FLOOD INSURANCE STUDY

NEWTON COUNTY, TEXAS
AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
CITY OF, NEWTON	480500
NEWTON COUNTY, UNINCORPORATED AREAS	480499

SEPTEMBER 21, 1998

Federal Emergency Management Agency

NOTICE TO
FLOOD INSURANCE STUDY USERS

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

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FLOOD INSURANCE STUDY
NEWTON COUNTY, TEXAS AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study revises and updates information on the existence and severity of flood hazards in the geographic area of Newton County, Texas, including the City of Newton and the unincorporated areas of Newton County (referred to collectively herein as Newton County), and 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 and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (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 Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydraulic analyses for this study were performed by Turner Collie & Braden Inc., for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-93-C-4126. The flood discharges used in this study were taken from hydrologic studies performed by Brown & Root Inc., for the Sabine River Authority (SRA) (Reference 1).

1.3 Coordination

The initial Consultation and Coordination Officer (CCO) meeting was held on June 29, 1992, and attended by representatives of the community, the SRA, FEMA, and Turner Collie & Braden Inc.

Four reaches of the Sabine River, encompassing a total of 20 stream miles, were studied. At the coordination meeting, it was revealed that the SRA has performed a flood study to determine peak discharges and floodplains for the reaches of the Sabine River downstream from the Toledo Bend Reservoir, including those through Newton County. Technical accomplishment of the SRA study was performed by Brown & Root Inc., of Houston, Texas.

The flood-flow analysis from the SRA study was consistent with the standards defined by FEMA Guidelines and Specifications (Reference 2). However, the hydraulic analysis did not meet these standards. As a result, the study performed by Turner Collie & Braden Inc. involved a hydraulic study of the selected reaches utilizing the discharges from the SRA study.

The results of the study were reviewed at the final CCO meeting held on February 26, 1996, and attended by representatives of FEMA and Newton County. All problems raised at that meeting have been addressed in this study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the geographic area of Newton County, Texas, including the incorporated communities listed in Section 1.1.

The principal source of flooding for the community is the Sabine River. The Sabine River forms the eastern boundary of Newton County, as well as the Texas/Louisiana boundary. The total stream reach of the river within Newton County is approximately 60 miles, running from the Toledo Bend Reservoir upstream to the Orange County line downstream. The floodplain of the Sabine River ranges up to 2 miles wide on each side of the river. Four separate stream reaches, or areas totaling approximately 20 miles, were studied in detail. These stream reaches were the Deweyville area, the Sabine Sands/Bon Weir area, the State Highway 63 area, and the area just downstream from the Toledo Bend Dam.

A brief description of each study reach is listed below.

1) The Deweyville Area Reach extends from approximately 2.6 miles downstream of the State Highway 12 bridge to approximately 1 mile upstream of the State Highway 12 bridge. This area includes the unincorporated community of Deweyville, with a number of residences, businesses, and schools. The City of Starks, Louisiana, is located on the Louisiana side of the river within this reach.

2) The Sabine Sands/Bon Weir Reach extends from the Caney Creek/Sabine River confluence upstream to a point on the Sabine River adjacent to Moon Lake. The Sabine Sands residential development is located downstream of U.S. Highway 190, and a private fish hatchery is located upstream of U.S. Highway 190. The City of Merryville, Louisiana, is located on the Louisiana side of the river within this reach.

3) The State Highway 63 Reach extends from a point approximately 1.4 miles downstream of the State Highway 63 bridge to a point 1.5 miles upstream from this bridge. Scattered single-family residences are located in the area north of the highway.

4) The Toledo Bend/River Road Area Reach extends from a point approximately 2,000 feet downstream (south) of the confluence of the Sabine River and the Toledo Bend Power Plant Discharge Channel upstream to the confluence of the river with Toro Bayou. The River Road area between the discharge channel and Toro Bayou includes a number of single-family residences.

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 Newton County.

2.2 Community Description

Newton County is located in extreme southeastern Texas along the Louisiana border. It is situated approximately 90 miles east of Houston and approximately 30 miles north of Beaumont. The county covers approximately 935 square miles. Its current population is approximately 14,000, of which approximately 1,700 live in Newton, the county seat and only incorporated town (Reference 3). No Flood Insurance Rate Map currently exists in the study area.

Physiographically, this portion of the Sabine River basin lies within the Gulf Coastal Plain, which is characterized by relatively flat terrain with level or nearly level areas in the floodplains, and higher areas in the northern portions of the county. Soils in the study area are sandy, clayey, and loamy, with significant sand deposits along the river channel (References 4, 5, 6, 7, and 8). The area is heavily wooded, with stands of pine and hardwoods. There are large stands of natural cypress trees in wetland areas within the floodplain in southern portions of the county. Elevations range from sea level to about 250 feet above the National Geodetic Vertical Datum of 1929 (NGVD). Some portions of Orange County to the south of the study area have undergone minor land subsidence, but no significant subsidence has occurred within the detailed-study reaches.

The study area is located in a humid subtropical climatic zone, which is characterized by moderate winters and warm summers. Rainfall is abundant, and on the average is evenly distributed throughout the year. The hurricane season extends from June through October. The average annual precipitation is approximately 54 inches, and the average annual temperature is approximately 68°F (Reference 9).

2.3 Principal Flood Problems

Low-lying areas adjacent to the Sabine River are subject to periodic flooding. Official records of past floods show that damaging floods occurred during 1884, 1913, 1945, 1953, 1989, and 1991. The discharges and recurrence intervals of recent major floods at these three study area stream gages are presented in Table 1, "Recent Major Flooding of the Sabine River" (Reference 10).

2.4 Flood Protection Measures

No flood-protection measures have been undertaken with Newton County. The Toledo Bend Reservoir, a water-supply reservoir, was constructed on the Sabine River just north of the study area in 1967. The previously mentioned study by SRA (Reference 10) determined that this reservoir provides some degree of regulation on lower flows, but does not specifically impact major floods (100-year recurrence interval and larger).

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 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-,

Table 1. Recent Major Flooding of the Sabine River

Gage Name	May 1989 Discharge (Cubic Feet per Second (cfs))	May 1989 Recurrence Interval (years)	July 1989 Discharge (cfs)	July 1989 Recurrence Interval (years)	April 1991 Discharge (cfs)	April 1991 Recurrence Interval (years)
State Highway 12 (Ruliff)	89,800	40	109,000	85	58,800	8
U.S. Highway 190 (Bon Weir)	91,200	47	98,200	75	72,100	19
State Highway 63 (Burkeville)	116,000	180	103,000	97	79,800	37

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 100-year flood (1-percent chance of annual exceedence) 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 study developed discharge-frequency relationships for return periods of 10, 50, 100, and 500 years (see Table 2, "Summary of Discharges"). A log-Pearson Type III statistical analysis of peak-discharge records at three U.S. Department of the Interior, Geological Survey (USGS) gaging stations on the lower Sabine River below the Toledo Bend Dam was performed. Each of these gaging stations is located within a detailed-study reach. The locations and length of flow records for the gaging stations are: Gage No. 08026000 at State Highway 63 -- 35 years; Gage No. 08028500 at U.S. Highway 190 -- 67 years; and Gage No. 08030500 at State Highway 12 -- 79 years.

The data record for the two gaging stations with shorter records was extended by a regression-analysis technique. In order to reflect the effect of reservoir regulation on downstream river flows, systematic record non-regulated discharges prior to 1967 were converted to "regulated" flows prior to performing the statistical analysis. The log-Pearson Type III statistical analysis of the records from the State Highway 63 and U.S. Highway 190 gage records was adopted for use in the hydraulic studies. However, the peak discharges for the Deweyville area from the State Highway 12 gaging station conflicted with two previous studies: the 1988 Flood Insurance Study of Calcasieu Parish, Louisiana, adjacent to the Deweyville study area, and the 1982 Flood Insurance Study of Orange County, Texas, just downstream from Deweyville.

Discharges for the State Highway 12 gaging station for this current study are statistically similar to discharges in the Calcasieu Parish Flood Insurance Study, but statistically dissimilar to flows calculated within the Orange County Flood Insurance Study. Therefore, in accordance with FEMA Guidelines, the Calcasieu Parish Flood Insurance Study discharges were used for the Deweyville area study.

Although peak discharges for the upstream detailed-study reach adjacent to the Toledo Bend Dam were, in general, based on the analysis of the State Highway 63 gage, discharges for the reach upstream of the Power Plant Discharge Channel were adjusted to reflect SRA operating policies. Records maintained by the SRA indicate that when total peak flow released from the Toledo Bend Dam exceeds approximately 50,000 cfs, the maximum release rate from the hydropower station is maintained at 18,000 cfs, and the remaining peak flow is released from the spillwater tainter gates. Therefore, 18,000 cfs were subtracted from each peak-flood discharge for this upstream reach.

Table 2. Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs) 10-Year	50-Year	100-Year	500-Year
Sabine River					
At State Highway 12	9,329	66,100	98,700	113,800	150,000
At U.S. Highway 190	8,229	61,000	94,000	110,000	148,000
At State Highway 63	7,482	57,000	90,000	105,000	144,000
At the Toledo Bend Dam[1]	7,178	39,000	72,000	87,000	126,000

[1]Adjusted for discharges from hydropower tailrace

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.

Water-surface elevations of the 10-, 50-, 100-, and 500-year floods were computed using the HEC-2 computer program developed by the U.S. Army Corps of Engineers (USACE), Hydrologic Engineering Center (Reference 11).

Channel and valley cross sections of the streams were obtained by field surveys and available data from the Texas Department of Transportation; the USACE; the Atchison, Topeka, and Santa Fe Railroad; and the Kansas City Southern Railroad (References 1, 12, and 13). Locations of the surveyed cross sections used in the hydraulic analyses are shown on Exhibit 1, "Flood Profiles," and on the Flood Insurance Rate Map.

Coefficients of roughness (Manning's "n") were assigned to elements of the valley on the basis of field inspection, aerial photos, and calibration to the rating from the USGS curves of the three stream gages in the study area from a previous study (Reference 10). Channel coefficients of roughness ranged from 0.025 to 0.035. Overbank coefficients of roughness ranged from 0.050 to 0.140. Starting water-surface elevations for each detailed stream reach were obtained from the hydraulic analyses in the SRA study.

The hydraulic analyses for the streams are based on existing conditions. Calculated flood elevations are valid only if the waterway structures and channel and overbank characteristics remain in essentially the same condition as ascertained for the period covered under the scope of this study.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. All elevations used in this study are measured from the NGVD, formerly referred to as the Sea Level Datum of 1929. Elevation reference marks are shown and described on the maps.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000, with a contour interval of 5 feet (Reference 14).

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year 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.

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 100-year 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 100-year 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 3, "Floodway Data"). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

The area between the floodway and 100-year 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 100-year 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.

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 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base (100-year) flood elevations (BFEs) or depths are shown within this zone.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Sabine River								
A	172,010	16,400	124,040	0.9	18.5	18.5	19.3	0.8
B	201,590	11,688	89,011	1.3	23.1	23.1	24.0	0.9
C	216,638	16,133	127,750	0.9	24.3	24.3	25.2	0.9
D	228,488	12,843	124,052	0.9	25.1	25.1	26.1	1.0
E	251,038	10,029	81,172	1.4	27.1	27.1	28.0	0.9
F	273,838	12,400	108,133	1.1	32.6	32.6	33.5	0.9
G	306,438	12,635	120,096	0.9	37.0	37.0	37.7	0.7
H	339,488	8,388	101,090	1.1	42.8	42.8	43.6	0.8
I	377,438	12,699	126,882	0.9	46.5	46.5	47.4	0.9
J	406,238	8,952	77,974	1.5	52.2	52.2	52.9	0.7
K	428,238	11,285	95,337	1.2	56.2	56.2	57.1	0.9
L	459,738	16,794	151,302	0.8	60.5	60.5	61.3	0.8
M	478,238	13,650	116,361	1.0	63.4	63.4	64.0	0.6
N	497,038	16,660	92,950	1.2	66.5	66.5	67.3	0.8
O	512,748	16,200	28,321	3.9	71.9	71.9	72.4	0.5
P	521,248	15,076	106,989	1.0	73.3	73.3	74.0	0.7
Q	534,898	8,673	33,714	3.3	74.6	74.6	75.4	0.8
R	559,088	10,875	122,241	0.9	80.2	80.2	81.2	1.0
S	593,608	15,200	112,839	1.0	85.8	85.8	86.7	0.9
T	617,288	8,300	83,741	1.3	88.8	88.8	89.8	1.0
U	641,668	7,986	42,303	2.6	92.0	92.0	92.9	0.9
V	670,108	7,487	67,682	1.6	96.7	96.7	97.6	0.9
W	699,238	8,785	91,745	1.2	100.2	100.2	101.2	1.0
X	718,208	8,625	82,251	1.3	105.2	105.2	105.9	0.7
Y	736,606	2,300	26,746	3.9	107.2	107.2	107.8	0.6
Z	768,126	7,286	68,868	1.5	111.4	111.4	112.2	0.8
AA	783,886	7,885	69,479	1.3	113.2	113.2	114.0	0.8
AB	804,286	3,192	24,486	3.6	115.5	115.5	116.5	1.0

[1]Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

NEWTON COUNTY, TX
AND INCORPORATED AREAS

FLOODWAY DATA

SABINE RIVER

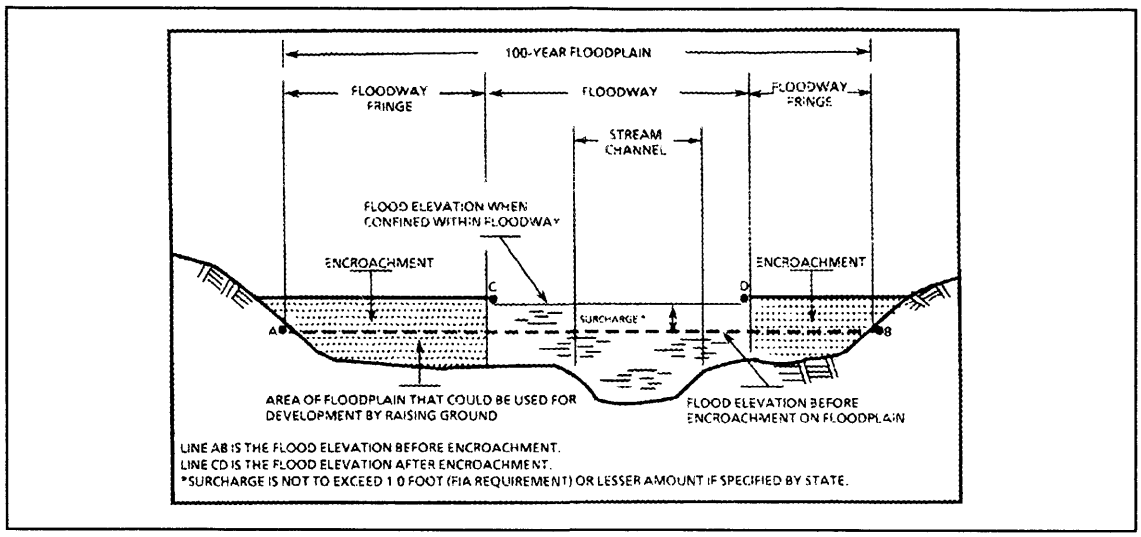

Figure 1. Floodway Schematic

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study 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 500-year floodplain, areas within the 500-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No BFEs or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map 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 100-year floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use the zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The countywide Flood Insurance Rate Map presents flooding information for the entire geographic area of Newton County. Previously, Flood Insurance Rate Maps were prepared for each incorporated community and the unincorporated areas of the County identified as floodprone. This countywide

Flood Insurance Rate Map also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps, where applicable. Historical data relating to the maps prepared for each community are presented in Table 4, "Community Map History."

7.0 OTHER STUDIES

The SRA performed a flood study to determine peak discharges and floodplains for the reaches of the Sabine River downstream from the Toledo Bend Reservoir, including those through Newton County (Reference 10). Technical accomplishment of the SRA study was performed by Brown & Root Inc., of Houston, Texas.

The SRA study developed flood flows for the 10-, 50-, 100-, and 500-year storms, using statistical methods and conducting a HEC-2 backwater analysis using cross sections taken from USGS quadrangle maps. The flood-flow analysis was consistent with the standard defined by FEMA Guidelines and Specifications. However, the hydraulic analysis did not meet these standards. As a result, the FEMA study described herein included a detailed hydraulic study but utilized the discharges from the SRA study.

In 1982, Flood Insurance Studies (Reference 15) were published by FEMA for Orange County, Texas. Flood flows for the Sabine River were obtained from a discharge-frequency curve for the Ruliff streamage developed by the USACE, Fort Worth District. Water-surface elevations were established for the Sabine River in this study through the use of a step-backwater computer program for riverine flows and a coastal surge model for hurricane-induced flooding. Riverine flooding dominated the Sabine River to a point downstream of the Interstate Highway 10 bridge crossing, where flood elevations caused by coastal surge tides became the predominant determinant of flood water-surface elevations.

In 1988, a Flood Insurance Study (Reference 16) was published by FEMA for Calcasieu Parish, Louisiana. Riverine discharges for the Sabine River were computed by the application of generalized rainfall-frequency, depth-duration data to synthetic unit hydrographs derived from regionalized storm and hydrography studies. This effort included a regression analysis of discharges before and after construction of the Toledo Bend Dam. The regression analysis analytically justified lower Sabine River peak discharges than were historically used.

Beauregard and Vernon Parishes, Louisiana, were converted into the Regular Program of the NFIP through Conditional Transfer Letters. No detailed Sabine River peak flows, floodplain, floodway water-surface elevation data, or detailed flood mapping information have been developed for these areas. The Sabine River floodplain shown on the Flood Insurance Rate Maps for these counties and parishes was developed using approximate study methods.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting FEMA, Mitigation Division, Federal Regional Center, 800 North Loop 288, Room 206, Denton, Texas 76201-3698.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISION DATE(S)
Newton, City of	June 7, 1974			September 21, 1998
Unincorporated Areas	July 5, 1977		April 1, 1987	September 21, 1988

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

NEWTON COUNTY, TX AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

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3. U.S. Department of Commerce, Bureau of the Census, County and City Data Book, A Statistical Abstract, 1990.

4. U.S. Department of Agriculture, Soil Conservation Service, Generalized Soils Map for Orange County, September 1980.

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10. Sabine River Authority, Sabine River Flood Study, January 1993.

11. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, Davis, California, HEC-2 Computer Program, Version 4.6, Revised February 1991.

12. Atchison, Topeka and Santa Fe Railroad, Bridge over Sabine River, August 1922.

13. Texas Department of Transportation, Replacement of State Highway 65 Bridge (Preliminary), April 1993; Plans of U.S. 190 Bridge; and Bridge Layout of State Highway 12 Relief Bridges (Preliminary), June 1993.

14. U.S. Department of the Interior, Geological Survey, Quadrangle Maps: Newton East, Texas, Provisional 1984; Merryville North, Louisiana-Texas, Provisional 1986; Merryville South, Louisiana-Texas, Provisional 1988; Weirgate Southeast, Texas-Louisiana, 1985; Burt Ferry, Louisiana, 1954, Photorevised 1967; Haddens, Louisiana-Texas, 1985; Hartburg, Texas-Louisiana, Provisional 1984; Starks, Louisiana-Texas, Provisional 1982.

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16. Federal Emergency Management Agency, Flood Insurance Study, Calcasieu Parish, Louisiana, 1988.

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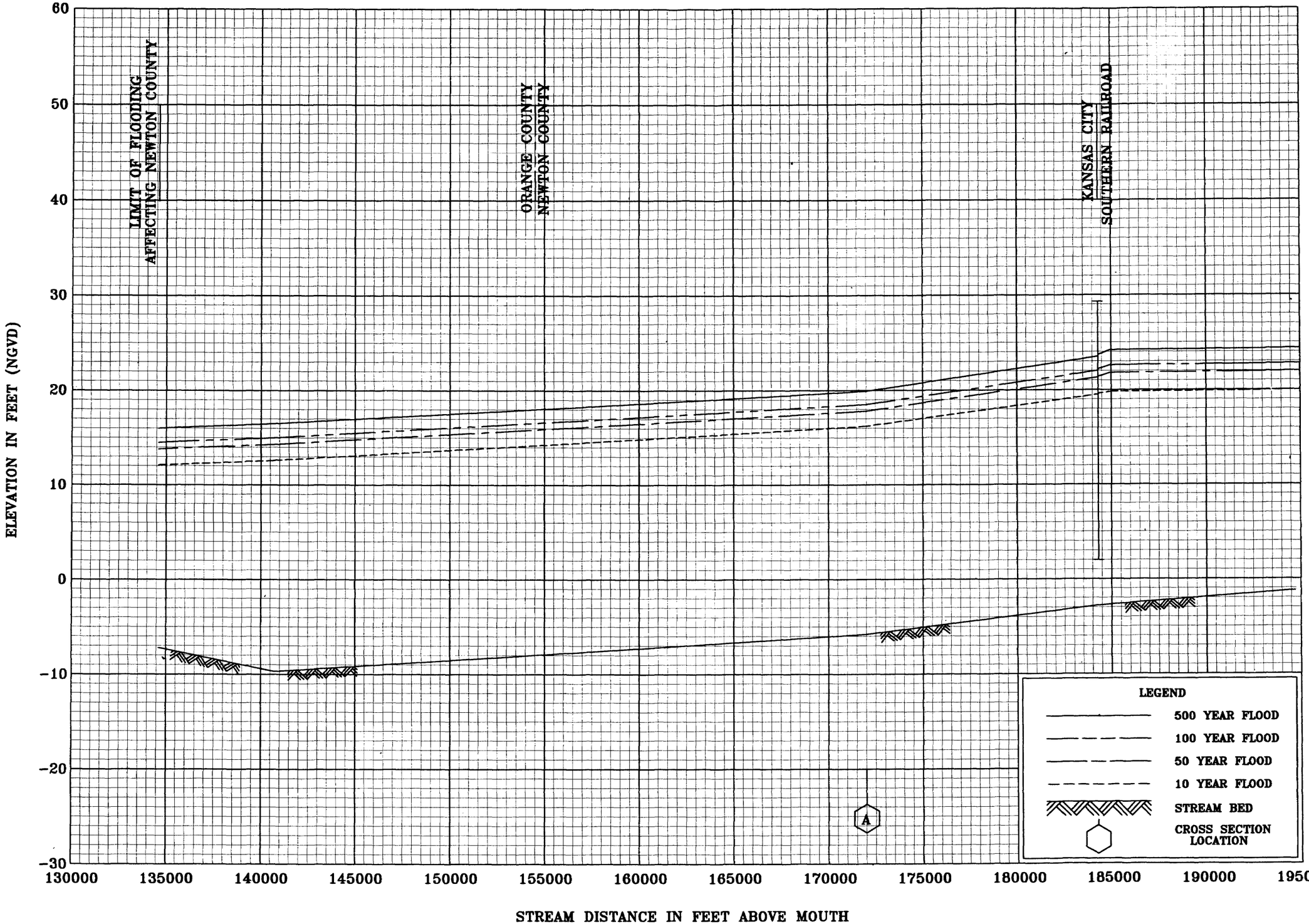


FLOOD PROFILES

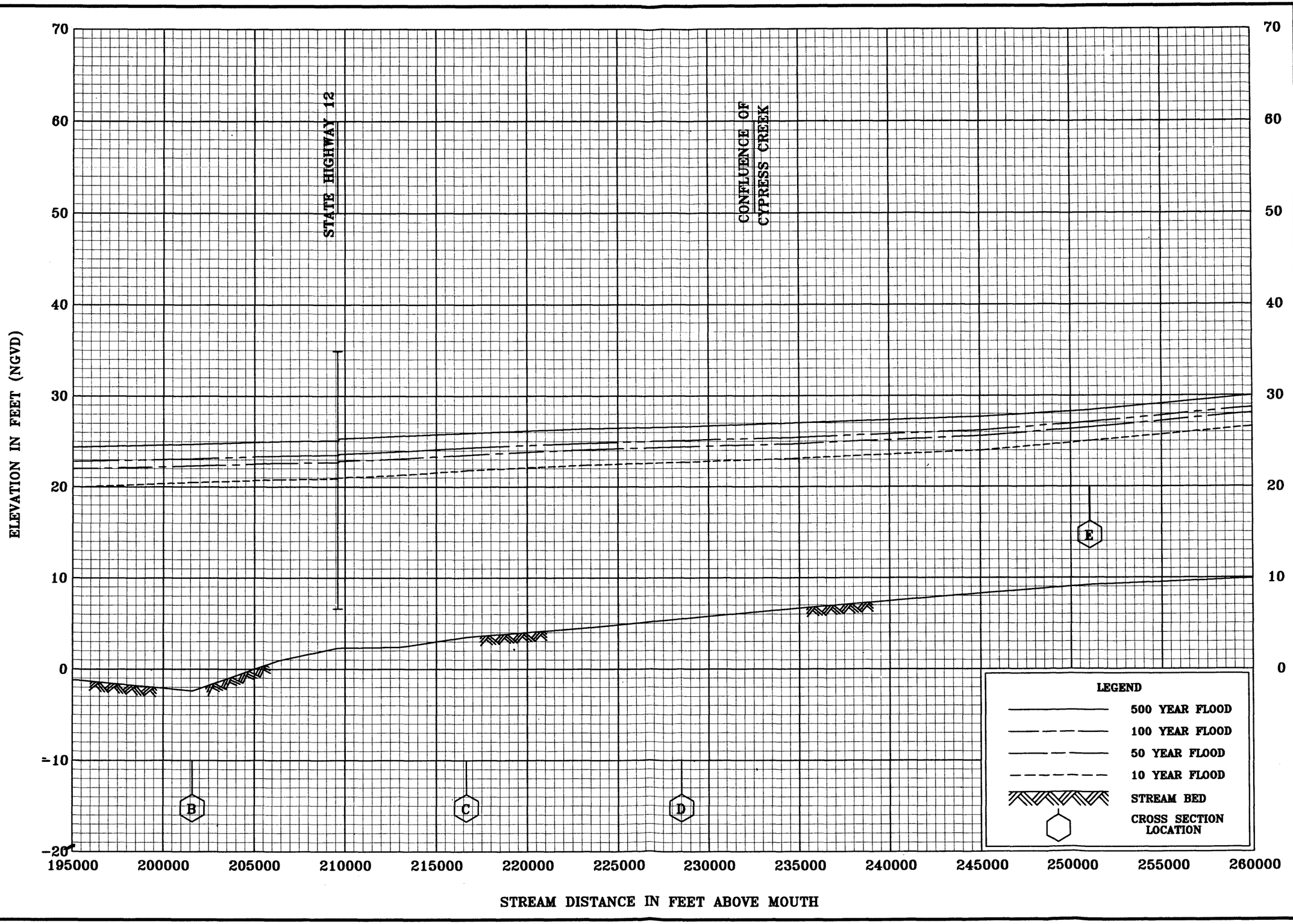
SABINE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

NEWTON COUNTY, TX

AND INCORPORATED AREAS

01P



FLOOD PROFILES

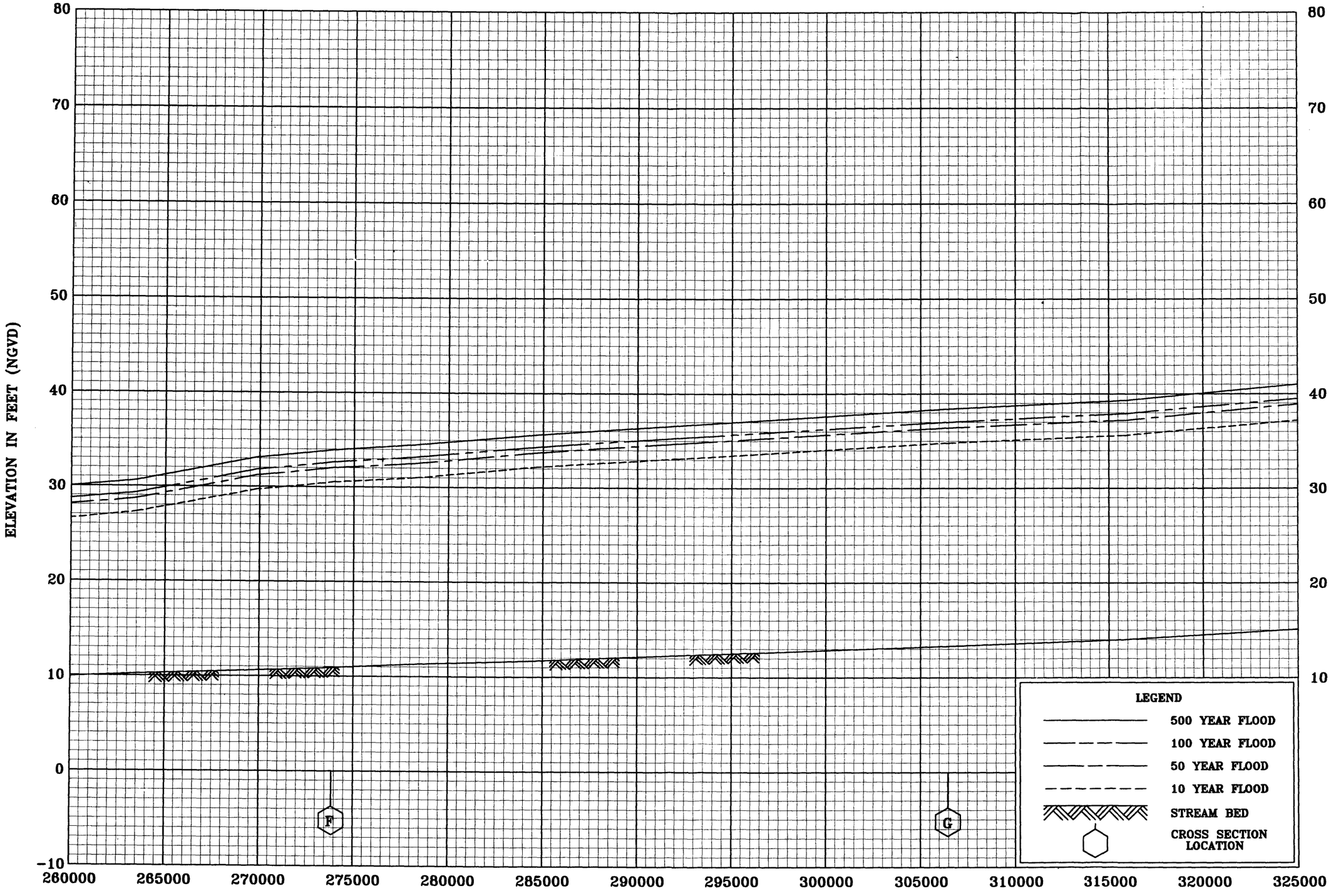
SABINE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

NEWTON COUNTY, TX

AND INCORPORATED AREAS

02P



ELEVATION IN FEET (NGVD)

STREAM DISTANCE IN FEET ABOVE MOUTH

FLOOD PROFILES

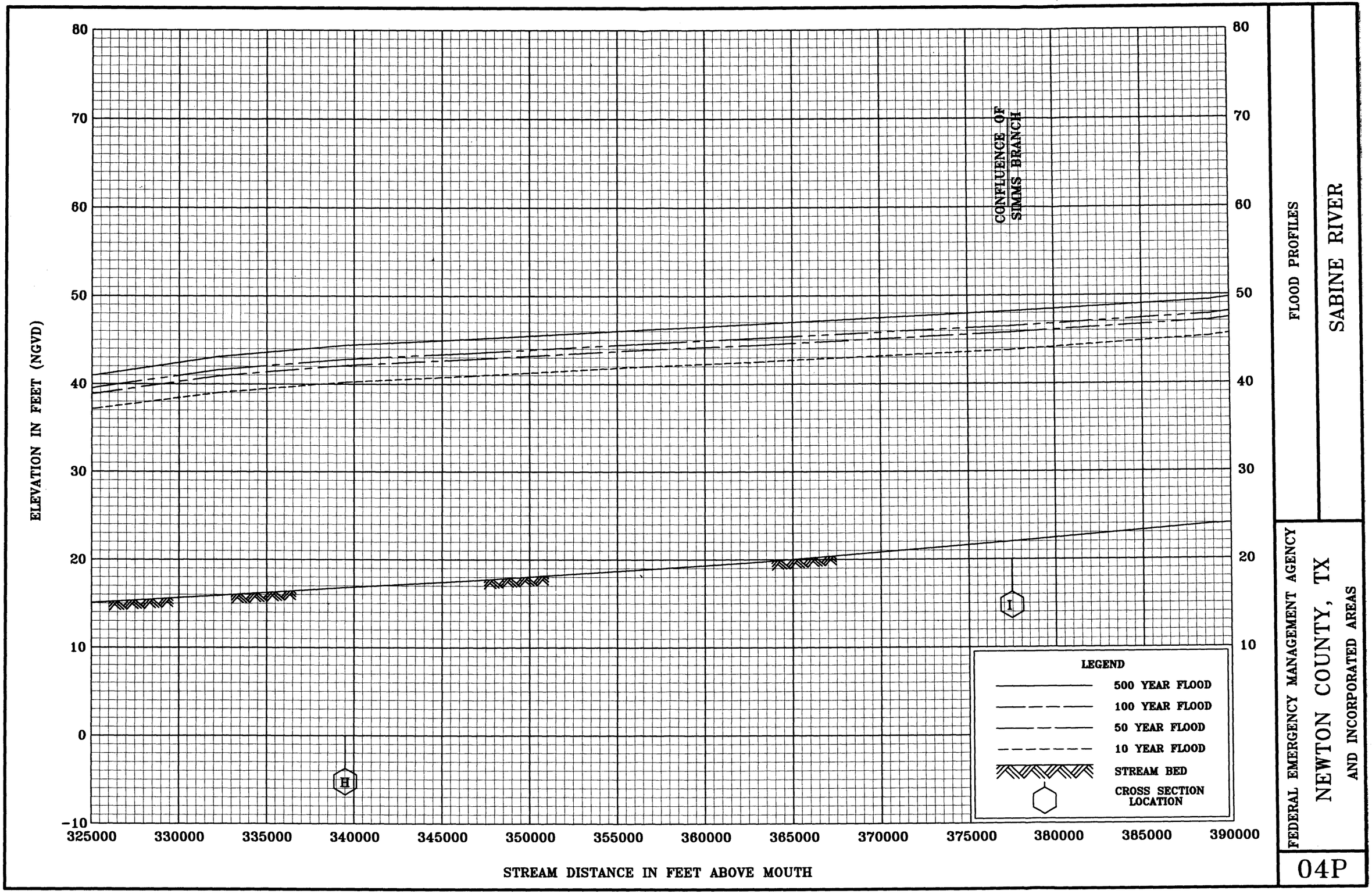
SABINE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

NEWTON COUNTY, TX

AND INCORPORATED AREAS

03P



FLOOD PROFILES

SABINE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

NEWTON COUNTY, TX

AND INCORPORATED AREAS

04P

ELEVATION IN FEET (NGVD)

CONFLUENCE OF BIG COW CREEK

90
80
70
60
50
40
30
20
10
0

390000 395000 400000 405000 410000 415000 420000 425000 430000 435000 440000 445000 450000 455000

STREAM DISTANCE IN FEET ABOVE MOUTH

J

K

LEGEND

500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION

FLOOD PROFILES

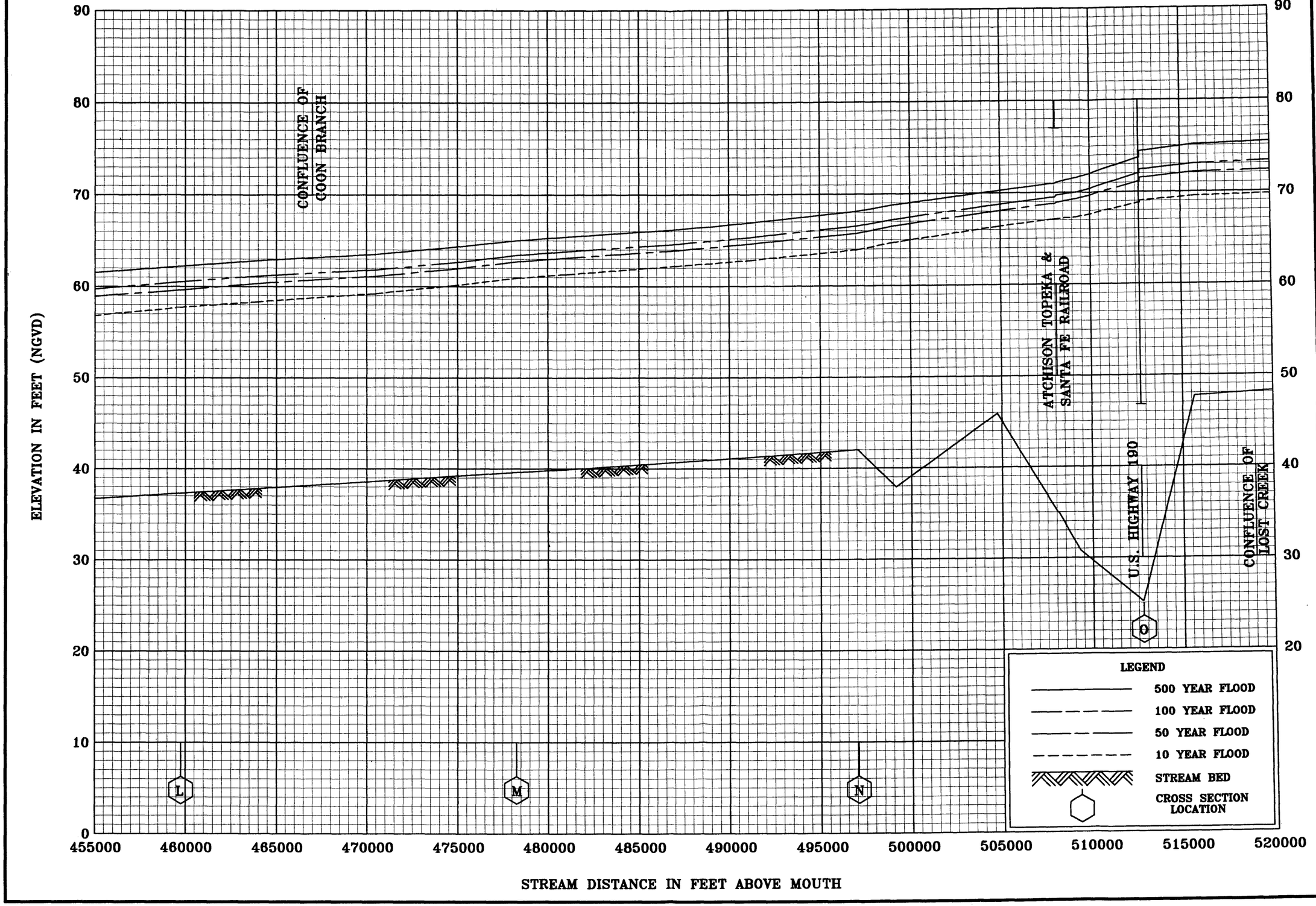
SABINE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

NEWTON COUNTY, TX

AND INCORPORATED AREAS

05P



FLOOD PROFILES

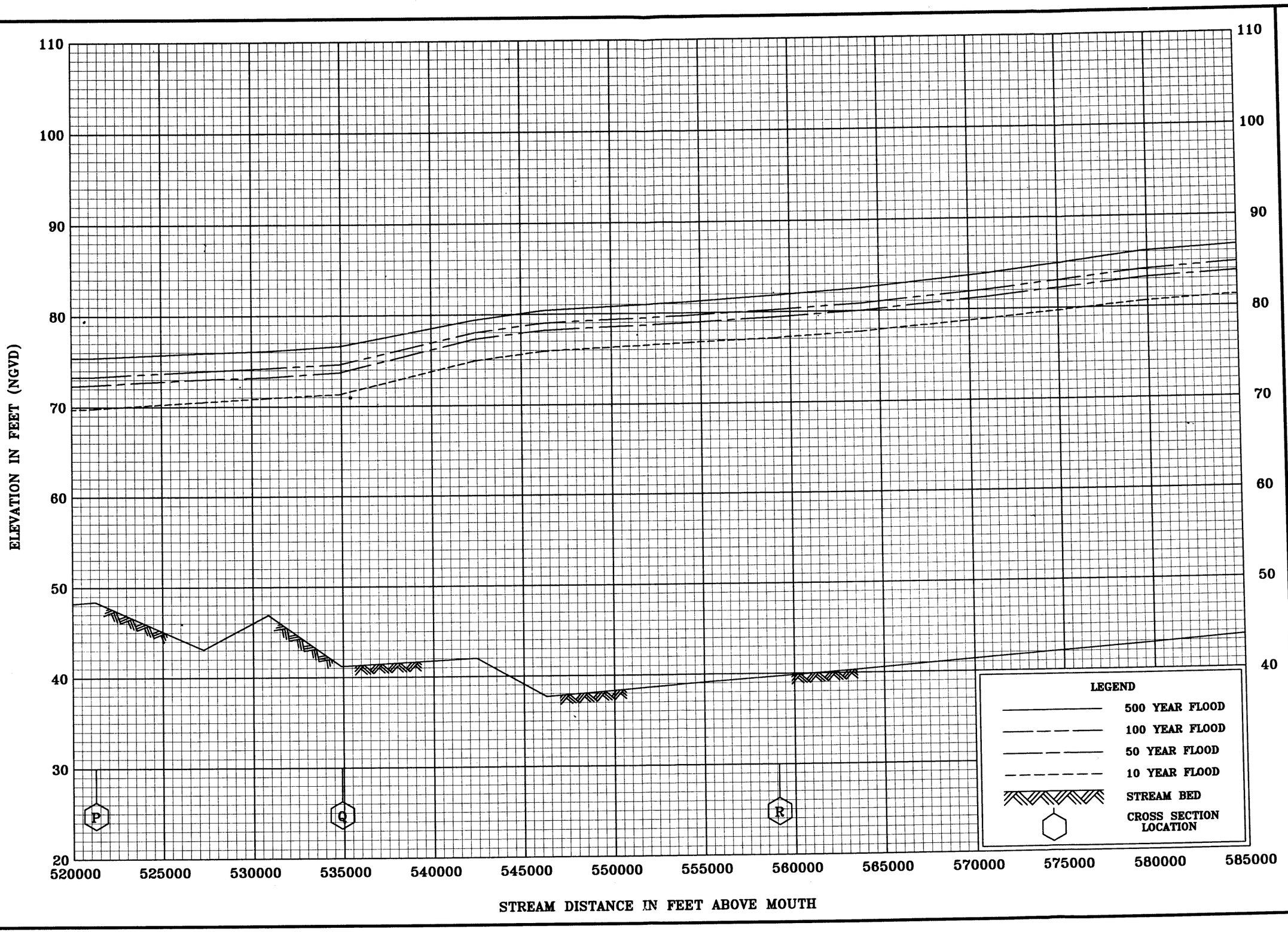
SABINE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

NEWTON COUNTY, TX

AND INCORPORATED AREAS

06P



FLOOD PROFILES

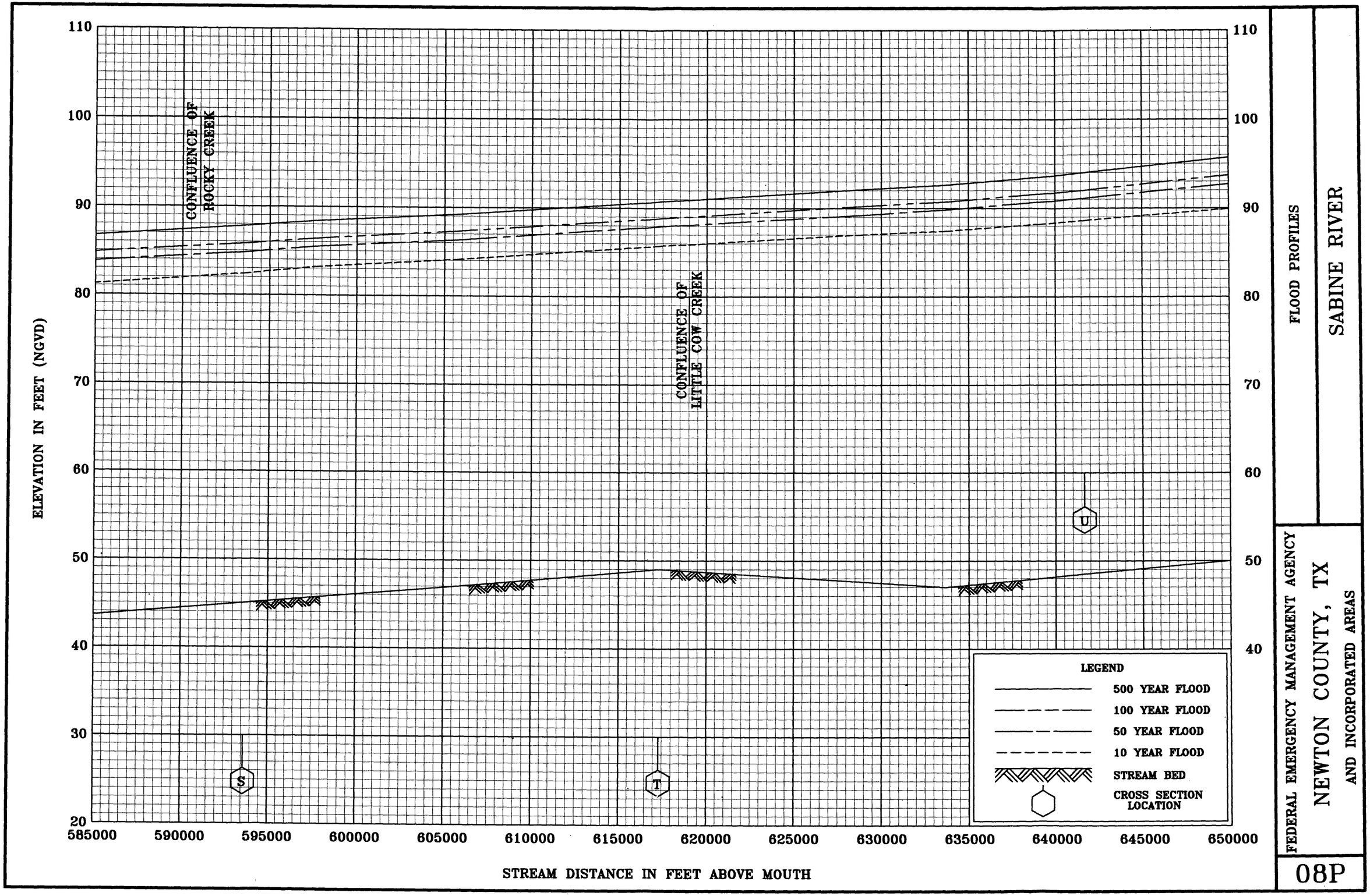
SABINE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

NEWTON COUNTY, TX

AND INCORPORATED AREAS

07P



FLOOD PROFILES

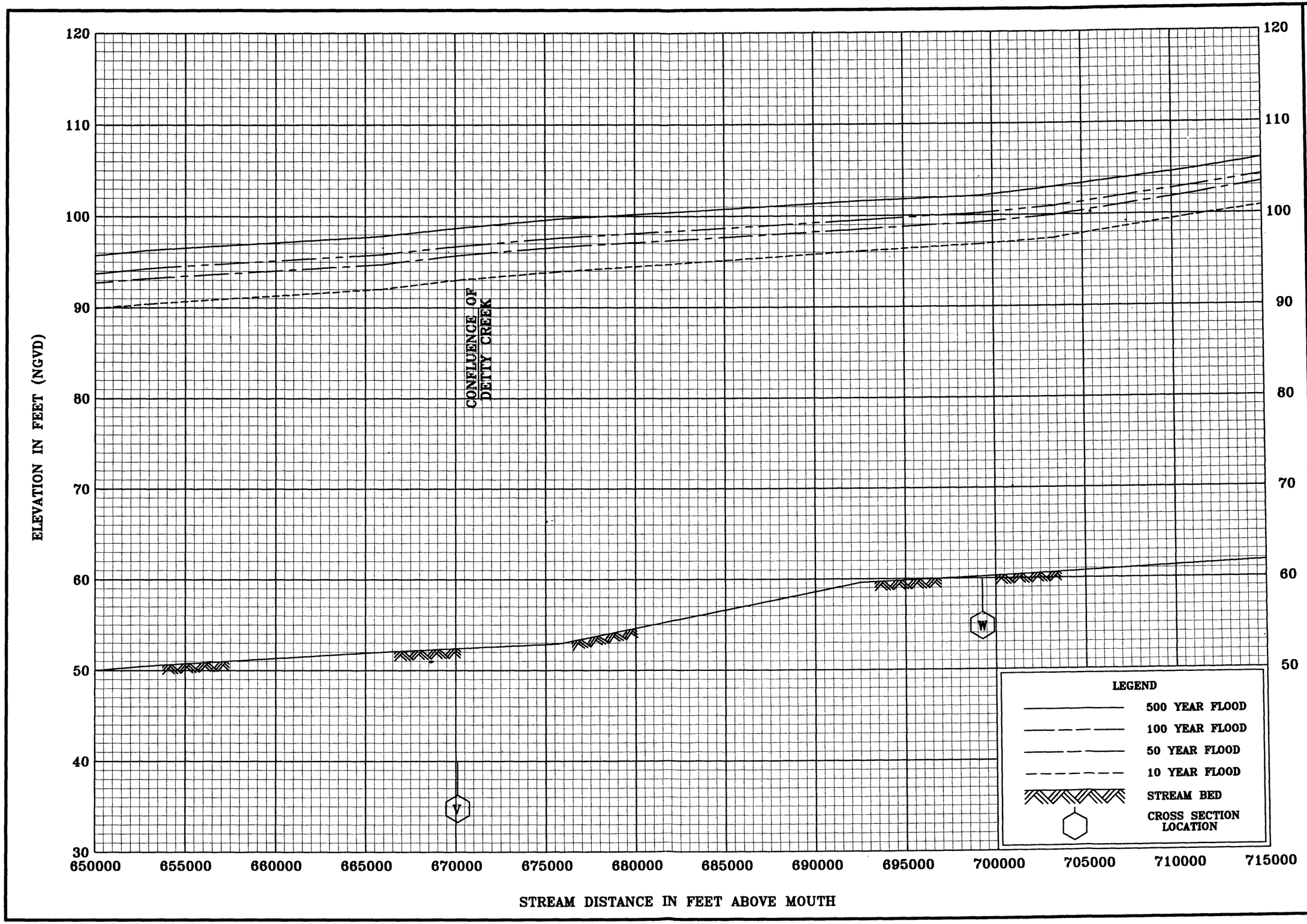
SABINE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

NEWTON COUNTY, TX

AND INCORPORATED AREAS

08P



FLOOD PROFILES

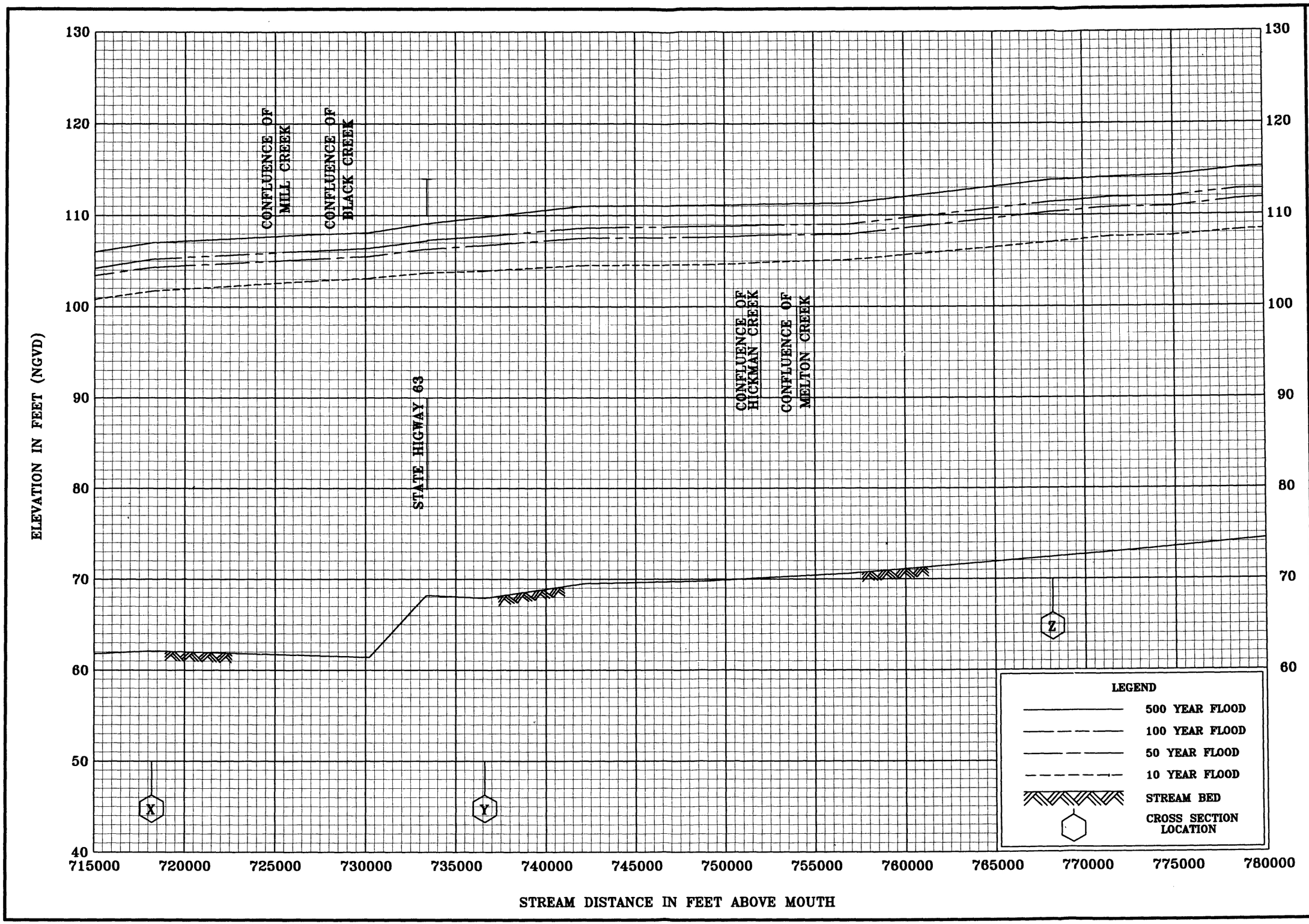
SABINE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

NEWTON COUNTY, TX

AND INCORPORATED AREAS

09P



FLOOD PROFILES

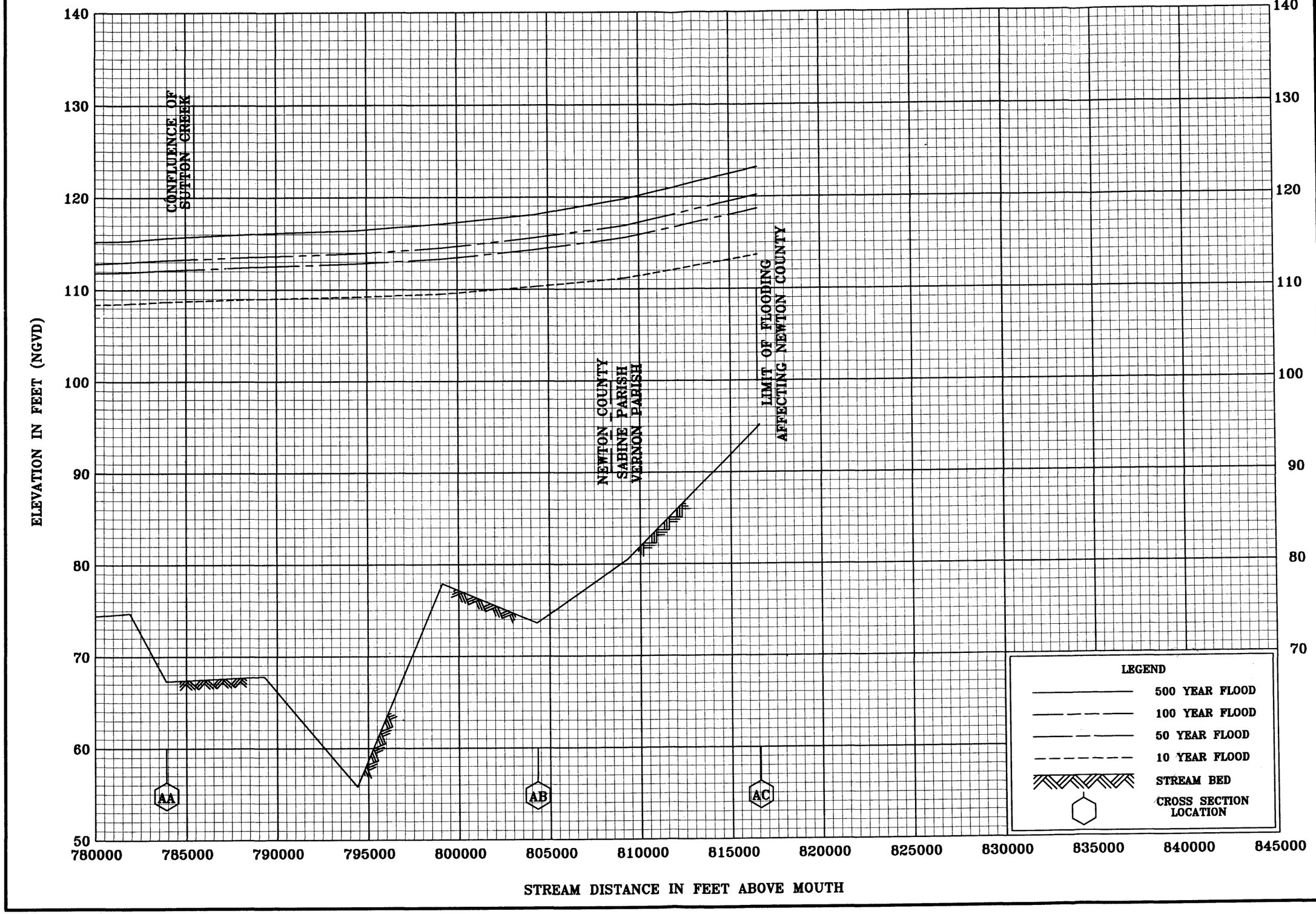
SABINE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

NEWTON COUNTY, TX

AND INCORPORATED AREAS

10P



FLOOD PROFILES

SABINE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

NEWTON COUNTY, TX

AND INCORPORATED AREAS

11P