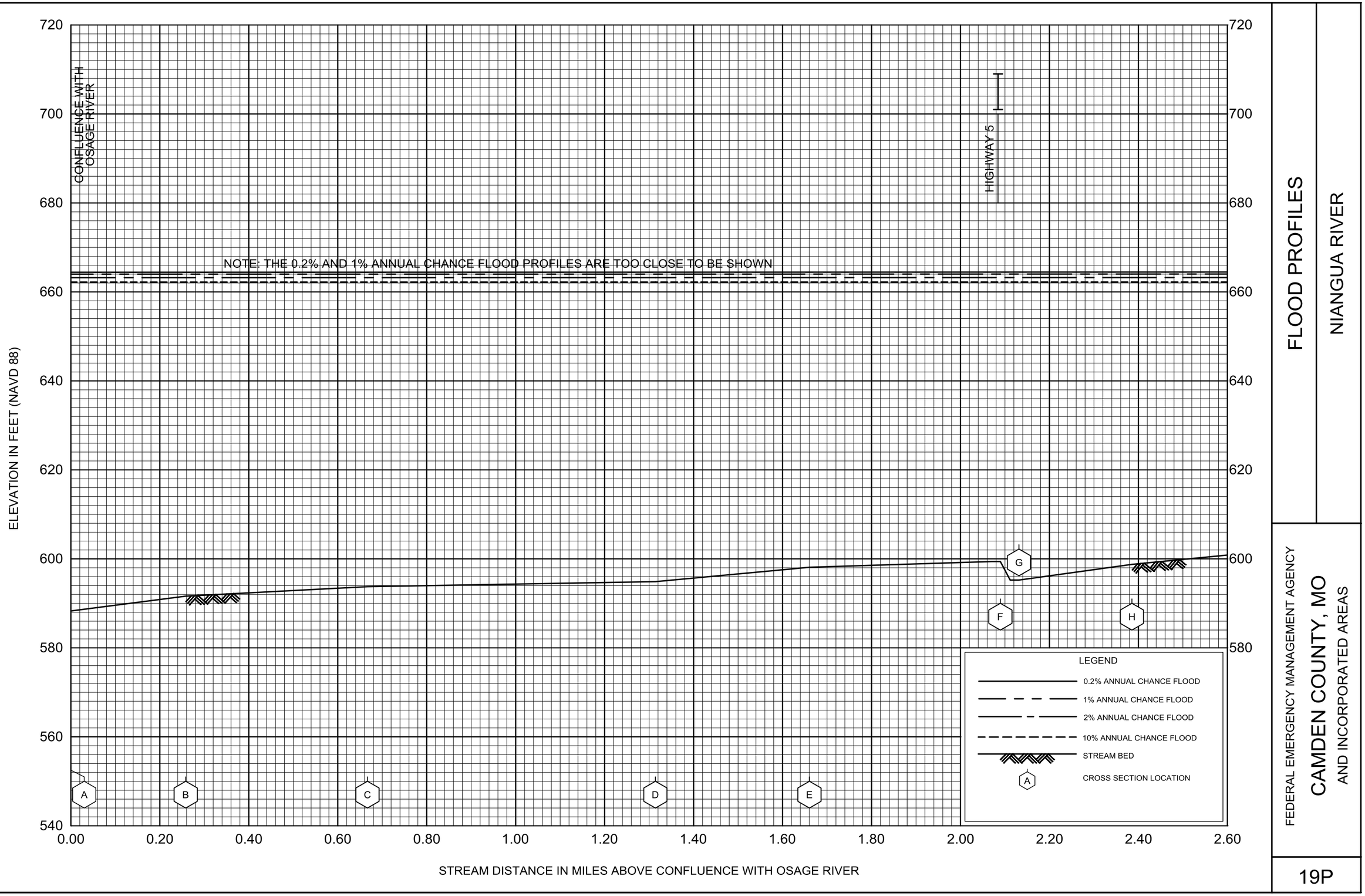
LITTLE NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

18P



FLOOD PROFILES

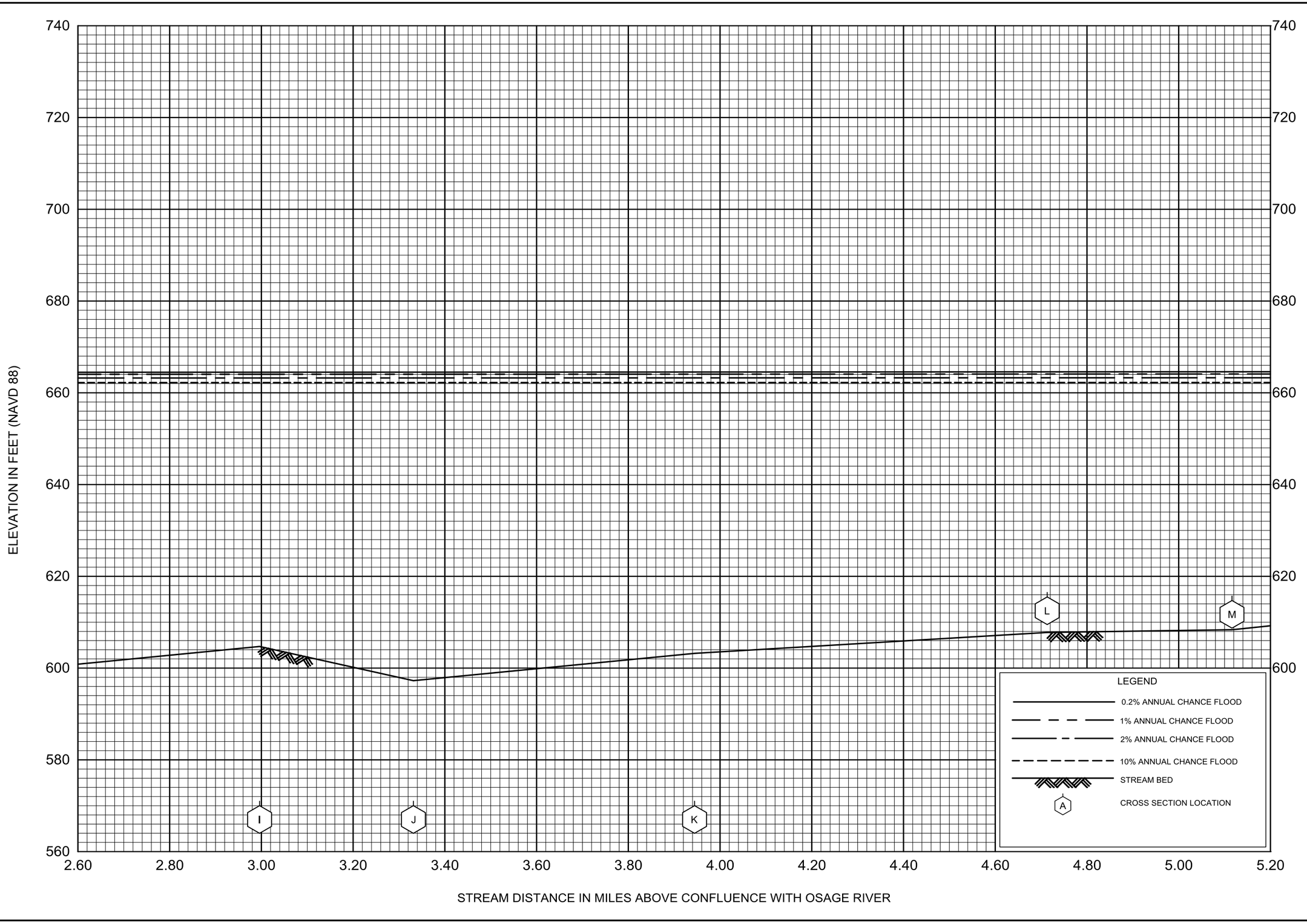
NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

19P



FLOOD PROFILES

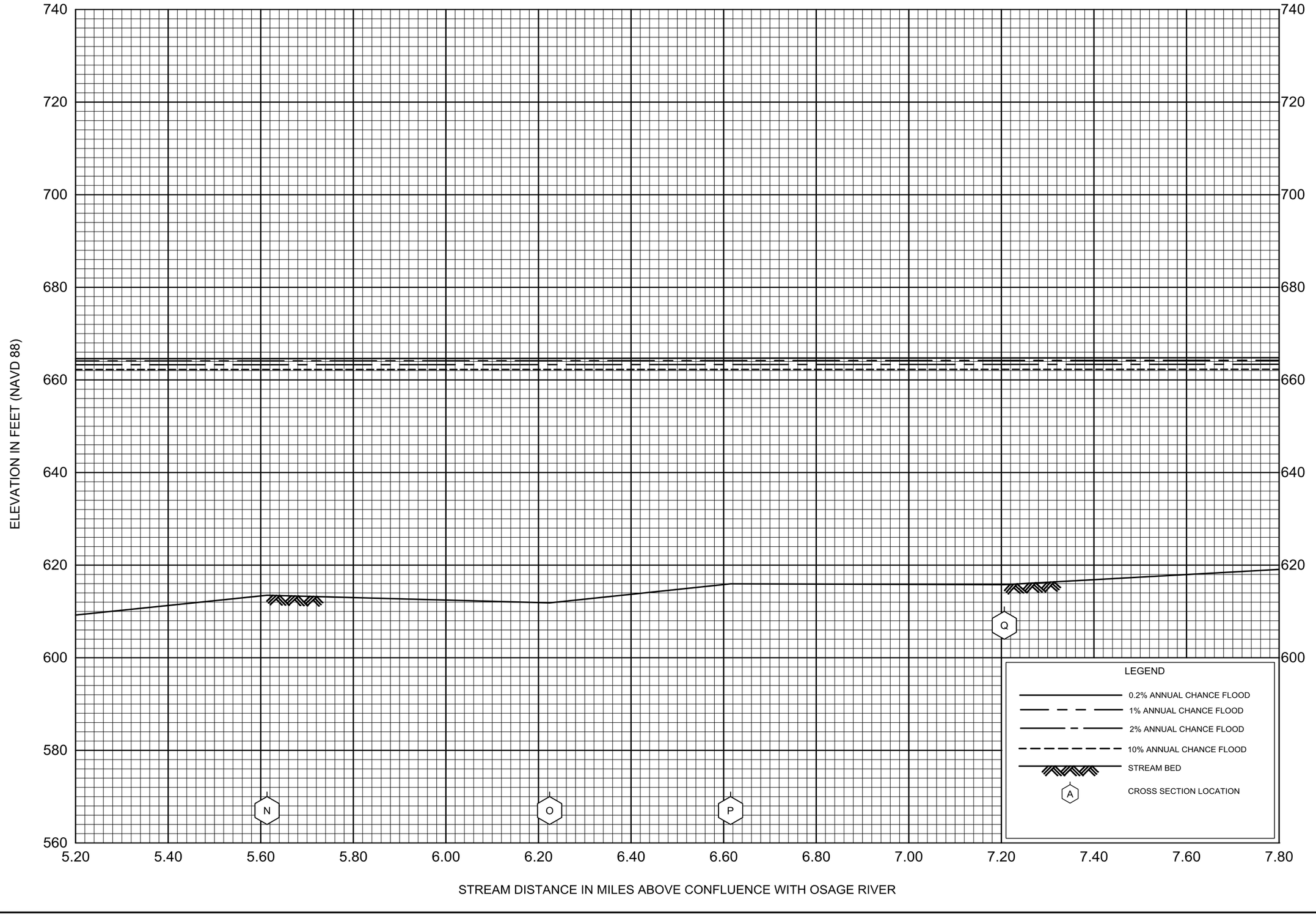
NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

20P



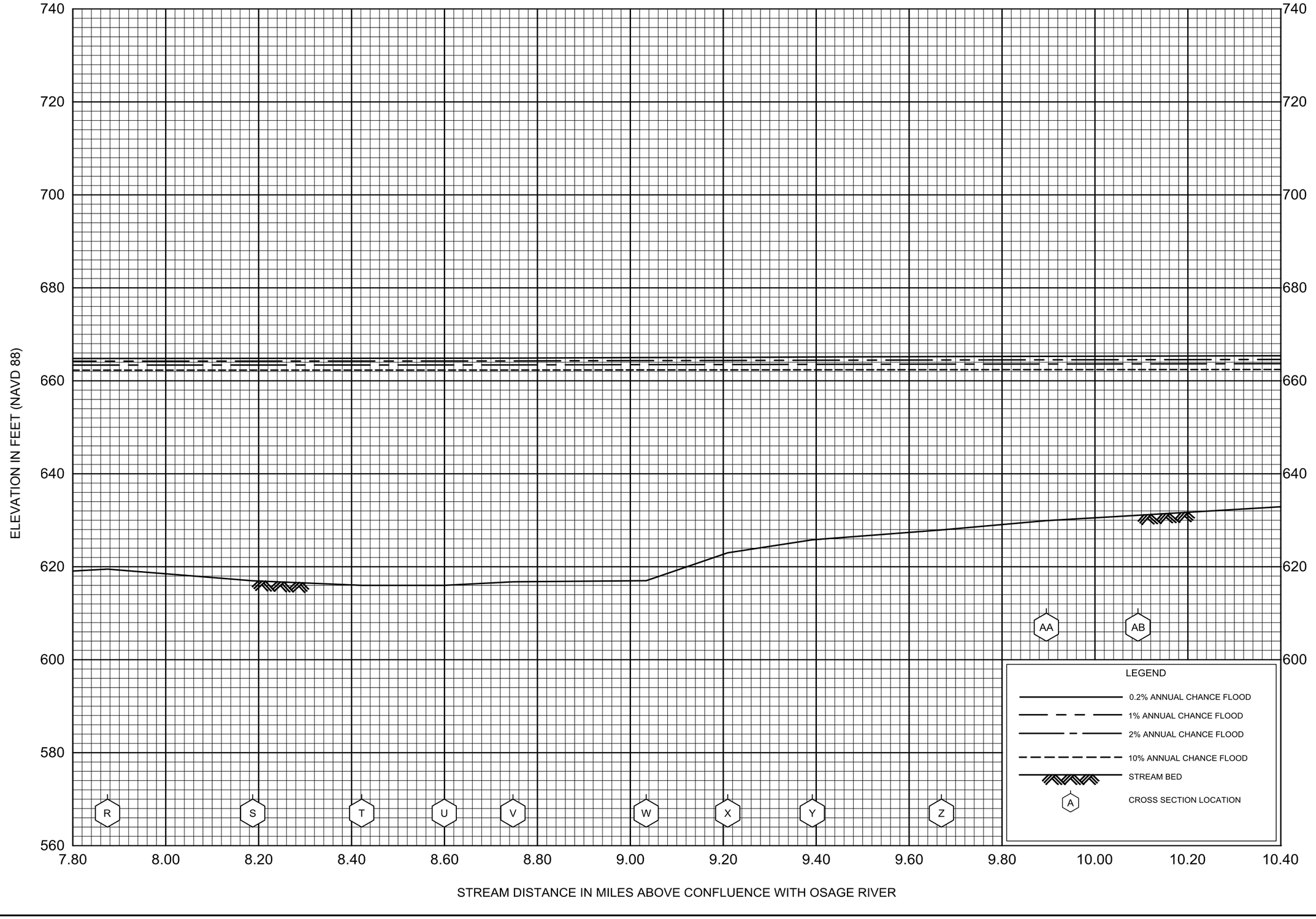
FLOOD PROFILES

NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS



FLOOD PROFILES

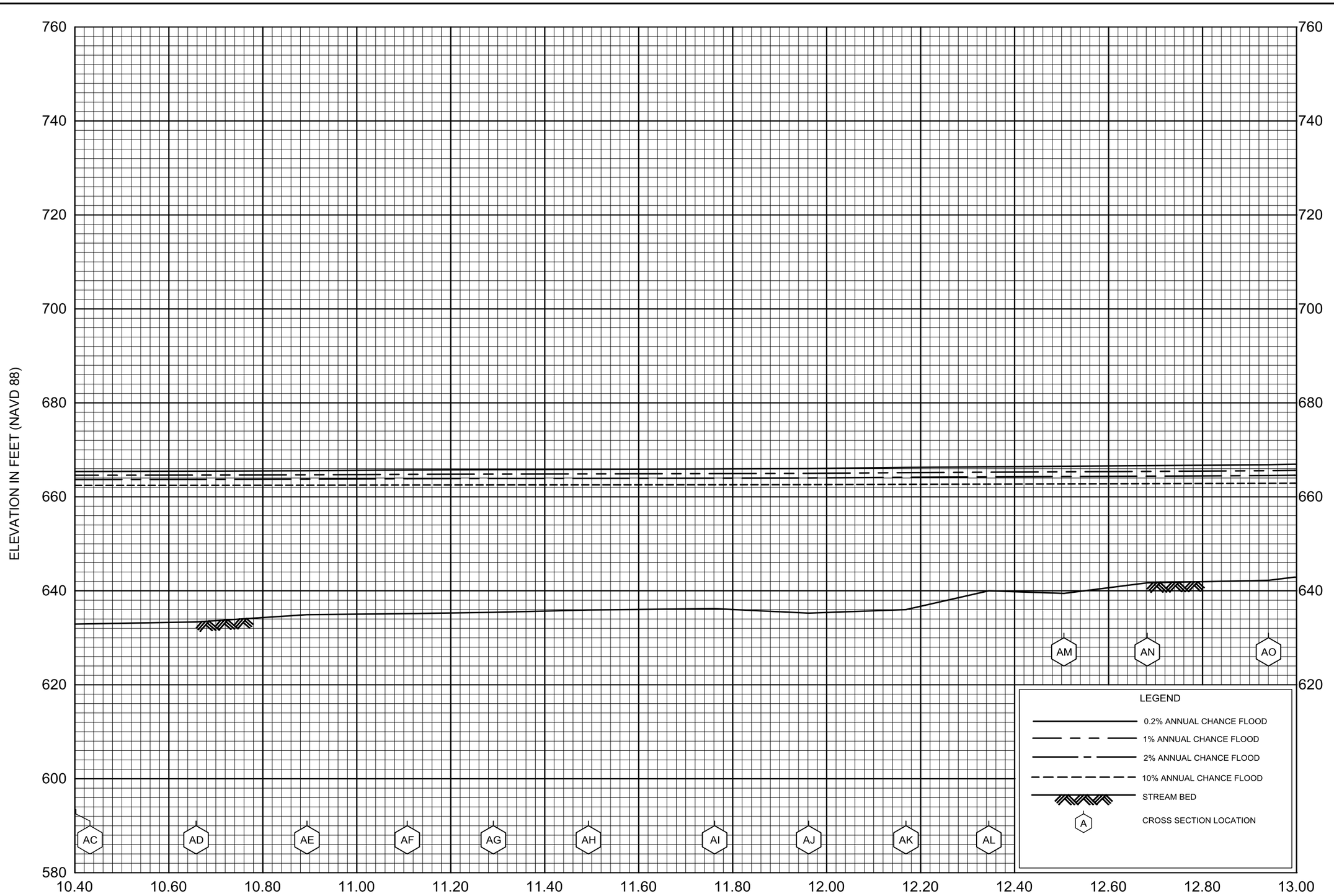
NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

22P



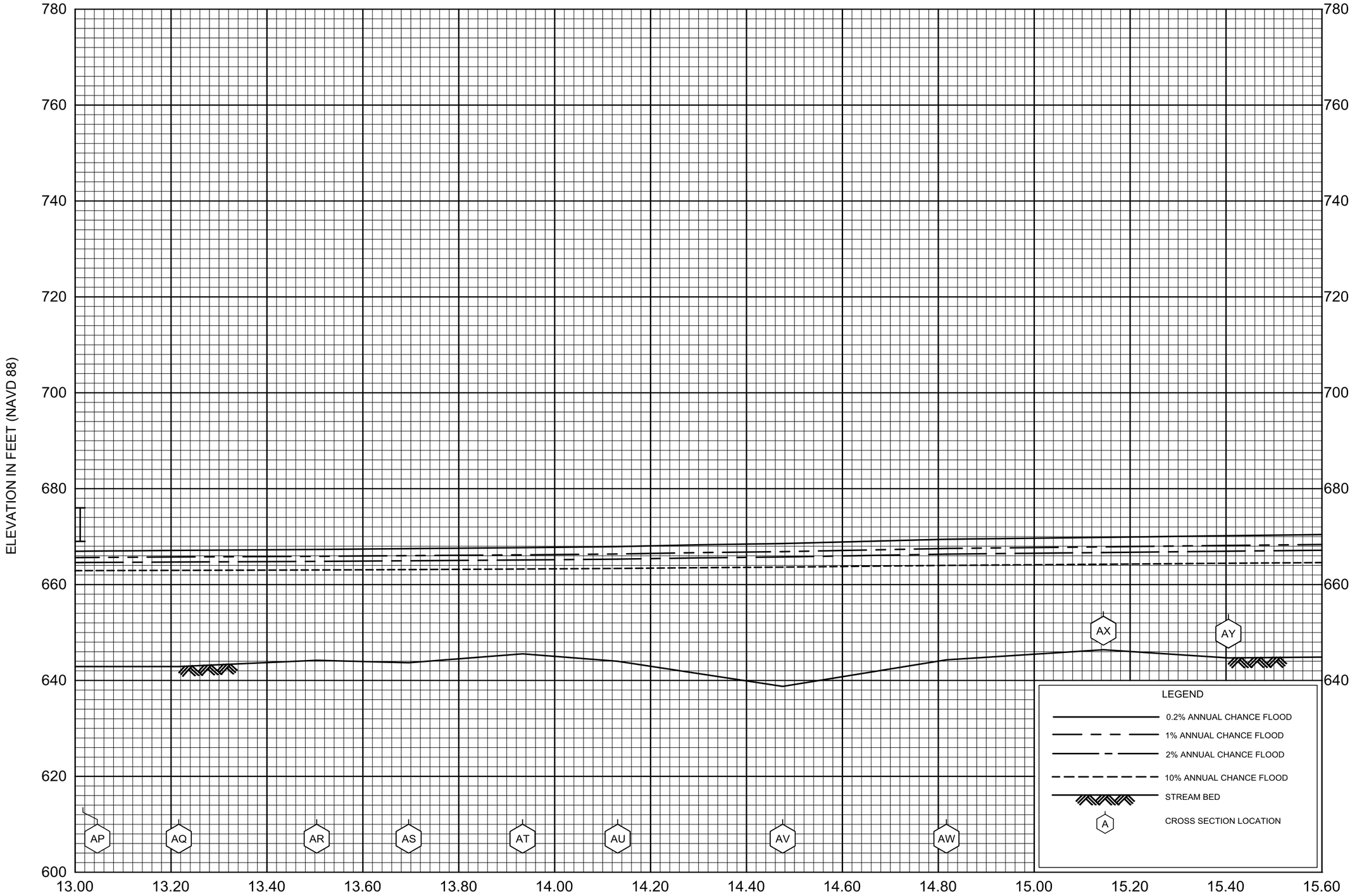
FLOOD PROFILES

NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS



FLOOD PROFILES

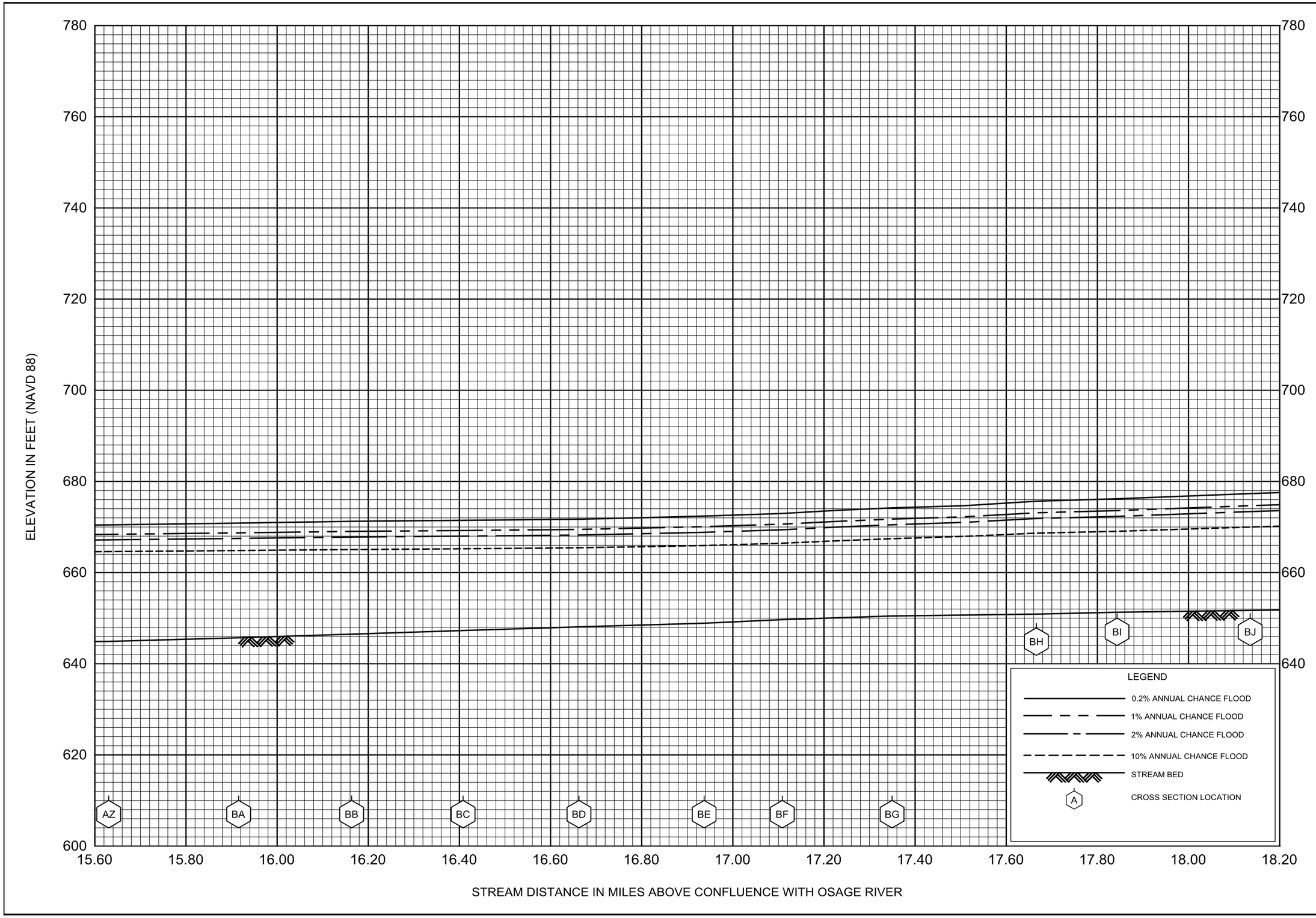
NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

24P



FLOOD PROFILES

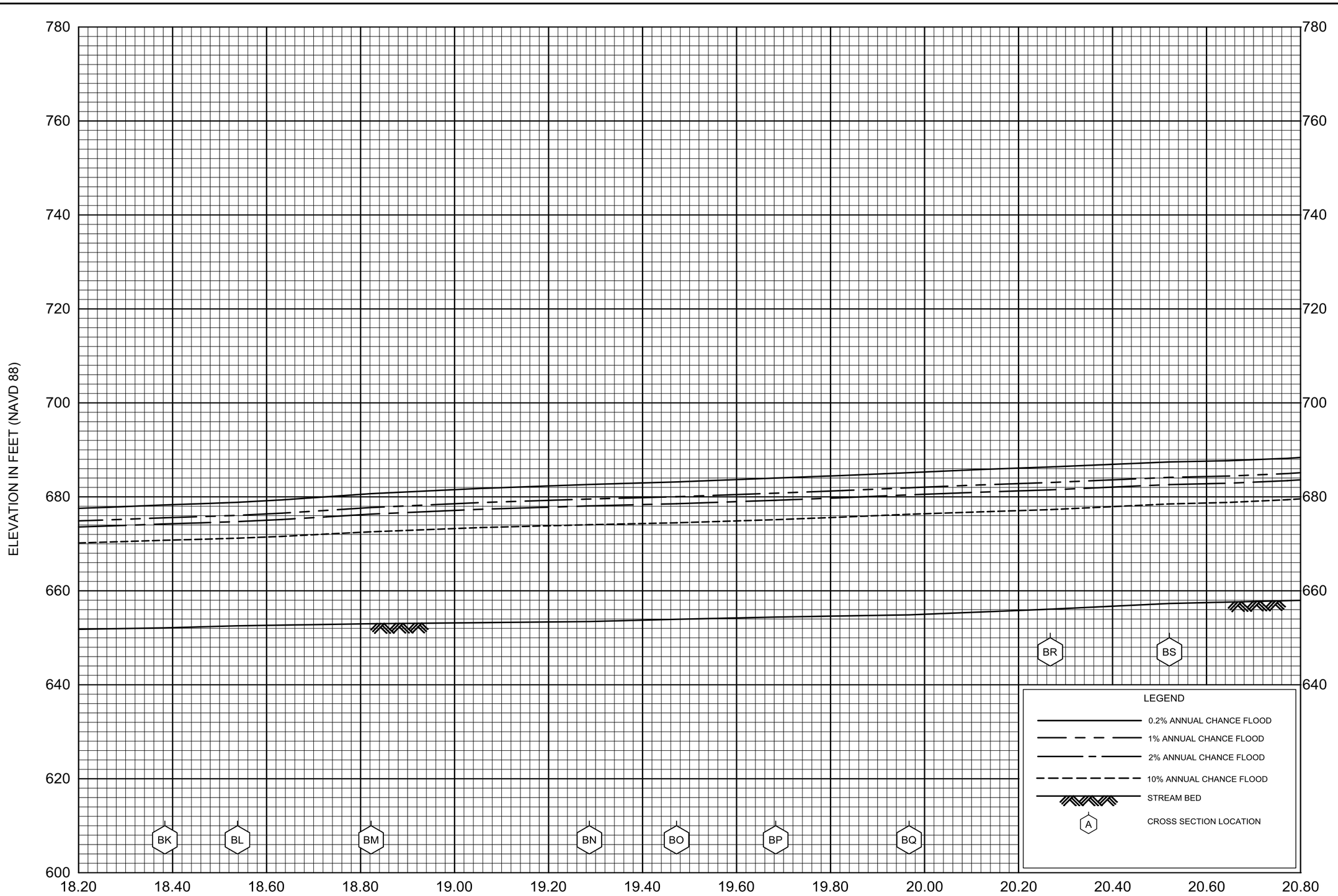
NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

25P



FLOOD PROFILES

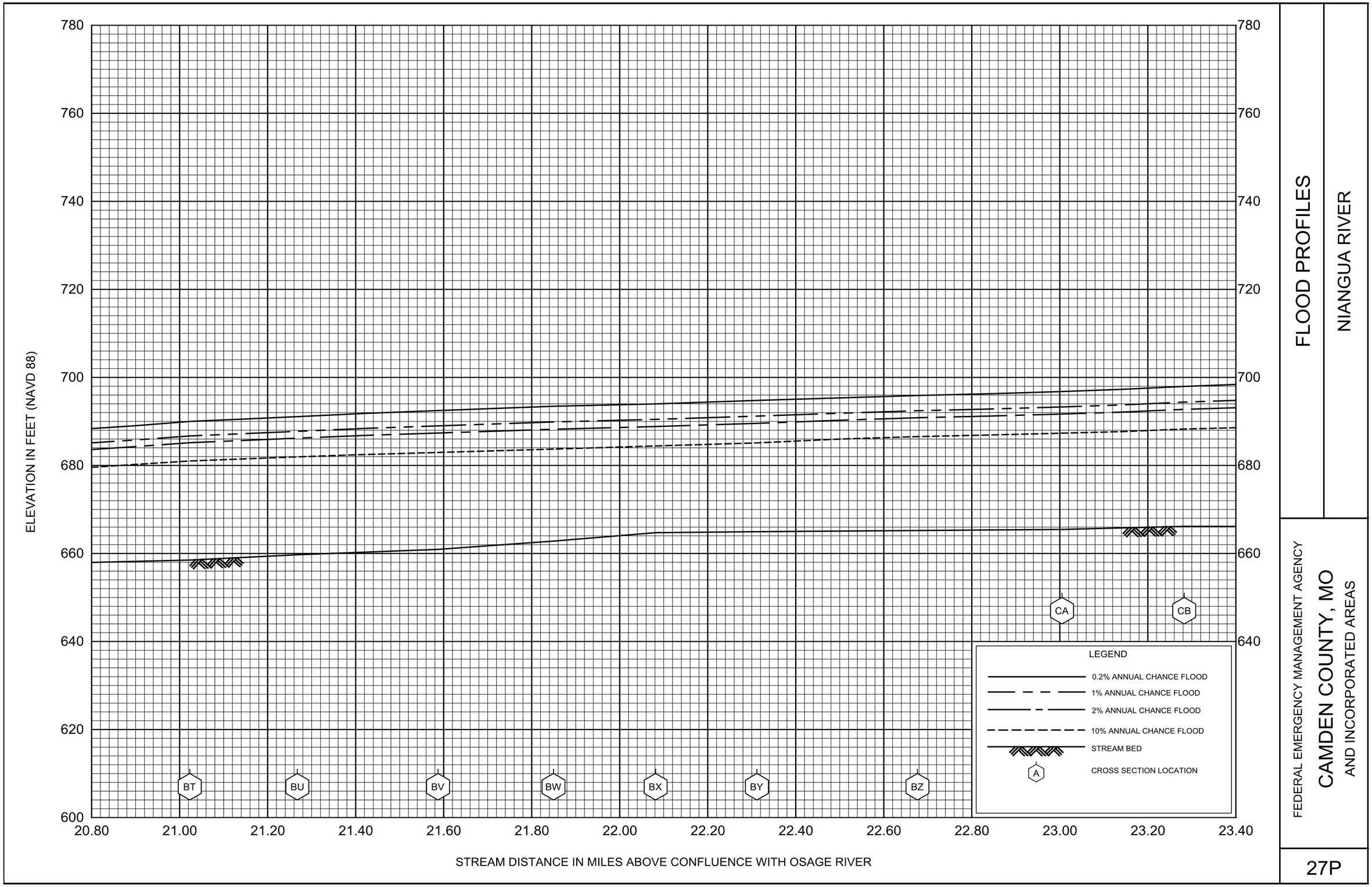
NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

26P



FLOOD PROFILES

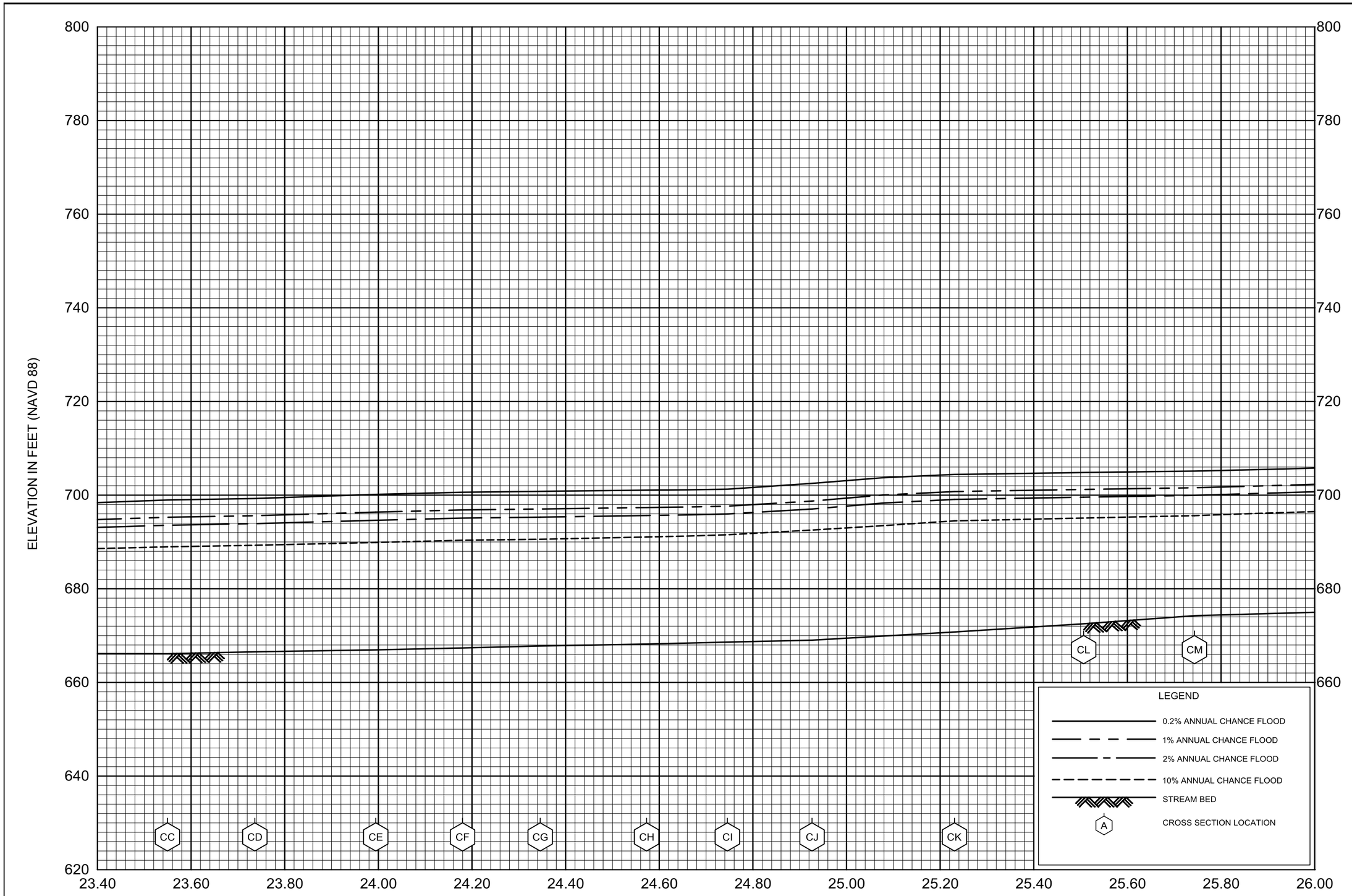
NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

27P



FLOOD PROFILES

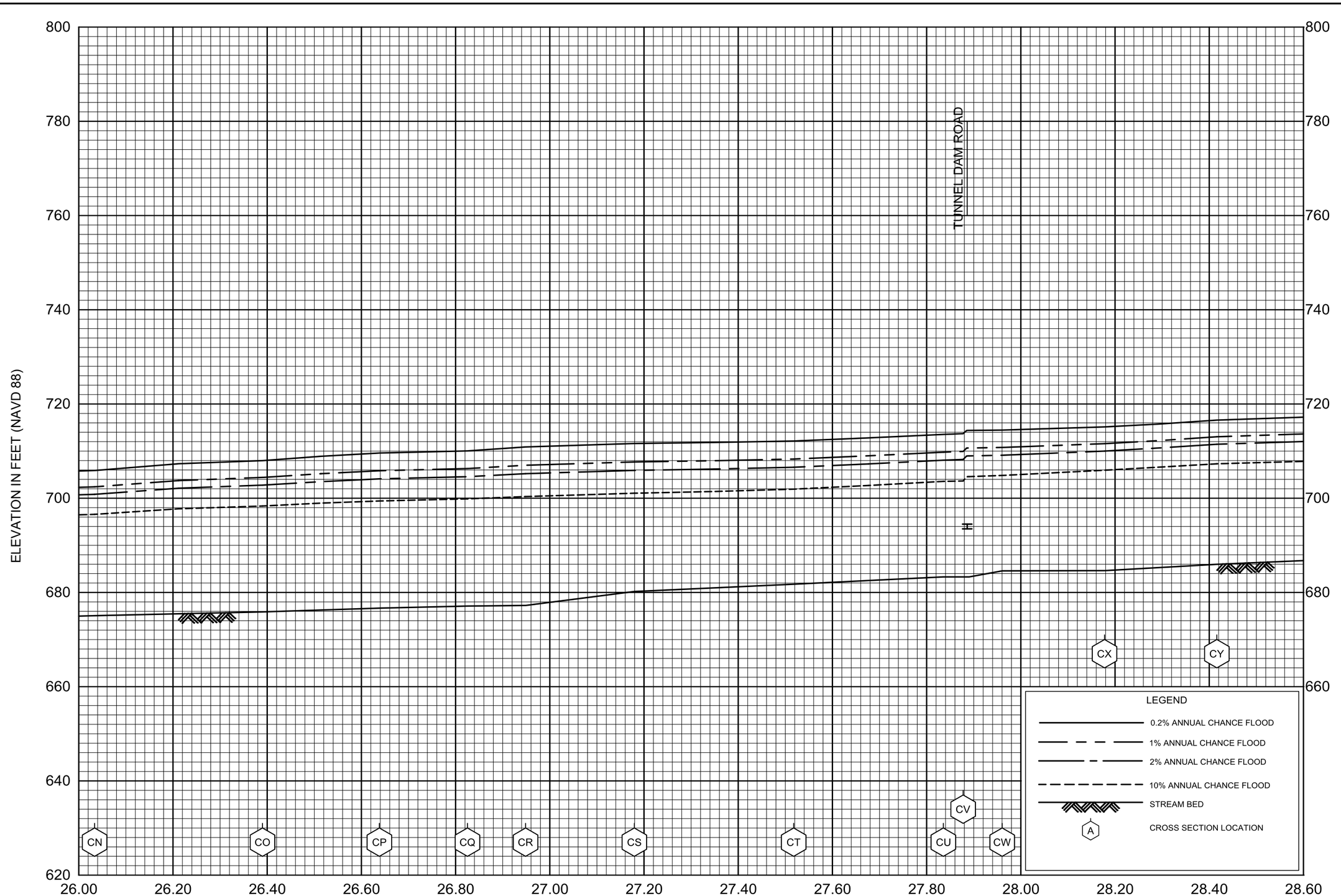
NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

28P



FLOOD PROFILES

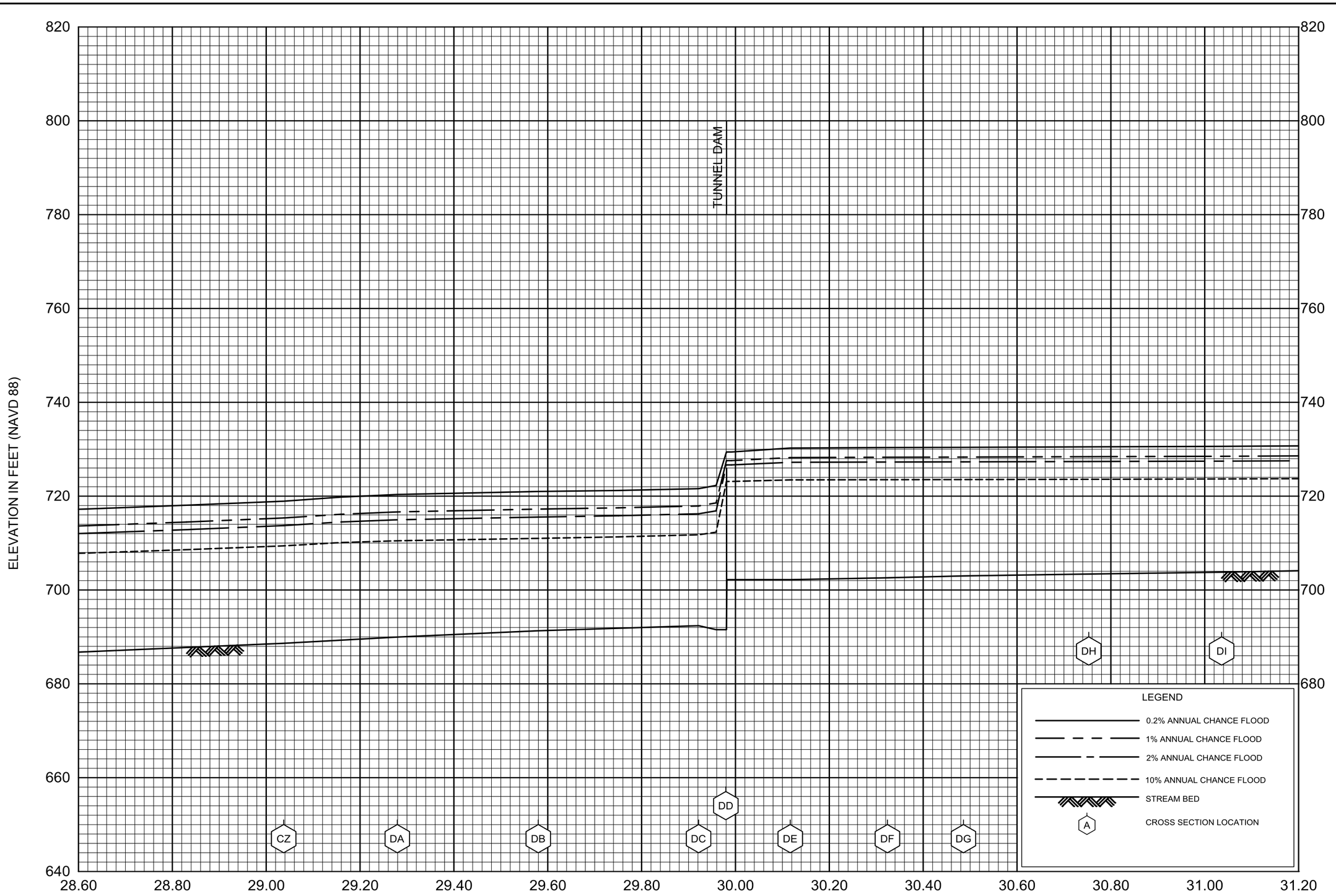
NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

29P



FLOOD PROFILES

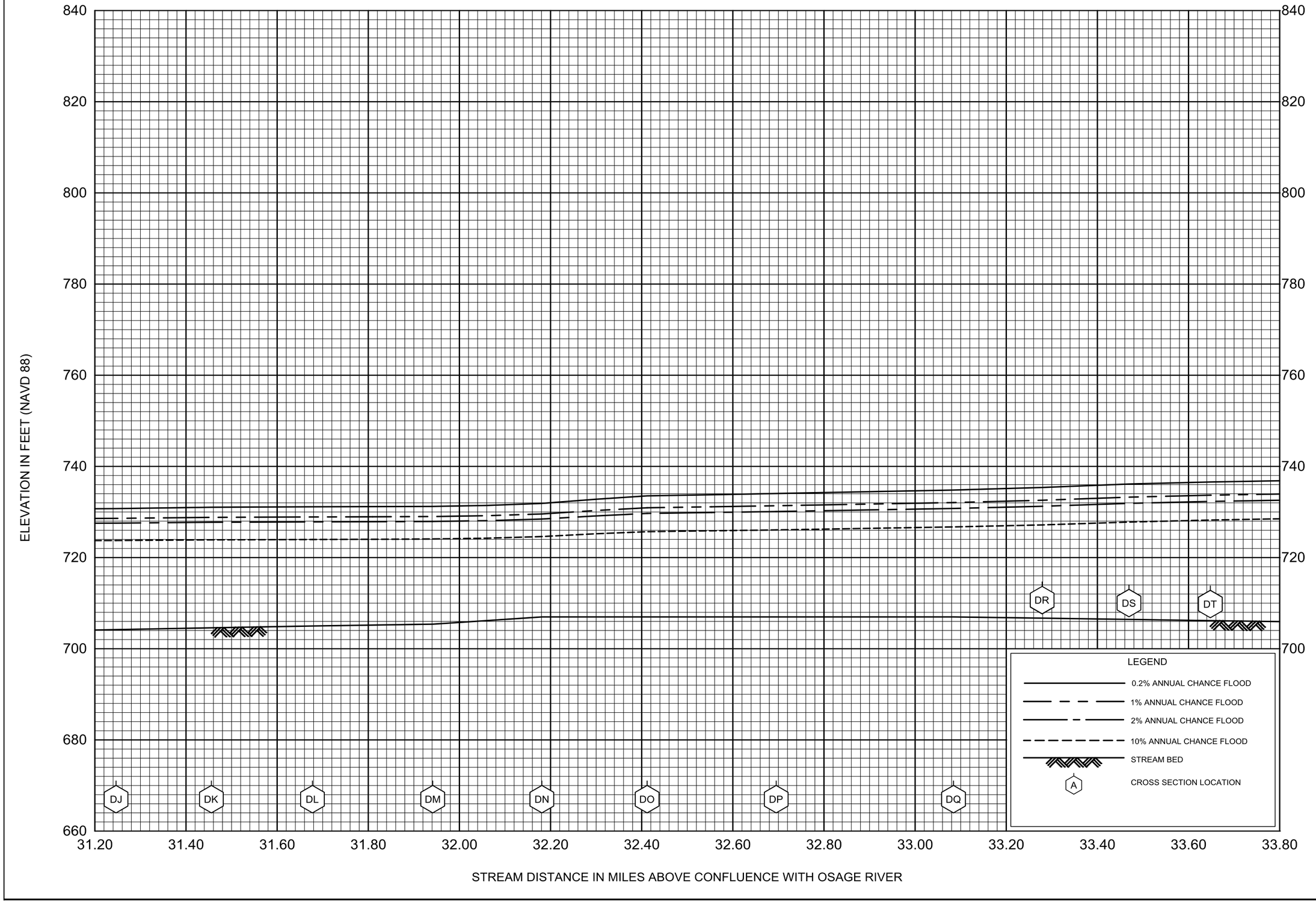
NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

30P



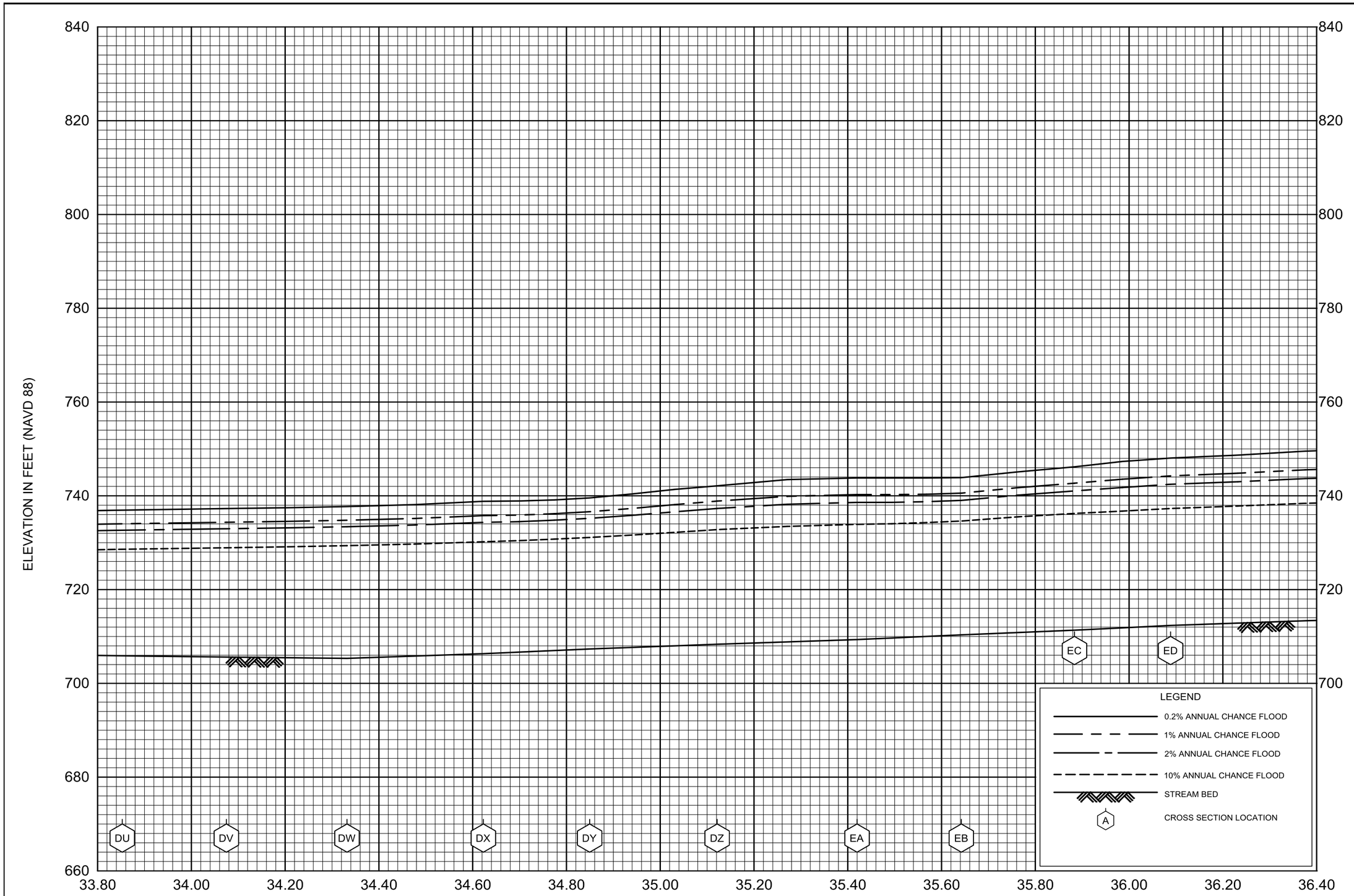
FLOOD PROFILES

NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS



FLOOD PROFILES

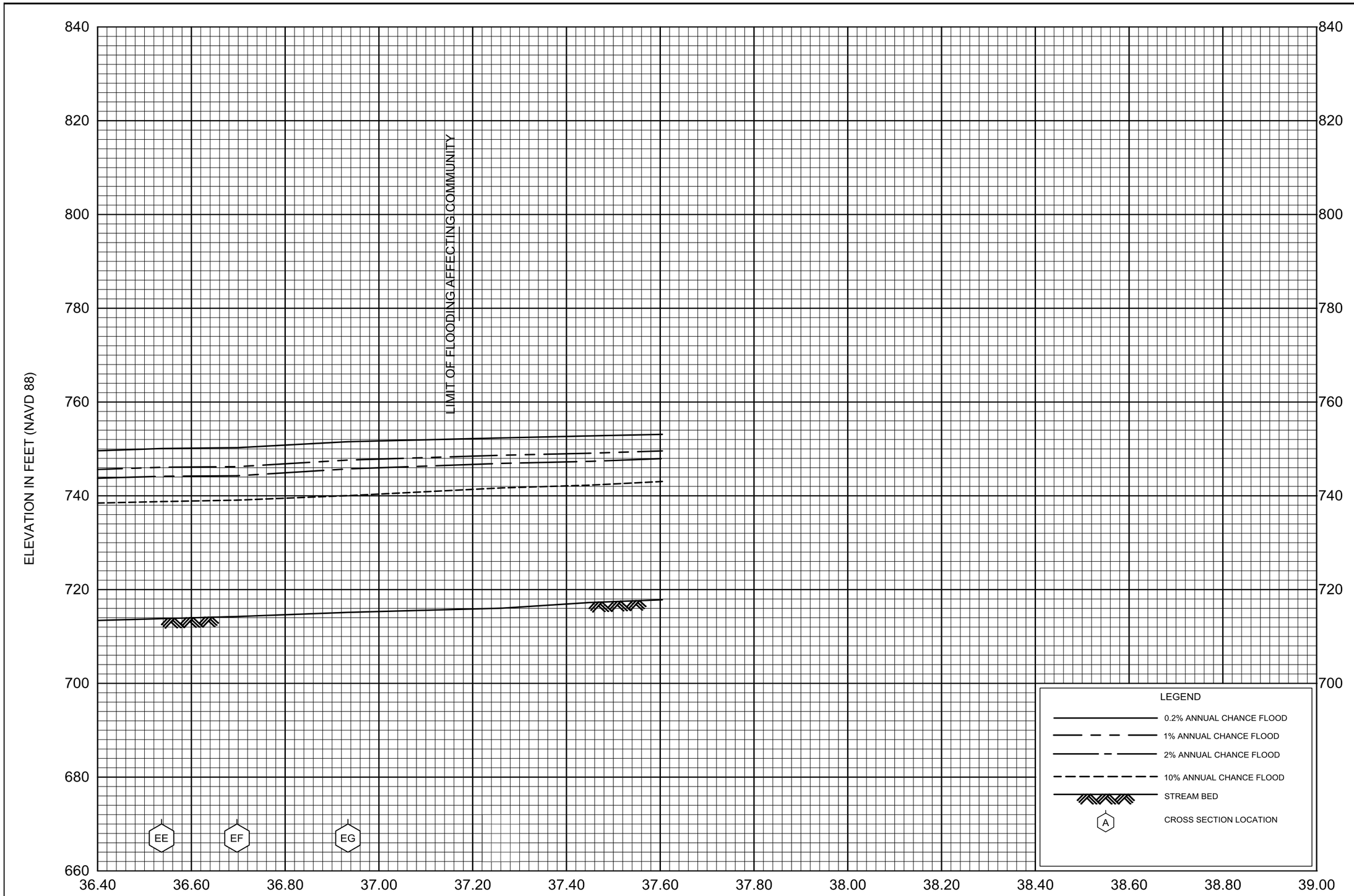
NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

32P



FLOOD PROFILES

NIANGUA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

33P

NOTE: THE 0.2% ANNUAL CHANCE FLOOD PROFILE IS TOO CLOSE TO THE 1% ANNUAL CHANCE FLOOD PROFILE TO BE SHOWN SEPARATELY

BAGNELL DAM

LIMIT OF DETAILED STUDY

ELEVATION IN FEET (NAVD 88)

680
660
640
620
600
580
560
540
520
500

0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00 3.25

STREAM DISTANCE IN MILES ABOVE BAGNELL DAM

A B C D

LEGEND
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO
AND INCORPORATED AREAS

NOTE: THE 0.2% ANNUAL CHANCE FLOOD PROFILE IS TOO CLOSE TO THE 1% ANNUAL CHANCE FLOOD PROFILE TO BE SHOWN SEPARATELY

ELEVATION IN FEET (NAVD 88)

680
660
640
620
600
580
560
540
520
500

3.25 3.50 3.75 4.00 4.25 4.50 4.75 5.00 5.25 5.50 5.75 6.00 6.25 6.50

STREAM DISTANCE IN MILES ABOVE BAGNELL DAM

E
F
G

LEGEND
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

NOTE: THE 0.2% ANNUAL CHANCE FLOOD PROFILE IS TOO CLOSE TO THE 1% ANNUAL CHANCE FLOOD PROFILE TO BE SHOWN SEPARATELY

ELEVATION IN FEET (NAVD 88)

680
660
640
620
600
580
560
540
520
500

6.50 6.75 7.00 7.25 7.50 7.75 8.00 8.25 8.50 8.75 9.00 9.25 9.50 9.75

STREAM DISTANCE IN MILES ABOVE BAGNELL DAM

H
I
J

LEGEND
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

NOTE: THE 0.2% ANNUAL CHANCE FLOOD PROFILE IS TOO CLOSE TO THE 1% ANNUAL CHANCE FLOOD PROFILE TO BE SHOWN SEPARATELY

ELEVATION IN FEET (NAVD 88)

680
660
640
620
600
580
560
540
520
500

9.75 10.00 10.25 10.50 10.75 11.00 11.25 11.50 11.75 12.00 12.25 12.50 12.75 13.00

STREAM DISTANCE IN MILES ABOVE BAGNELL DAM

K L M

LEGEND
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

37P

NOTE: THE 0.2% ANNUAL CHANCE FLOOD PROFILE IS TOO CLOSE TO THE 1% ANNUAL CHANCE FLOOD PROFILE TO BE SHOWN SEPARATELY

ELEVATION IN FEET (NAVD 88)

680
660
640
620
600
580
560
540
520
500

13.00 13.25 13.50 13.75 14.00 14.25 14.50 14.75 15.00 15.25 15.50 15.75 16.00 16.25

STREAM DISTANCE IN MILES ABOVE BAGNELL DAM

N O P

LEGEND
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

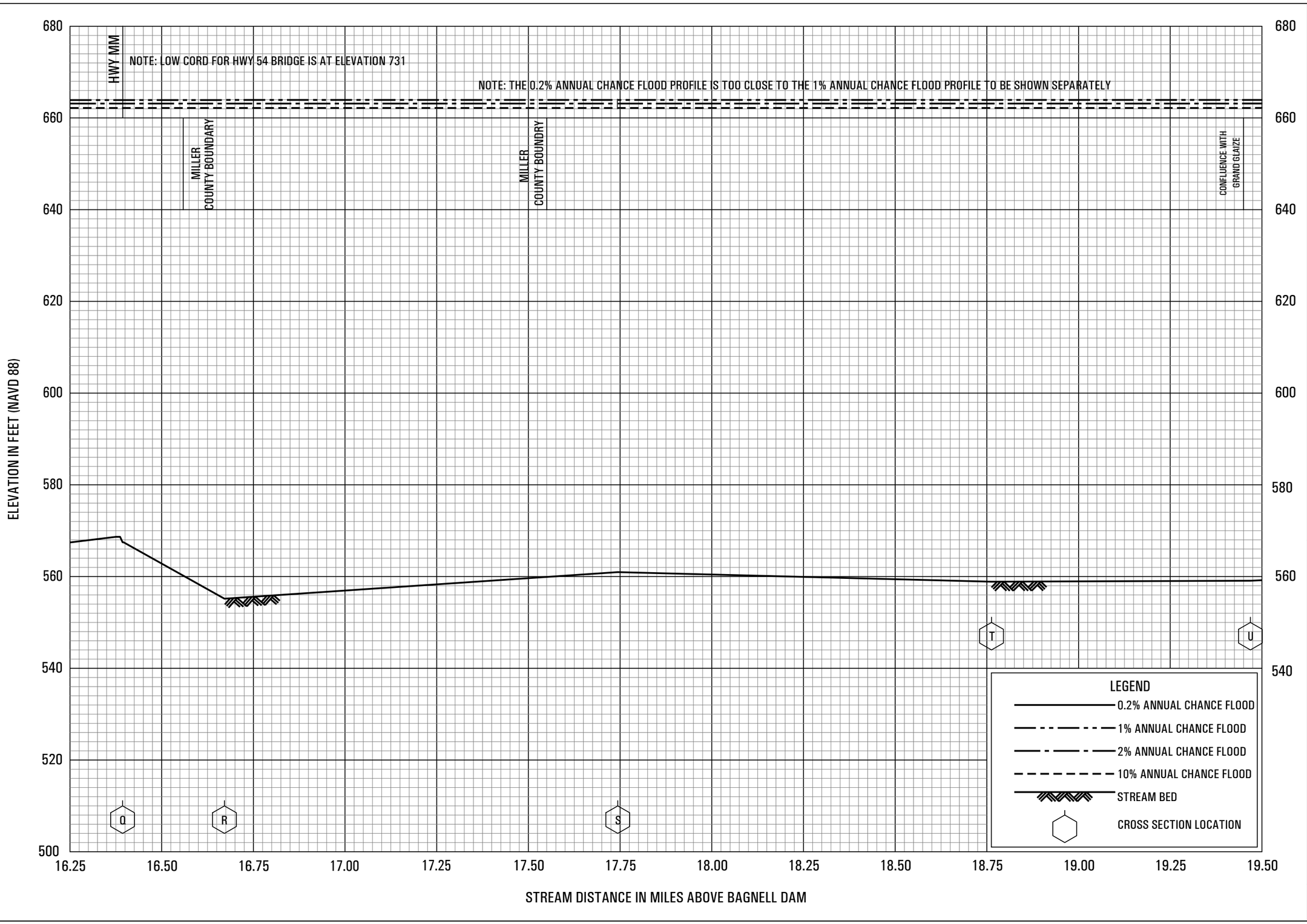
OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

38P



FLOOD PROFILES

OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

39P

NOTE: THE 0.2% ANNUAL CHANCE FLOOD PROFILE IS TOO CLOSE TO THE 1% ANNUAL CHANCE FLOOD PROFILE TO BE SHOWN SEPARATELY

ELEVATION IN FEET (NAVD 88)

680
660
640
620
600
580
560
540
520
500

19.50 19.75 20.00 20.25 20.50 20.75 21.00 21.25 21.50 21.75 22.00 22.25 22.50 22.75

STREAM DISTANCE IN MILES ABOVE BAGNELL DAM

V W X

LEGEND
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

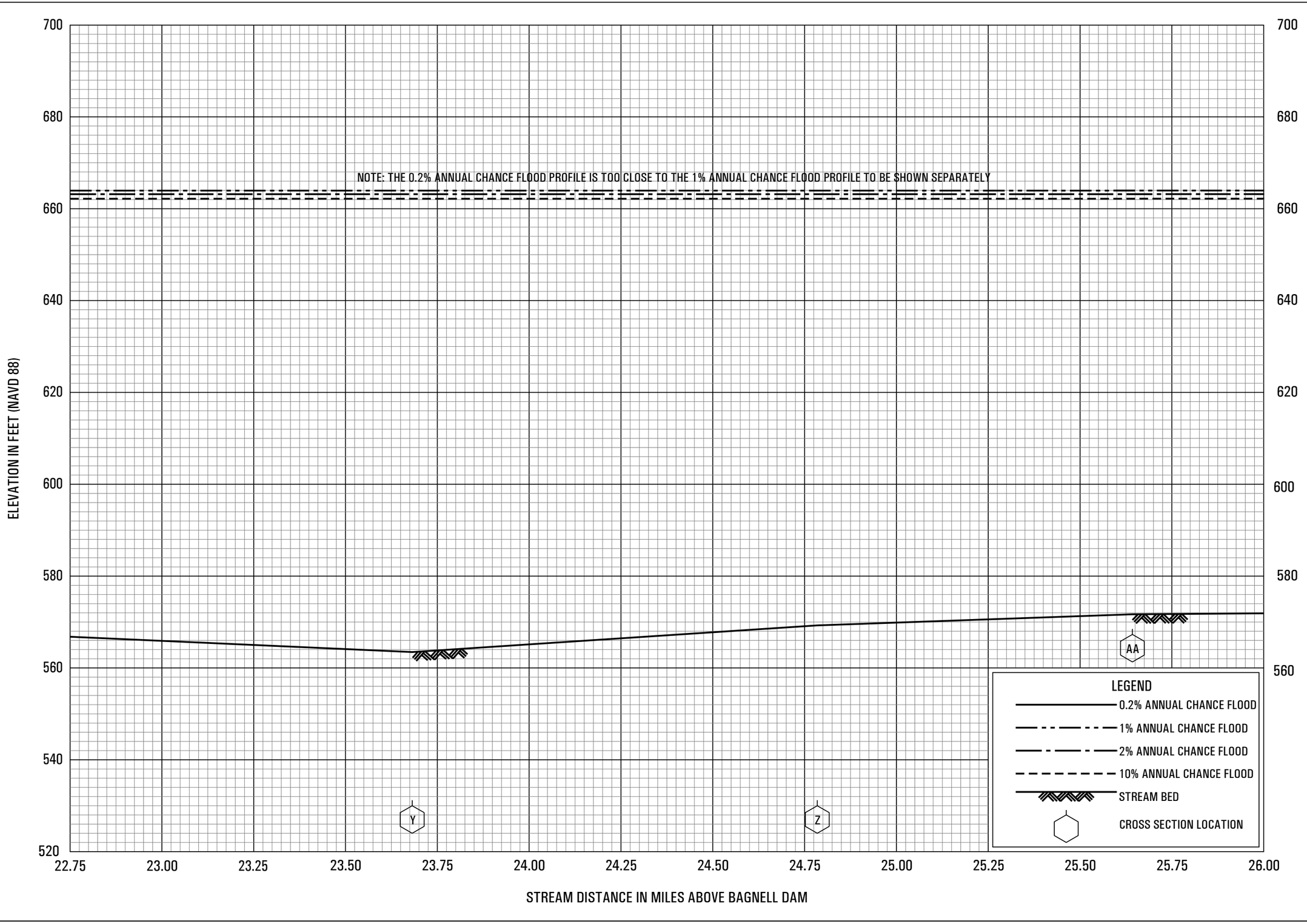
FLOOD PROFILES

OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS



FLOOD PROFILES

OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

41P

NOTE: THE 0.2% ANNUAL CHANCE FLOOD PROFILE IS TOO CLOSE TO THE 1% ANNUAL CHANCE FLOOD PROFILE TO BE SHOWN SEPARATELY

ELEVATION IN FEET (NAVD 88)

700
680
660
640
620
600
580
560
540
520

26.00 26.25 26.50 26.75 27.00 27.25 27.50 27.75 28.00 28.25 28.50 28.75 29.00 29.25

STREAM DISTANCE IN MILES ABOVE BAGNELL DAM

AB
AC
AD

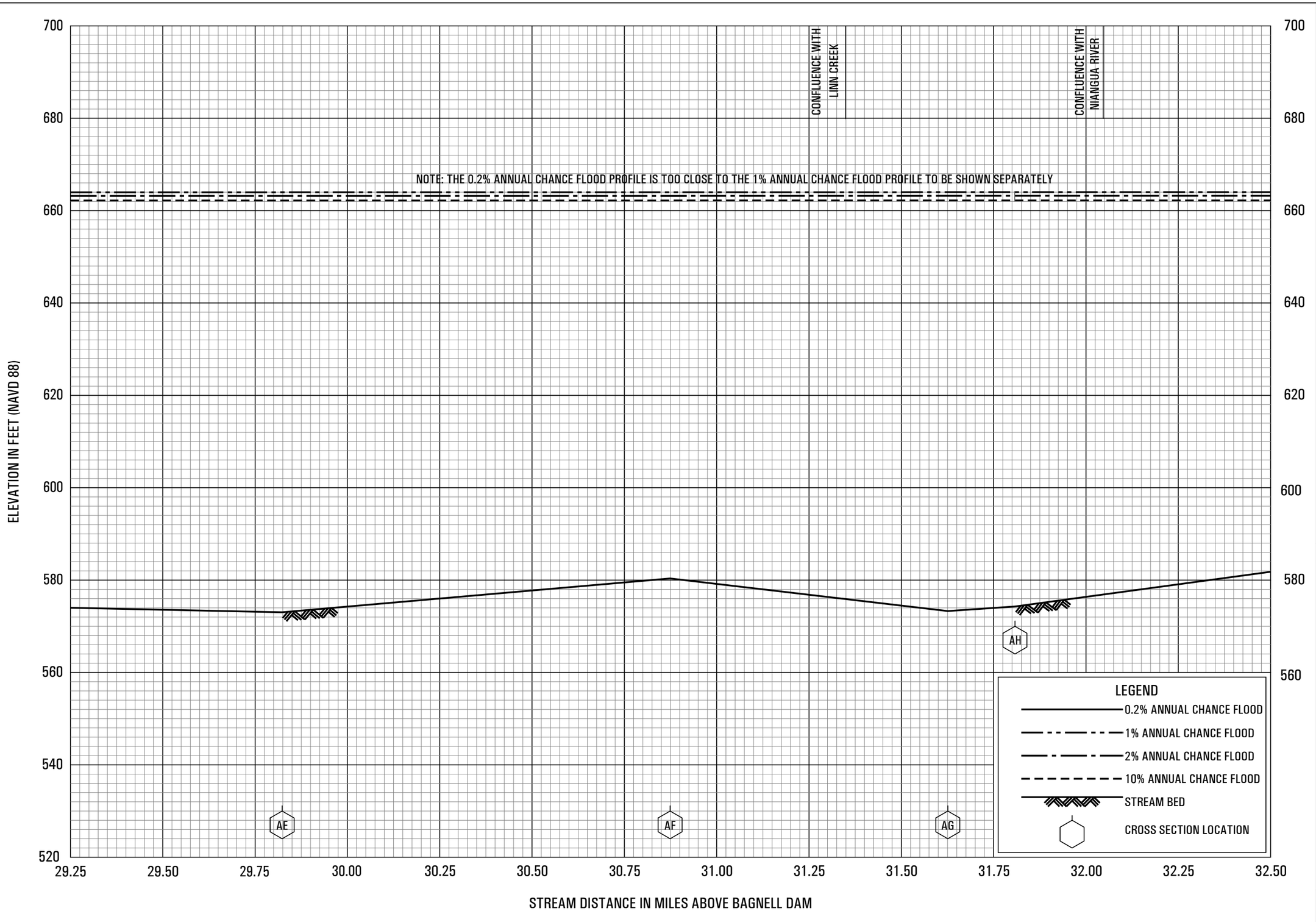
LEGEND
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO
AND INCORPORATED AREAS



FLOOD PROFILES

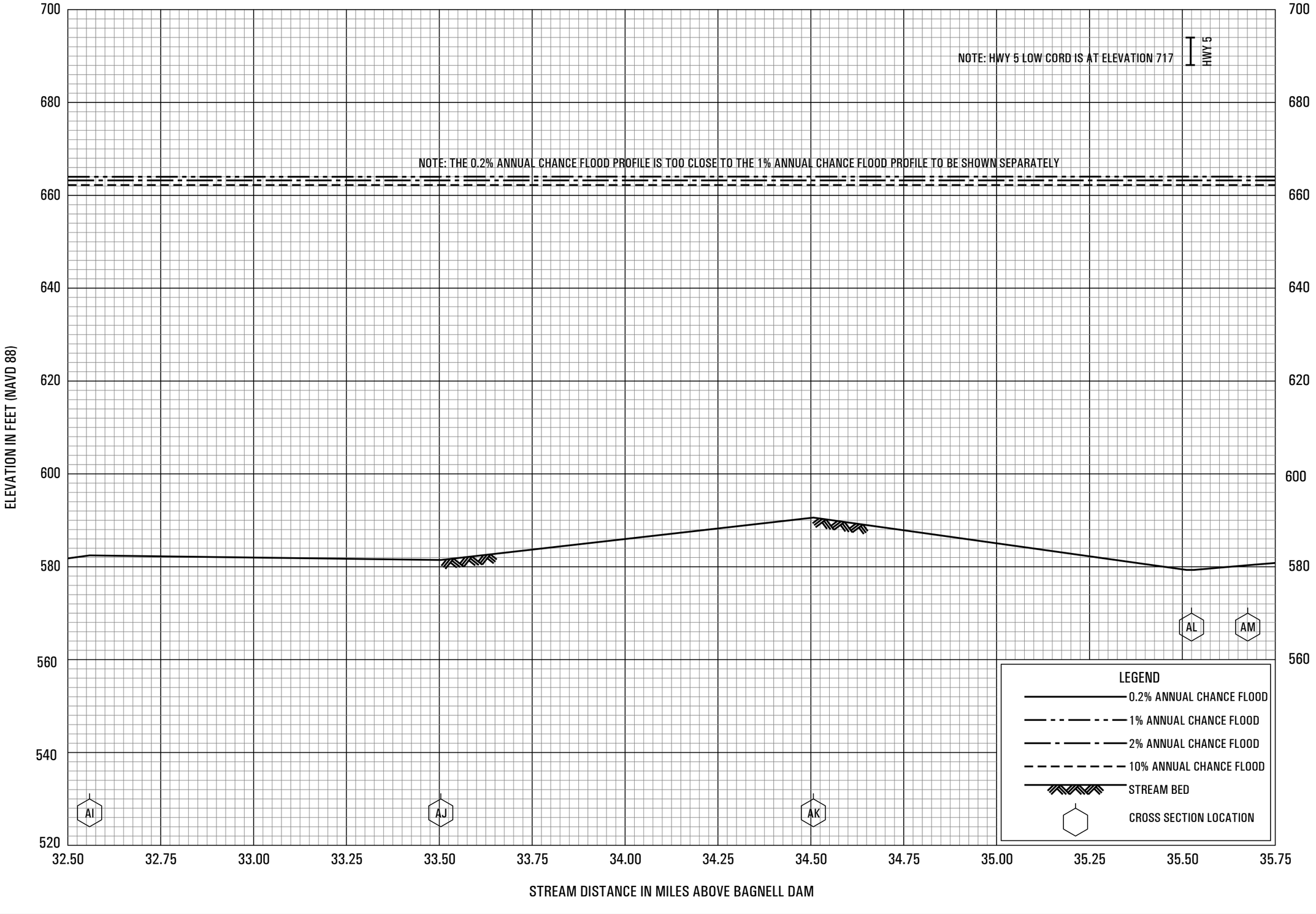
OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

43P



FLOOD PROFILES

OSAGE RIVER

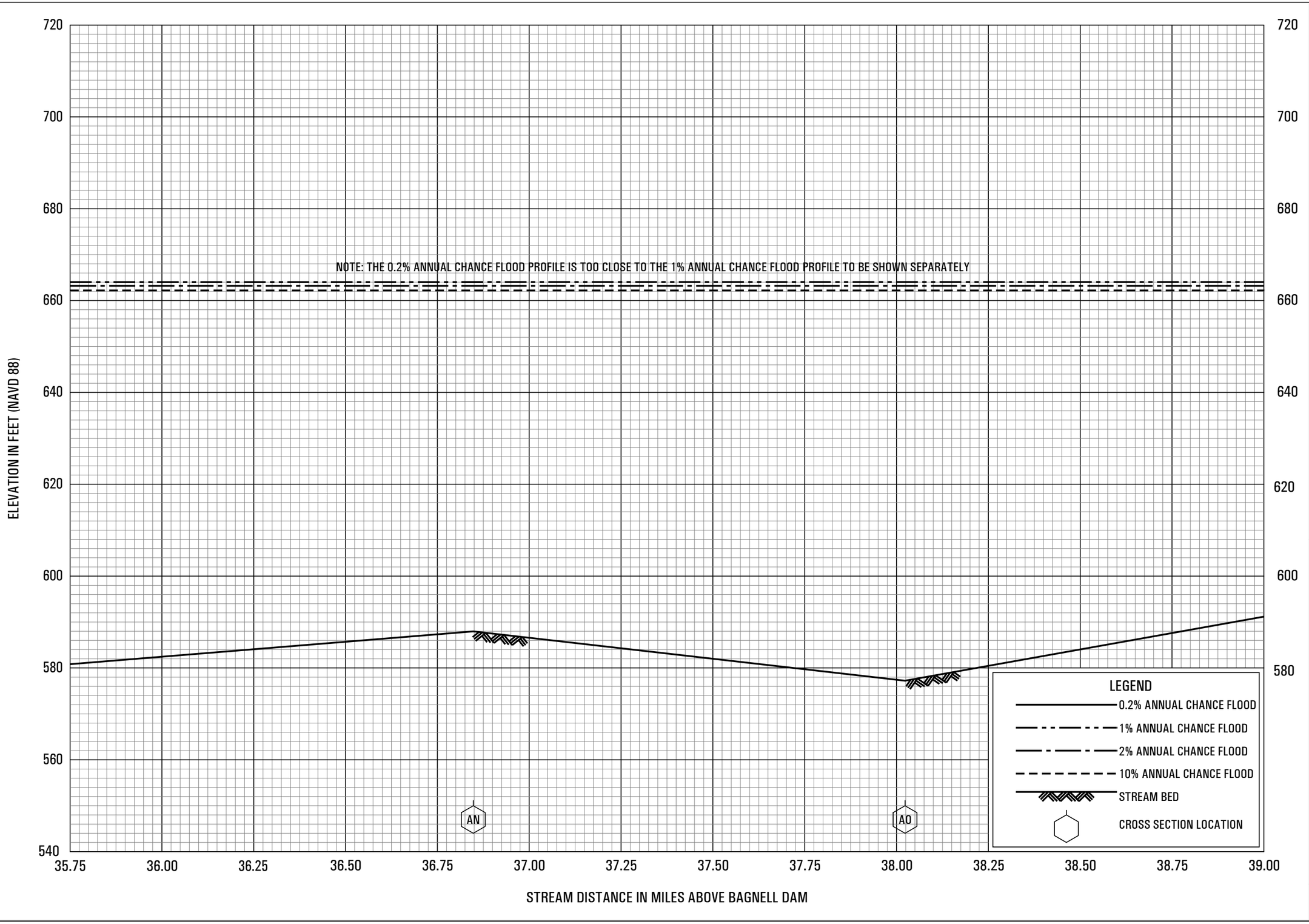
FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

44P

T



FLOOD PROFILES

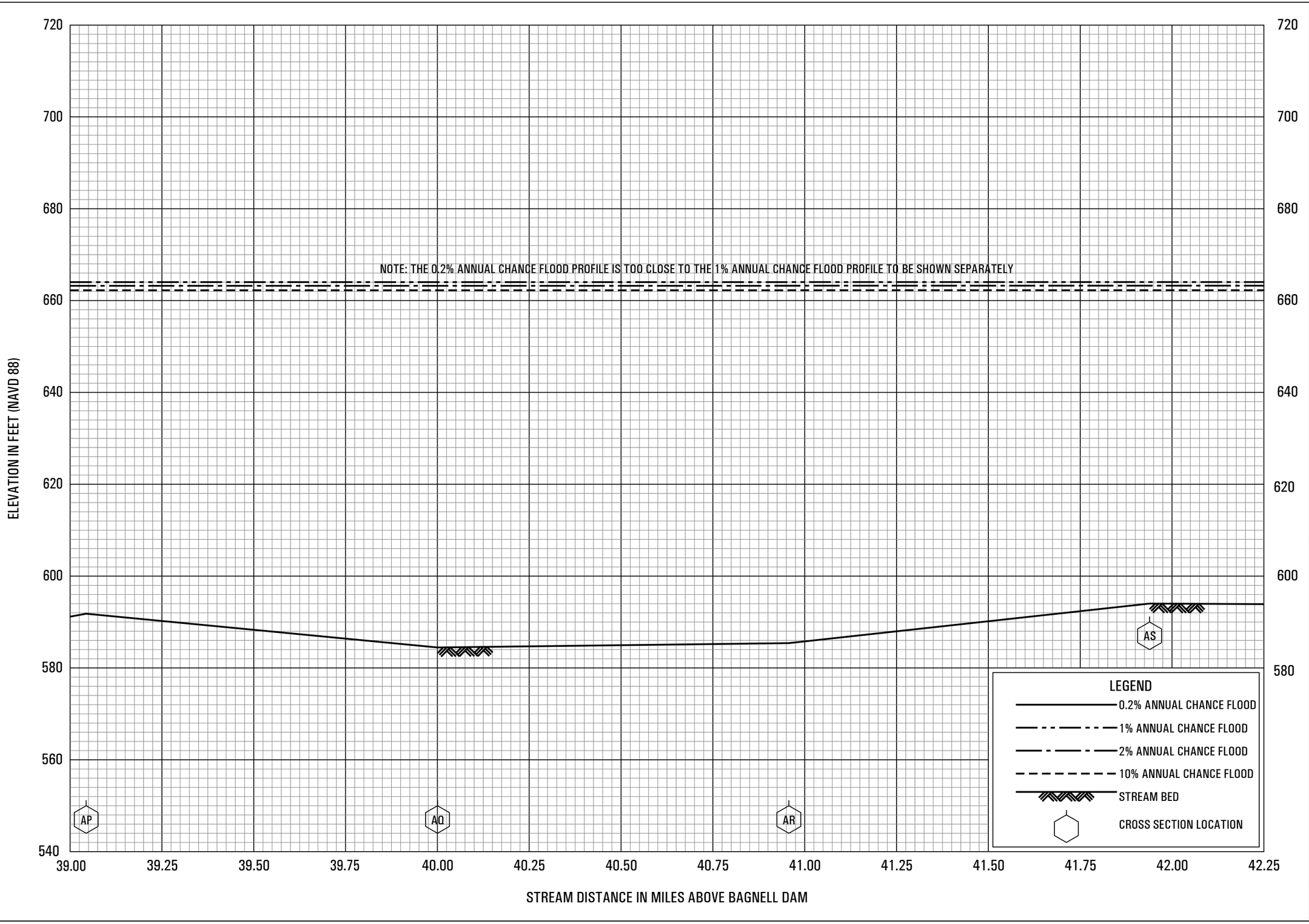
OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

45P



FLOOD PROFILES

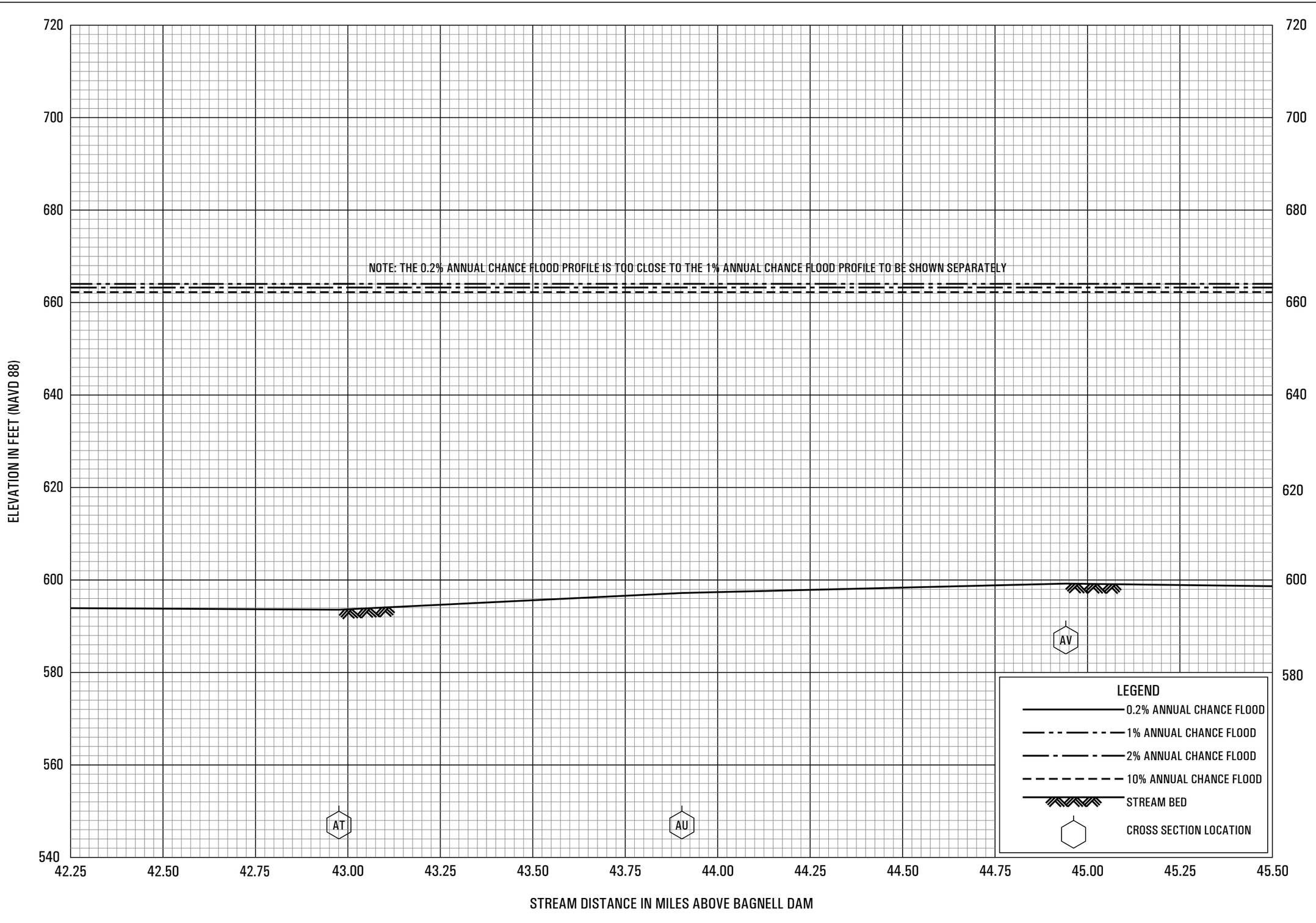
OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

46P



FLOOD PROFILES

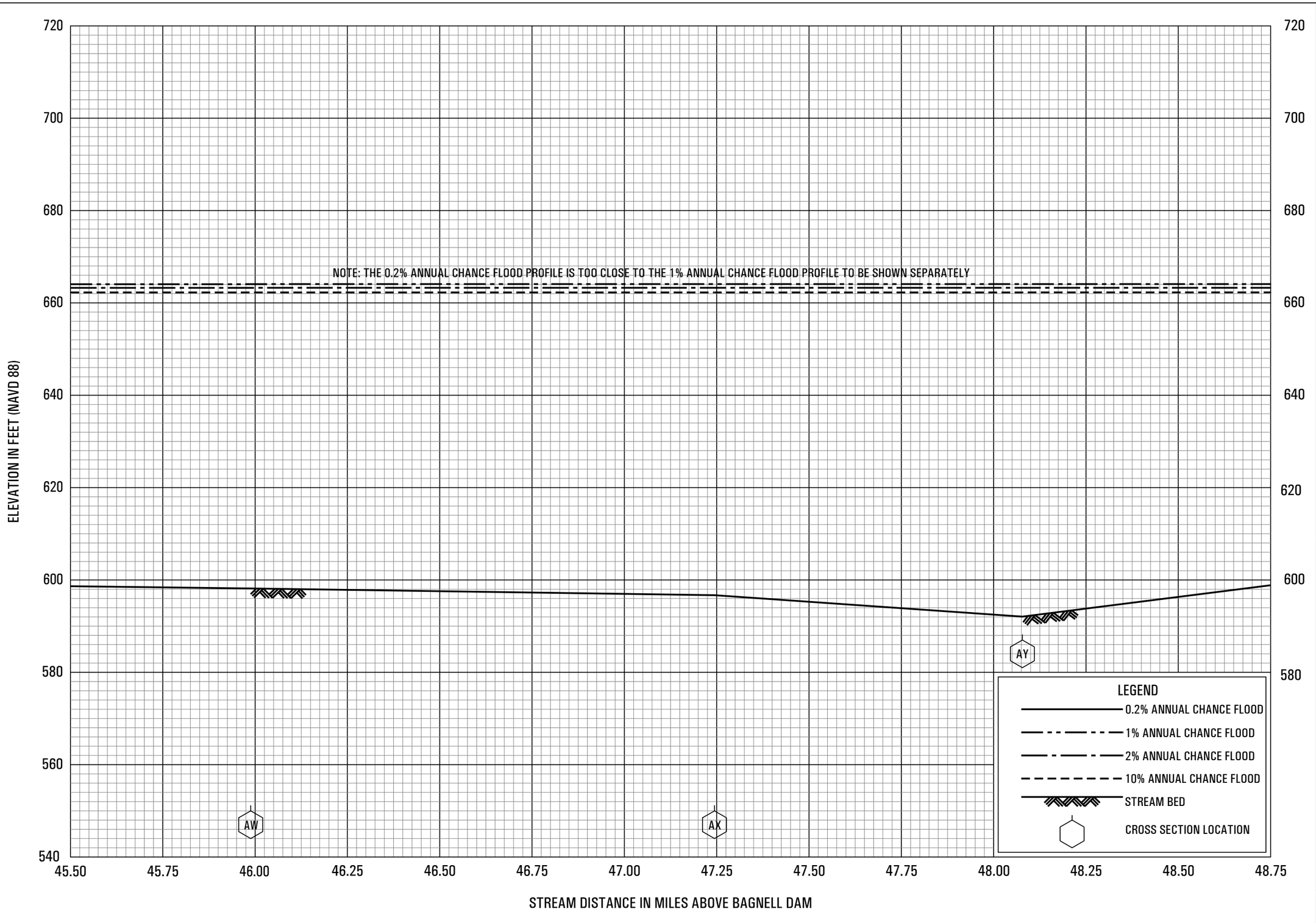
OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

47P



FLOOD PROFILES

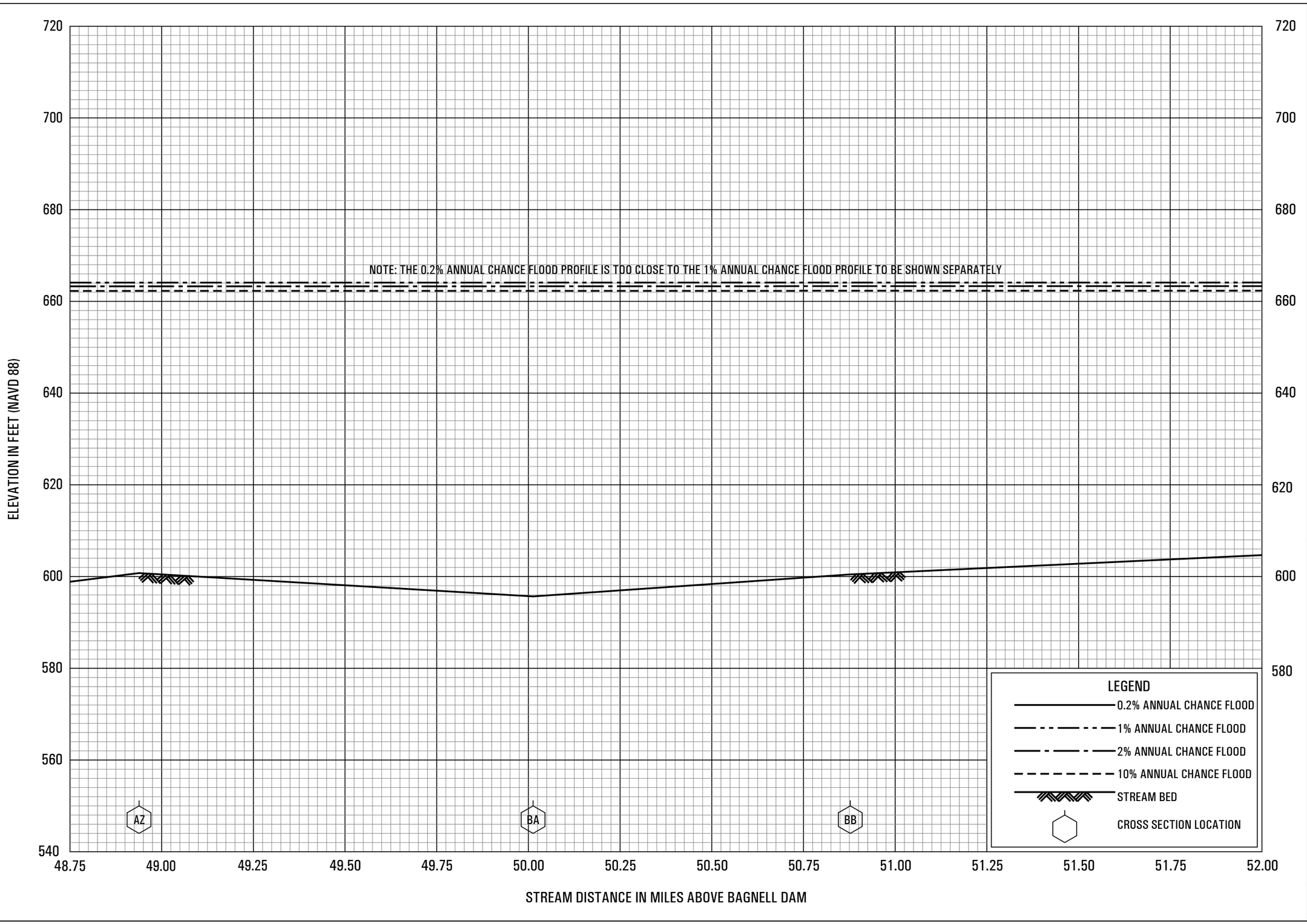
OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

48P



FLOOD PROFILES

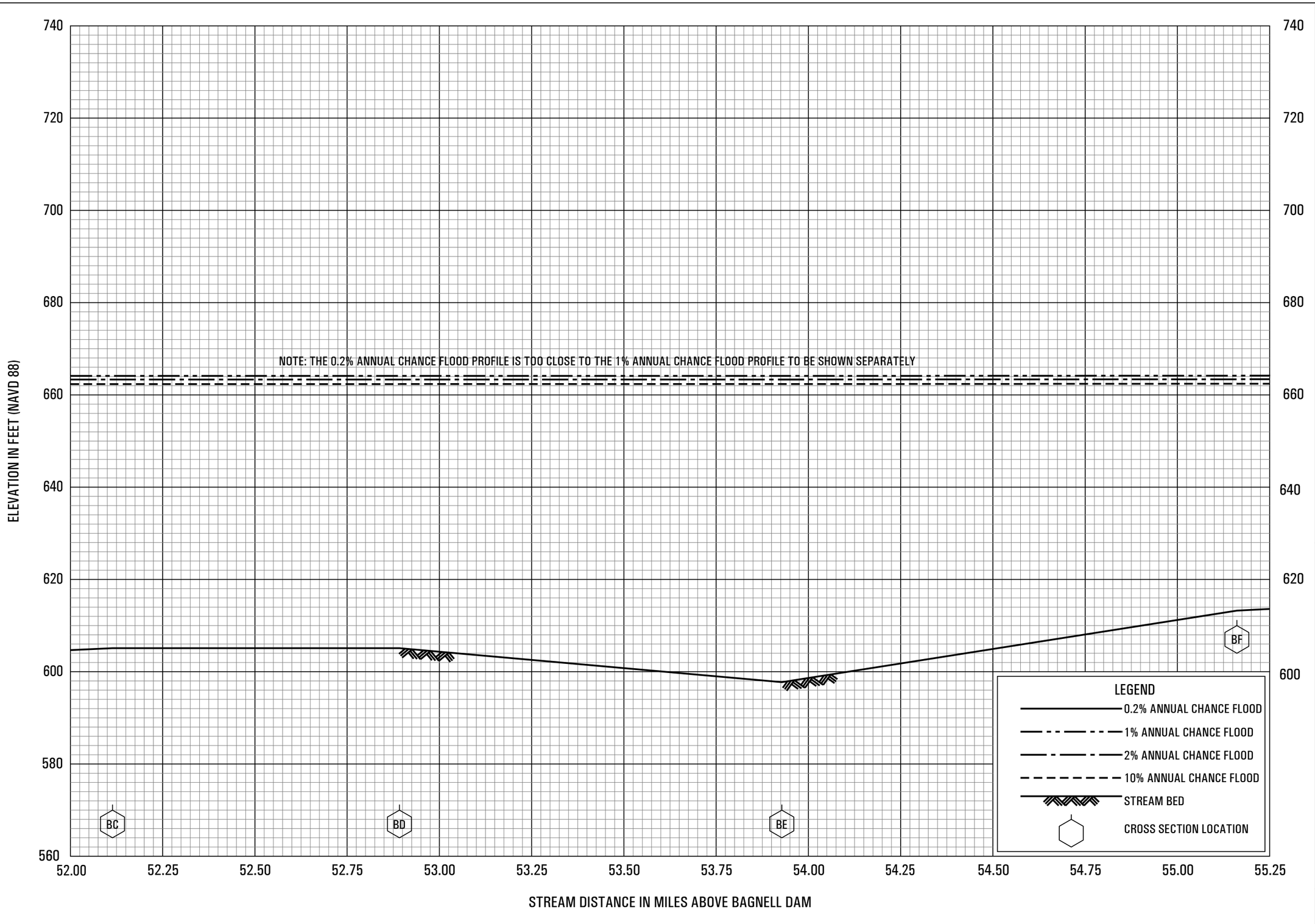
OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

49P



FLOOD PROFILES

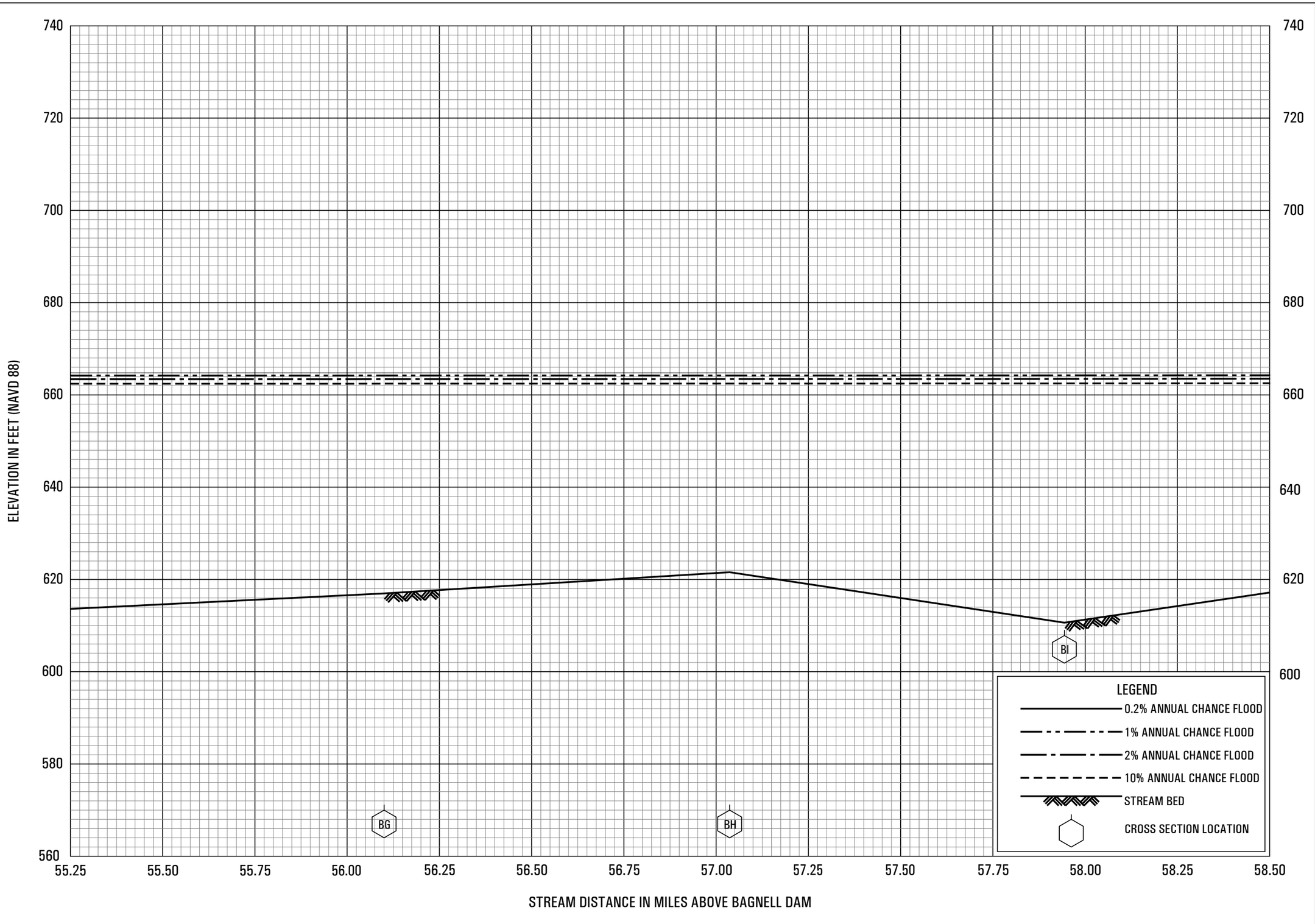
OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

50P



FLOOD PROFILES

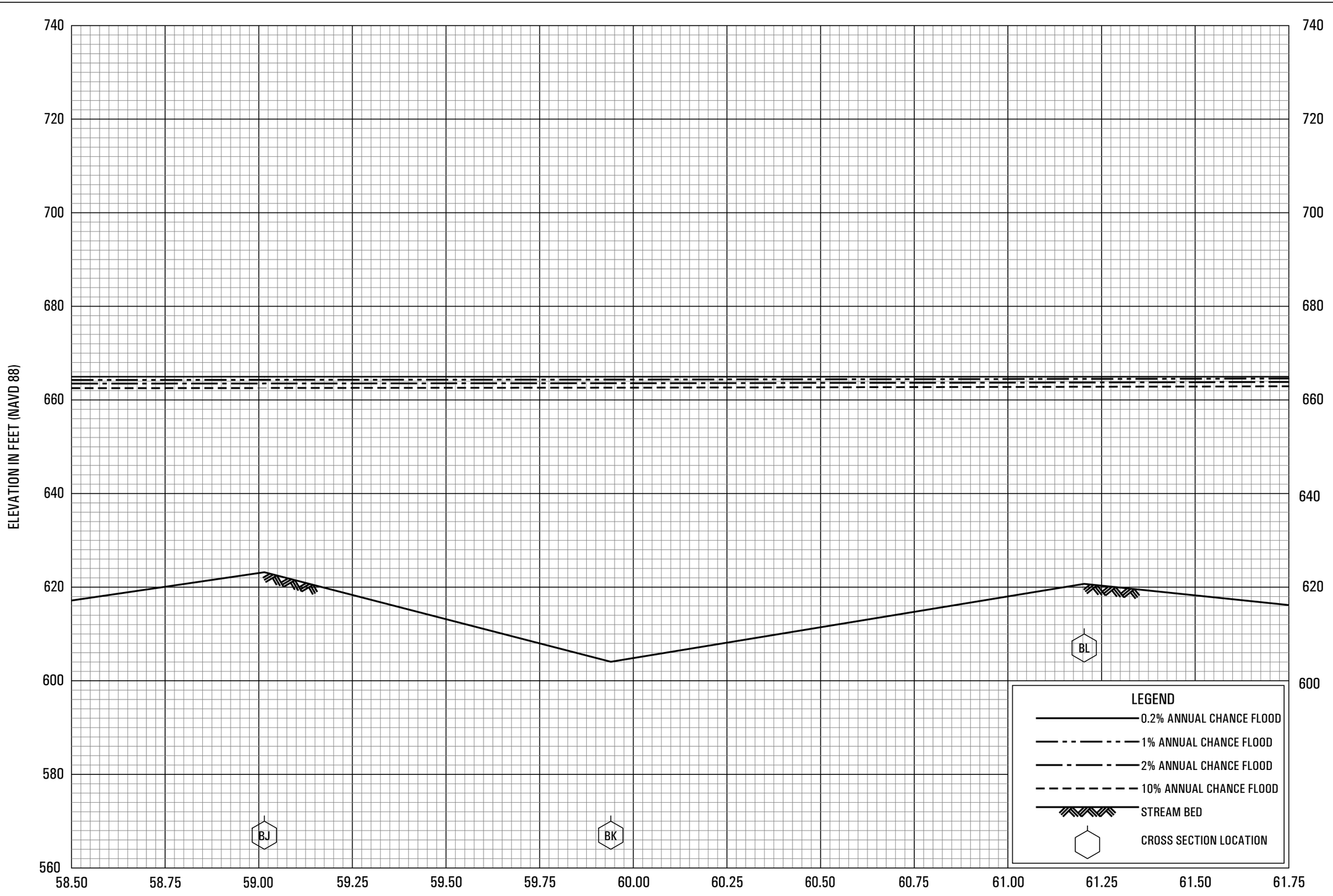
OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

51P



FLOOD PROFILES

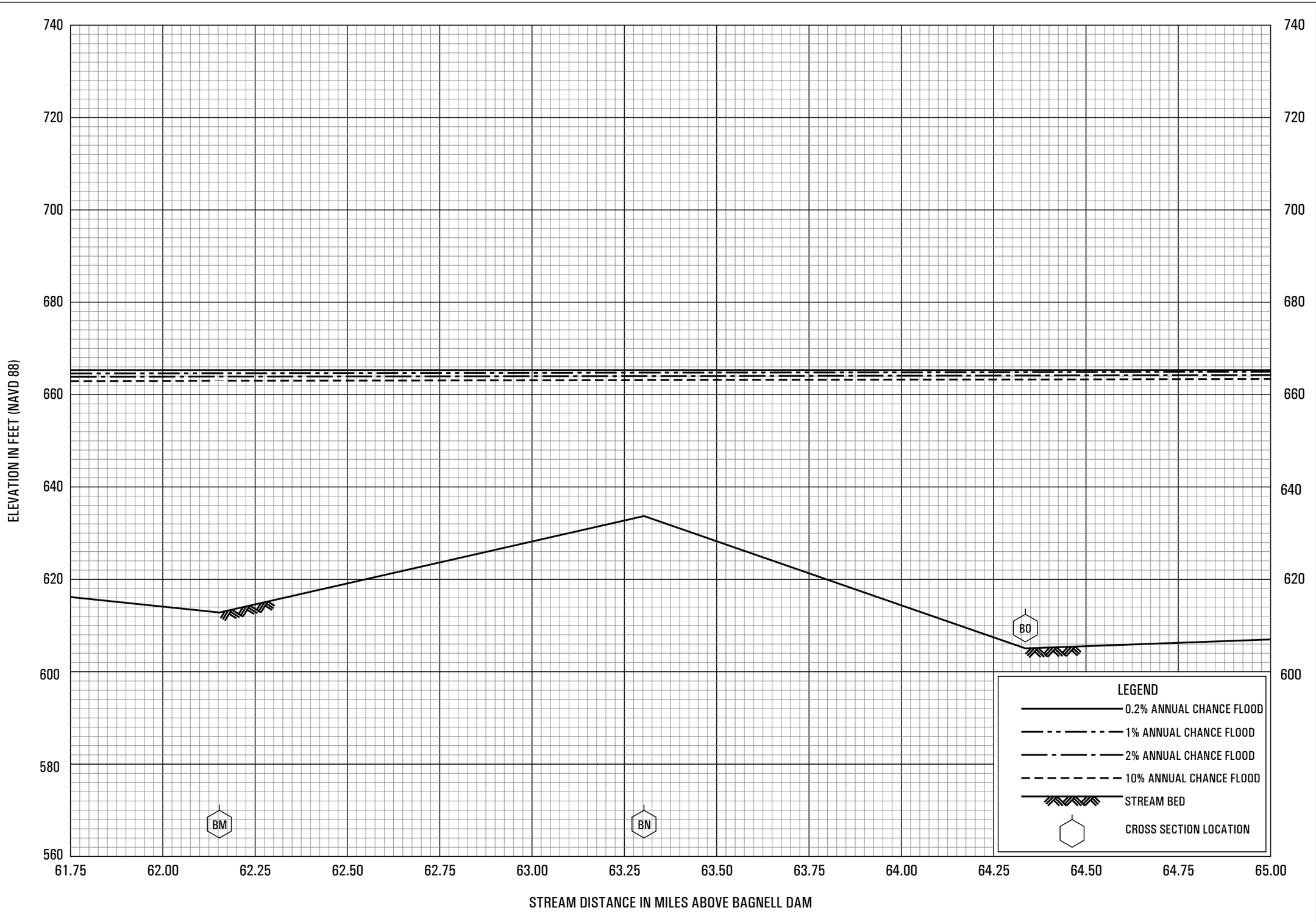
OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

52P



FLOOD PROFILES

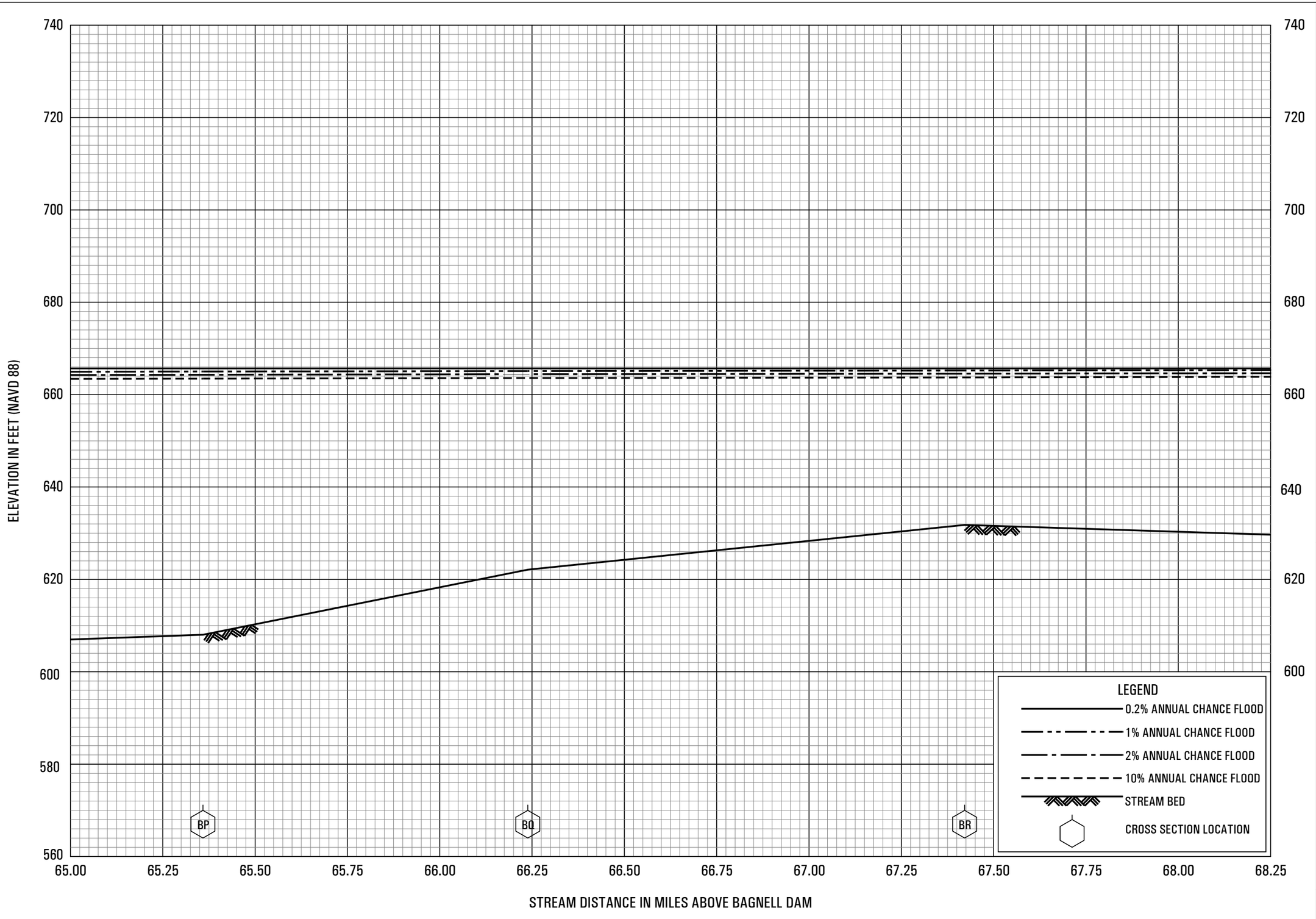
OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

53P



FLOOD PROFILES

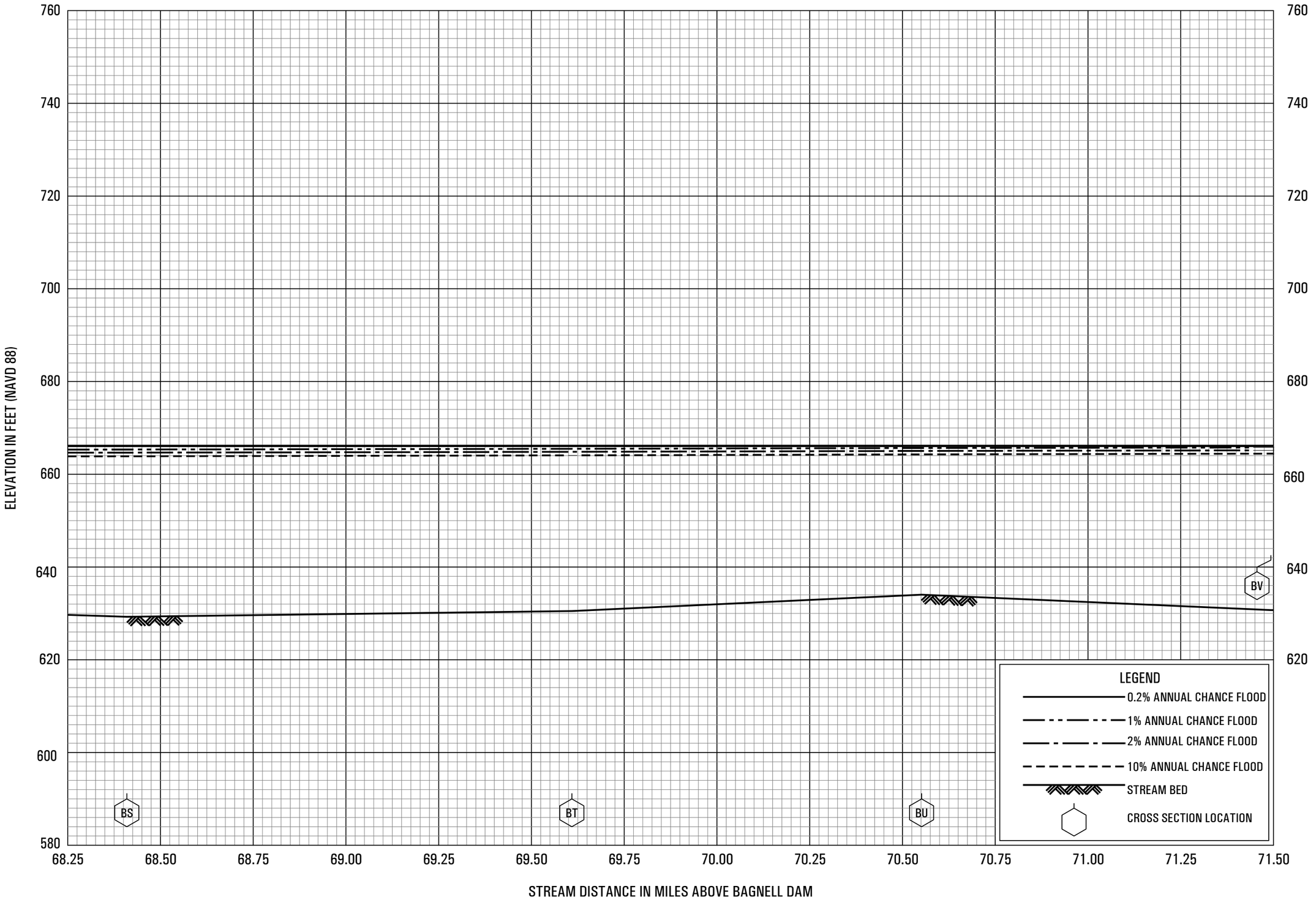
OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

54P



FLOOD PROFILES

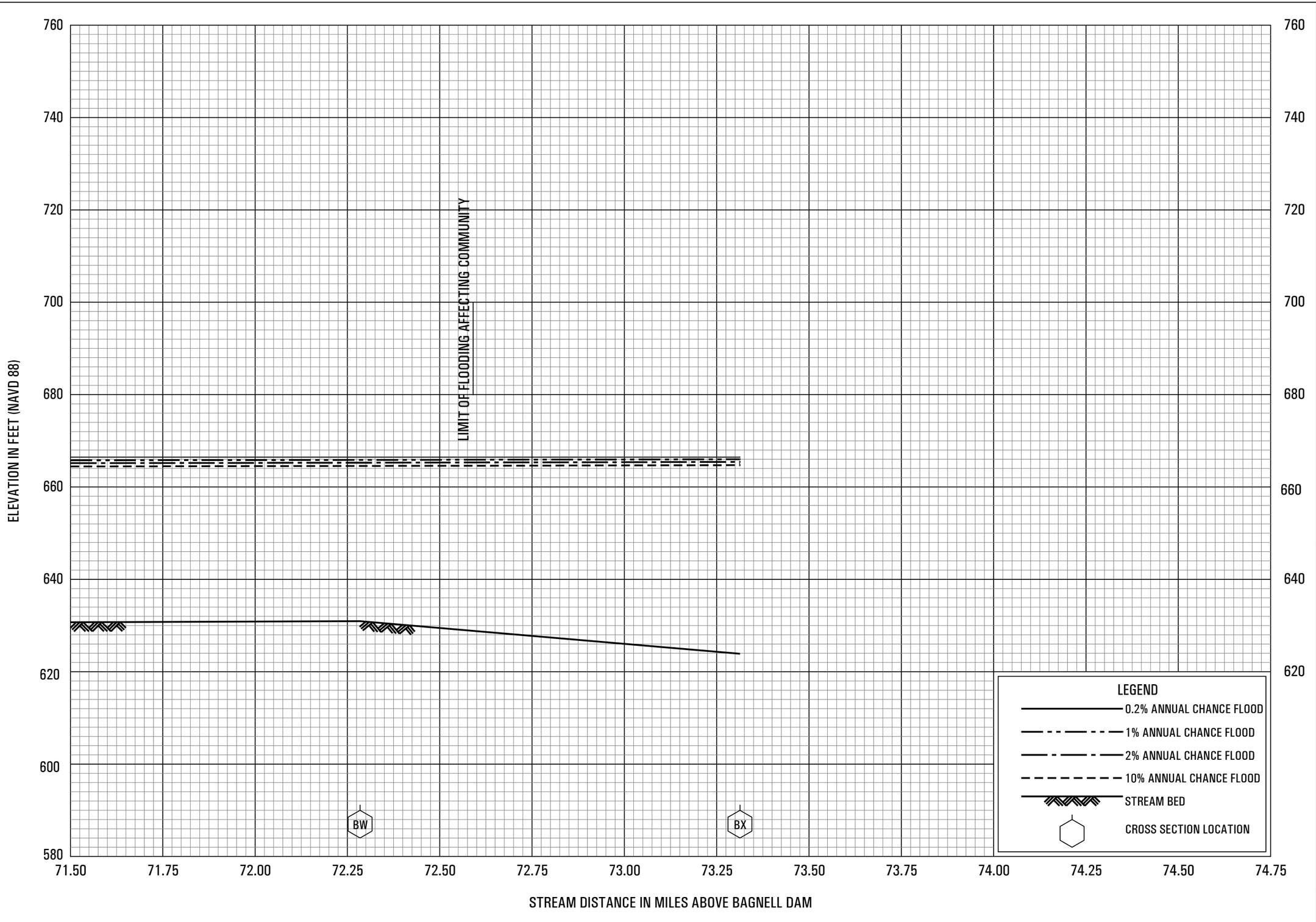
OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

55P



FLOOD PROFILES

OSAGE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, MO

AND INCORPORATED AREAS

56P