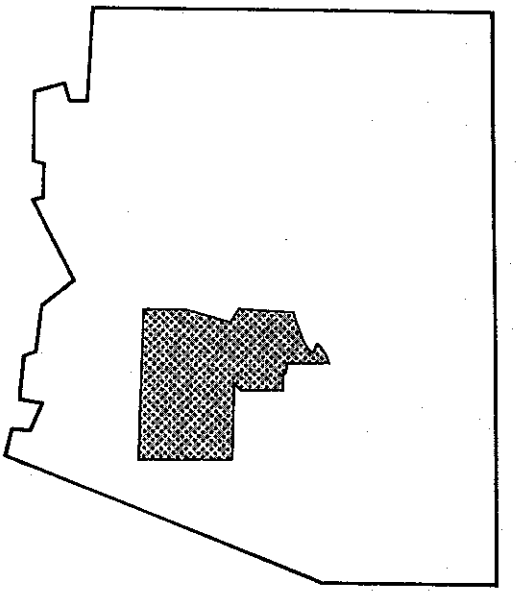
FLOOD INSURANCE STUDY

MARICOPA COUNTY, ARIZONA

AND INCORPORATED AREAS

VOLUME 3 OF 12



COMMUNITY NAME	COMMUNITY NUMBER
AVONDALE, CITY OF	040038
BUCKEYE, TOWN OF	040039
CAREFREE, TOWN OF	040126
CAVE CREEK, TOWN OF	040129
CHANDLER, CITY OF	040040
EL MIRAGE, TOWN OF	040041
GILA BEND, TOWN OF	040043
GILBERT, TOWN OF	040044
GLENDALE, CITY OF	040045
GOODYEAR, TOWN OF	040046
GUADALUPE, TOWN OF	040111
LITCHFIELD PARK, CITY OF	040128
MARICOPA COUNTY UNINCORPORATED AREAS	040037
MESA, CITY OF	040048
PARADISE VALLEY, TOWN OF	040049
PEORIA, CITY OF	040050
PHOENIX, CITY OF	040051
QUEEN CREEK, TOWN OF	040132
SCOTTSDALE, CITY OF	045012
SURPRISE, TOWN OF	045053
TEMPE, CITY OF	040054
TOLLESON, CITY OF	040055
WICKENBURG, TOWN OF	040056
YOUNGSTOWN, TOWN OF	040057

REVISED: SEPTEMBER 30,1995

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. The Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

This publication incorporates revisions to the original Flood Insurance Study. These revisions are presented in Section 10.0.

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PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

Flood Boundary and Floodway Map Index
Flood Boundary and Floodway Map

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were computed at cross sections. Between cross sections, the boundaries were interpolated. In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

The floodways for Little San Domingo, Mockingbird, and Powder House Washes are shown coincident with the 100-year floodplain boundaries because of high, hazardous velocities in their respective floodplains. No floodway was computed for Wash B downstream of Granite Reef Aqueduct. Also, no floodway was computed for Cave Creek below Arizona Canal. No floodway was computed for Wittmann Drainage due to the split flow below Center Street. Floodways for Grass Wash below the U.S. Highway 60 bridge and for Aguila Farm Channel were not computed due to excessive overbank losses.

Floodways are not applicable for areas of shallow flooding; therefore, floodways were not computed for any of the canals, railroad embankments, or for Sand Tank and Bender Washes, Rodeo Wash and its tributary, Airport and Scott Avenue Washes, Lower El Mirage Wash Tributary, and Apache Creek.

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 by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 7.

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 flood elevations or depths are shown within this zone.

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 base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

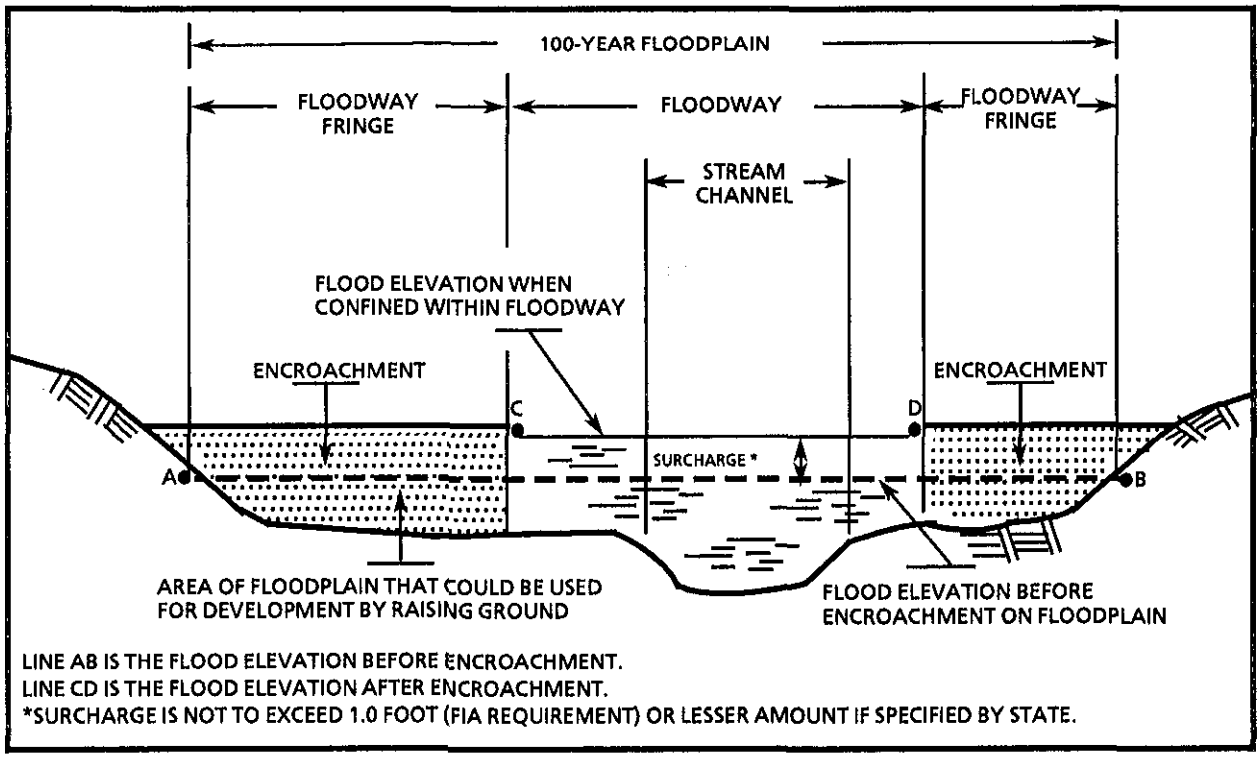

Figure 7. Floodway Schematic

Zone AH:

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zones A1 - A30:

Special Flood Hazard Areas inundated by the 100-year flood; with base flood elevations shown.

Zone B:

Areas between the Special Flood Hazard Areas and the limits of the 500-year flood; areas that are protected from the 100- or 500-year floods by dike, levee, or other local water-control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C:

Areas of minimal flood hazard; not subdivided.

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 base flood elevations or depths are shown within this zone.

Zone D:

Areas of undetermined, but possible flood hazard.

For all irrigation canals, Zone A is designated for the upslope side of canals and Zone B for the downslope. Alluvial fan flood hazard areas are shown on the Flood Insurance Rate Map (published separately) as AO zones, with average depths and velocities of flow given. In these areas, depths of the 100-year flood may exceed 3 feet. Development on alluvial fans is subject to a more severe flood hazard than would normally be encountered in an AO zone due to high velocities and unpredictability of the location of the stream channel across the width of the fan.

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 base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

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

7.0 OTHER STUDIES

Flood Insurance Studies have been published for the following: City of Apache Junction (Reference 1), City of Avondale (Reference 2), Town of Buckeye (Reference 3), Town of Carefree (Reference 4), City of Chandler (Reference 5), Town of El Mirage (Reference 6), Town of Gila Bend (Reference 7), Town of Gilbert (Reference 8), City of Glendale

(Reference 9), Town of Goodyear (Reference 10), City of Mesa (Reference 11), Town of Paradise Valley (Reference 12), City of Peoria (Reference 13), City of Phoenix (Reference 14), City of Scottsdale (Reference 15), Town of Surprise (Reference 16), City of Tempe (Reference 17), City of Tolleson (Reference 18), Town of Wickenburg (Reference 19), Town of Youngtown (Reference 20), and the unincorporated areas of Maricopa County (Reference 67). Information from all of these studies has been incorporated into this study. See Table 6 for a map history of the aforementioned communities.

Flood Insurance Studies have been published for adjacent areas of La Paz County (Reference 68), Yavapai County (Reference 69), and Yuma County (Reference 70), Revised Flood Insurance Studies are being prepared for Pinal County (Reference 71) and Pima County (Reference 72). Approximate flooding areas in Yavapai and Pinal Counties were not studied in Maricopa County. All other county studies are in agreement with this study.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Mitigation Division, Federal Emergency Management Agency, Region IX, Building 105, The Presidio of San Francisco, San Francisco, California 94129-1250.

9.0 BIBLIOGRAPHY AND REFERENCES

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2. Federal Emergency Management Agency, Flood Insurance Study, City of Avondale, Arizona, Revised August 3, 1982

3. Federal Emergency Management Agency, Flood Insurance Study, Town of Buckeye, Arizona, February 15, 1980

4. Federal Emergency Management Agency, Flood Insurance Study, Town of Carefree, Arizona, unpublished

5. Federal Emergency Management Agency, Flood Insurance Study, City of Chandler, Arizona, July 16, 1980

6. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Town of El Mirage, Arizona, December 1, 1978

7. Federal Emergency Management Agency, Flood Insurance Study, Town of Gila Bend, Arizona, December 4, 1979

8. Federal Emergency Management Agency, Flood Insurance Study, Town of Gilbert, Arizona, Revised September 30, 1983

9. Federal Emergency Management Agency, Flood Insurance Study, City of Glendale, Arizona, Revised September 22, 1981

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FIRM EFFECTIVE DATE	FIRM REVISION DATE(S)
Avondale, City of	February 15, 1974	January 16, 1976	June 15, 1979	August 3, 1982 April 15, 1988 September 29, 1989 September 4, 1991 December 3, 1993 September 30, 1995
Buckeye, Town of	February 15, 1980		February 15, 1980	April 15, 1988 September 4, 1991 September 30, 1995
Carefree, Town of	July 2, 1979		July 2, 1979	April 15, 1988 September 29, 1989 September 4, 1991 December 3, 1993 September 30, 1995
Cave Creek, Town of	June 9, 1988		September 29, 1989	September 29, 1989 September 4, 1991 December 3, 1993 September 30, 1995
Chandler, City of	May 24, 1977	January 17, 1978	July 16, 1980	April 15, 1988 December 3, 1993 September 30, 1995
El Mirage, Town of	February 15, 1974		December 1, 1978	April 15, 1988 September 29, 1989 September 4, 1991 December 3, 1993 September 30, 1995

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FIRM EFFECTIVE DATE	FIRM REVISION DATE(S)
Gila Bend, Town of	January 23, 1974	December 24, 1976	December 4, 1979	April 15, 1988 December 3, 1993 September 30, 1995
Gilbert, Town of	April 5, 1974	October 15, 1976	January 16, 1980	September 30, 1983 April 15, 1988 December 3, 1993 September 30, 1995
Glendale, City of	July 26, 1974	April 9, 1976	April 16, 1979	September 22, 1981 April 15, 1988 September 29, 1989 September 4, 1991 December 3, 1993 September 30, 1995
Goodyear, Town of	March 15, 1974	April 30, 1976	July 16, 1979	October 18, 1983 April 15, 1988 September 29, 1989 September 4, 1991 December 3, 1993 September 30, 1995
Guadalupe, Town of	April 15, 1988		April 15, 1988	December 3, 1993 September 30, 1995
Litchfield Park, City of	September 29, 1989		September 29, 1989	September 4, 1991 December 3, 1993 September 30, 1995

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FIRM EFFECTIVE DATE	FIRM REVISION DATE(S)
Mesa, City of	April 13, 1973	April 22, 1977	May 15, 1980	April 15, 1988 September 4, 1991 December 3, 1993
Paradise Valley, Town of	December 7, 1973	May 21, 1976	May 1, 1980	June 3, 1986 April 15, 1988 September 29, 1989 December 3, 1993 September 30, 1995
Peoria, City of	January 16, 1981		January 16, 1981	April 15, 1988 September 4, 1991 December 3, 1993
Phoenix, City of	June 28, 1974	September 12, 1975	December 4, 1979	June 1, 1984 April 15, 1988 September 29, 1989 September 4, 1991 December 3, 1993 September 30, 1995
Queen Creek, Town of	September 4, 1991		September 4, 1991	December 3, 1993
Scottsdale, City of	September 21, 1973		December 31, 1977	December 4, 1984 April 15, 1988 September 4, 1991 September 29, 1989 December 3, 1993 September 30, 1995

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FIRM EFFECTIVE DATE	FIRM REVISION DATE(S)
Surprise, Town of	June 28, 1974	December 5, 1975	January 15, 1978	March 1, 1983 April 15, 1988 September 4, 1991 December 3, 1993 September 30, 1995
Tempe, City of	June 28, 1974	September 5, 1978	August 15, 1980	December 14, 1982 April 15, 1988 September 4, 1991 December 3, 1993 September 30, 1995
Tolleson, City of	April 12, 1974	December 19, 1975	January 16, 1980	April 15, 1988 September 4, 1991
Wickenburg, Town of	February 1, 1974	October 10, 1975	January 5, 1978	March 29, 1983 April 15, 1988 September 4, 1991
Youngtown, Town of	December 28, 1973		November 15, 1978	April 5, 1988
Unincorporated Areas	July 2, 1979		July 2, 1979	April 15, 1988 September 4, 1991 December 3, 1993 December 30, 1995

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

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10.0 REVISION DESCRIPTIONS

This section has been added to provide information regarding significant revisions made since the original Flood Insurance Study was printed. Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To assure that any user is aware of all revisions, it is advisable to contact the community repository.

10.1 First Revision

This study was revised on September 29, 1989, to include the restudy conducted for the City of Wickenburg and surrounding unincorporated areas of Maricopa County; to include the newly incorporated Town of Cave Creek; and to include the revisions described below. As part of this revision, the conversion of the FIRM for Maricopa County, Arizona, and Incorporated Areas to the Map Initiatives Format on a panel-to-panel basis was initiated. In the Map Initiatives Format, all base flood elevations, cross sections, and floodplain and floodway boundaries are shown on the FIRM. The flood insurance zone designations were changed to reflect the Map Initiatives Format. Areas previously shown as numbered Zone A were revised to Zone AE, Zone B was revised to Zone X (shaded), and Zone C was revised to Zone X (unshaded). In addition, all Flood Insurance Zone Data Tables were removed from the Flood Insurance Study report and all zone designations and reach determinations were removed from the profiles. The FIRM Index was revised to reflect the 100-year flooding shown on all FIRM panels. In addition, the Township and Range Lines for Maricopa County and Incorporated Areas have been added to the FIRM and Flood Boundary and Floodway Map Index as requested by the FCDMC.

New River Below Skunk Creek

For the reach of the New River from the confluence with the Agua Fria River upstream to Skunk Creek, revised hydrologic and hydraulic analyses were developed by Coe and Van Loo Consulting Engineers, Inc. (CVL).

The hydrologic analysis developed by CVL for the reach of the New River between the confluence of the Agua Fria River and Skunk Creek was based on the 1984 COE study. CVL modified the COE study to reflect existing floodplain conditions, and developed the 10-, 50-, and 500-year discharges for this reach. These revised discharges are presented in Table 3 entitled "Summary of Discharges." The revised discharges reflect the construction of the Adobe, New River, and Cave Buttes Dams and the Arizona Canal Diversion Channel (ACDC). These data are presented in the technical report entitled "Hydrology Update, November 15, 1986, New River Below Skunk Creek, Maricopa County, Arizona," prepared by CVL for the FCDMC.

The revised HEC-2 hydraulic analyses for this reach of the New River utilized cross sectional data from the original COE model for the New River based on 1982 topography. These cross sections were modified to include the following channelization projects:

- Glendale Municipal Airport
- Plaza Del Rio Development located South of Thunderbird Road
- Desert Harbor Development located from approximately 3,600 feet downstream of the Thunderbird Road Bridge to North of Greenway Road

The starting water-surface elevations were based on the slope-area method. The roughness factors ("n" values) were originally established by the COE. CVL conducted a field investigation of the river and revised these factors. Based on the field investigation, CVL utilized the values established by the COE. The revised floodway analysis was also based on the COE model and utilized Method 1 encroachment. These data are presented in the technical report entitled "Flood Insurance Study, New River Below Skunk Creek, Maricopa County, Arizona," prepared by CVL for FCDMC, dated December 30, 1986.

The 100- and 500-year floodplain and the 100-year floodway boundaries were delineated on topographic maps at a scale of 1" = 200', contour interval of 2 feet, entitled "New River Floodplain Delineation, Agua Fria River to Skunk Creek Wash," prepared by CVL and revised July 1987. The maps were based on aerial mapping flown by Aerial Mapping Company, Inc., on November 20, 1981, at a scale of 1" = 100', contour interval of 2 feet.

New River Upstream of New River Dam

The revised 100-year hydrologic analysis for the reach of the New River upstream of the New River Dam to Rock Springs was developed by CVL using the COE HEC-1 hydrologic computer model. These data are presented in the technical report entitled "Hydrology Report, Including Approval Letters For Flood Insurance Study, New River, from New River Dam to Rock Springs, Maricopa County, Arizona," prepared by CVL for FCDMC, dated December 1987. Only the 100-year discharge was developed because the channel geometry for this reach of the New River is characterized by wide floodplains with numerous low-flow channels that are highly unstable. These channels change significantly during low-flow floods. The revised 100-year discharge is presented in Table 3.

The hydraulic analyses were conducted by CVL utilizing the COE HEC-2 hydraulic computer model. The starting water-surface elevations were based on the slope-area method. The high-water level in the New River Dam was not used due to difference in the time of peak flow. Cross sectional data were based on 1" = 200' topographic mapping prepared by Aerial Mapping Company, Inc., in March 1985 and December 1986.

Three split flow reaches of the New River and Sweat Canyon Wash were analyzed in addition to the main channel of the New River. The three split flow reaches of the New River are identified as New River East Split, New River Middle Split, and New River West Split. Roughness factors ("n" values) for the New River, the split flows of the New River, and Sweat Canyon Wash were established based on field investigation, topography, and photographs of the area. These values are presented in Table 4. No floodways were computed for these areas because of the unique topography.

The 100-year floodplain boundaries were delineated using topographic maps at a scale of 1:4,800, contour interval of 4 feet, entitled "New River Floodplain Delineation, New River Dam Reservoir to Rock Springs," and prepared by CVL.

Tables 1, 2, 3, and 4 have been revised to reflect these modifications to the flooding along the New River. The Floodway Data Table for the New River was also revised to reflect the revised hydraulic analysis. Due to the addition of cross sections for the reach between the Agua Fria River and Skunk Creek, the cross sections located upstream of Skunk Creek to the New River Dam were relabeled. Profile Panels 24P through 59P were revised to reflect these changes and to show the split flow reaches. Profile Panels 60P and 61P for Sweat Canyon Wash were added to the Flood Insurance Study report.

East Fork Cave Creek

The SFHA along a reach of East Fork Cave Creek, east of 7th Street, was modified based on a revised hydrologic analysis of the 100-year discharge performed by NBS/Lowry Engineers and Planners (NBS/Lowry). This analysis is presented in reports prepared by NBS/Lowry entitled: "Upper East Fork Cave Creek, Area Drainage Master Study, Technical Submittals," submittal number 4, dated June 30, 1987; "Upper East Fork Cave Creek, Area Drainage Master Study, Technical Submittals" (Executive Summary), undated, and "Upper East Fork Cave Creek, Area Drainage Master Study, Technical Submittals," undated.

The revised hydrologic analysis was developed using the SCS TR-20 hydrologic computer model. The routing used in the analysis more accurately represents the existing flow conditions in the Upper East Fork Cave Creek drainage basin than that developed for the existing Flood Insurance Study. As a result of this analysis, the floodway was eliminated for the reach of East Fork Cave Creek east of 7th Street. The SFHA east of the 7th Street was revised to Zone A approximate with the floodplain boundaries remaining as shown on the April 15, 1988, FIRM. The area located between Cave Creek and East Fork Cave Creek, which was designated as Zone C on the April 15, 1988, FIRM, was revised to Zone X (shaded). These changes are reflected on FIRM Panels 1215 and 1220. The Floodway

Data Table and profile panels have also been modified to reflect these changes.

The Letter of Map Amendment (LOMA) issued on August 1, 1986, for the City of Phoenix for Lots 117 to 136 of Coral Gable Estates is shown on FIRM Panels 1655 and 1255. The LOMA stated that this property was not within the SFHAs. The 100-year floodplain delineation along East Fork Cave Creek was revised to reflect this LOMA.

Buchanan Wash

Hydrologic and hydraulic analyses for Buchanan Wash from its confluence with Skunk Creek to the CAP Canal were conducted by AGK Engineers, Inc., for the FCDMC. These analyses are presented in the technical reports entitled "Hydrologic Analyses for Buchanan Wash, Maricopa County, Arizona," and "Flood Insurance Study for Buchanan Wash, from Skunk Creek to CAP Canal, Maricopa County, Arizona," both dated November 1987 and prepared by AGK Engineers, Inc. As a result of these analyses, new detailed flooding and a floodway for Buchanan Wash are shown on FIRM Panel 1185.

Discharge-frequency relationships from historical flood records could not be developed for Buchanan Wash because no gaging stations are available in the watershed. Therefore, the COE HEC-1 hydrologic computer model was utilized to develop the peak discharges, which are shown in Table 3.

Cross sectional data for the HEC-2 hydraulic analyses were obtained from topographic maps at a scale of 1" = 200', contour interval of 2 feet, prepared by Aerial Mapping Company, Inc., and flown in September 1986. Roughness factors ("n" values) were selected using engineering judgment and field observations. These values are listed in Table 4.

The COE HEC-2 hydraulic computer model was used to develop the water-surface profiles. Starting water-surface elevations were obtained from the 1981 COE study for Skunk Creek. The floodway was computed on the basis of equal conveyance reduction from each side of the floodplain.

Floodway Data Tables and profile panels have been added to the Flood Insurance Study report to reflect this new detailed flooding information.

Andora Hills Wash

The SFHA along a reach of Andora Hills Wash located between a point north of Rancho Manana Boulevard and a point approximately 690 feet downstream of Rancho Manana Boulevard has been modified as shown on FIRM Panel 0805. This modification reflects the construction of a roadway crossing and culvert. In support of this revision, a technical report entitled "Application for Flood Plain Variance for Rancho Manana," undated, and Sheet 8 of 8 of

certified "as-built" construction plans entitled "Rancho Manana Country Club Lots-Water, Sewer, Paving Plans," dated March 28, 1988, were prepared by American Engineering Company. The technical report contained a revised HEC-2 hydraulic computer model for this reach of Andora Hills Wash.

As a result of the roadway crossing and culvert construction, the base flood elevations and the floodway width increased between cross sections E and F. These modifications are reflected on the profile panel and Floodway Data Table for Andora Hills Wash.

Agua Fria River

The floodway boundary along a reach of the Agua Fria River in the vicinity of the Brookview Country Club was modified as shown on FIRM Panels 1165 and 1170. The basis for the revision was a revised HEC-2 hydraulic analysis presented in a technical report entitled "Request for Letter of Map Revision-Agua Fria River Floodway (Brookview Country Club)," prepared by Willdan Associates and dated December 1987. As a result of this analysis, the floodway boundary delineation was modified between cross sections BE and BF. The Floodway Data Table reflects this change.

Granite Reef Aqueduct

The SFHA designated as Zone A along a reach of the Granite Reef Aqueduct, part of the CAP, as shown on FIRM Panel 1475, was revised to reflect the correct alignment of the Granite Reef Aqueduct. The basis for this modification was a topographic map submitted by the FCDMC which showed the correct alignment.

Cave Creek

The Letter of Map Revision (LOMR) issued on May 12, 1988, for the City of Phoenix to reflect a channelization project along Cave Creek from 11th Avenue to Bell Road is shown on FIRM Panel 1215. In support of this request, certified "as-built" plans entitled "Grading, Drainage, Channel Grading, and Culvert Details, Bell Road Autopark," dated September 30, 1987, and a revised HEC-2 hydraulic analysis of Cave Creek were submitted by Amwest Engineering Company, Inc. As a result of this channelization project, the 100-year flood is contained within the channel for this reach of Cave Creek. The profile panels and Floodway Data Table have been revised to reflect this modification.

Arizona Canal Diversion Channel

The LOMRs issued on May 17, 1988, for the cities of Phoenix and Glendale, and the unincorporated areas of Maricopa County, to reflect the construction of the ACDC from the confluence with Skunk Creek to 47th Avenue are shown on FIRM Panels 1190, 1630, and 1635. To support this request, the following data were submitted:

- Sheets 2 and 15 through 19 of 74 of the final construction drawings, entitled "Arizona Canal Diversion Channel, 29th Avenue to 47th Drive," prepared by the COE, Los Angeles District, and dated July 19, 1987

- Sheets 2 and 4 through 8 of 30 of the final construction drawings, entitled "Arizona Canal Diversion Channel, 47th Drive to Cactus Road," prepared by the COE, Los Angeles District, and dated September 10, 1986

- Sheets 2, 6 through 19, 27, and 27A of 38 of the final construction drawings, entitled "Arizona Canal Diversion Channel, Cactus Road to Skunk Creek," prepared by the COE, Los Angeles District, and dated June 24, 1986

- A letter of certification, dated December 31, 1987, from the COE, Los Angeles District, stating that the reach of the ACDC from Skunk Creek to 47th Avenue was built in conformance with the above-referenced construction drawings

The 100-year flood is contained within the right-of-way of the ACDC in this reach. The Zone A floodplain boundaries along the north side of the ACDC have been revised to coincide with the right-of-way limits for the ACDC. The areas outside of the right-of-way limits on the north side of the ACDC have been redesignated as Zone X (shaded).

The LOMRs issued on September 15, 1988, for the cities of Peoria and Glendale to reflect the completed portion of the ACDC at the confluence with Skunk Creek are shown on FIRM Panel 1190. To support these LOMRs, Sheets 2 and 3 of 10 of work maps entitled "Lower Skunk Creek, New River and Skunk Creek Areas, Arizona," prepared by the COE and dated February 4, 1980, were submitted by the FCDMC. As a result of the construction of the ACDC, the area previously designated as Zone A at the confluence of Skunk Creek and the ACDC has been revised to Zone X (shaded).

The LOMR issued on October 4, 1988, for the City of Phoenix to reflect the construction of the ACDC from 47th Avenue to 29th Avenue is shown on FIRM Panels 1635 and 1655. In support of this request, the following data were submitted:

- Sheets 2, 4, and 5 of 30 of the final construction drawings, entitled "Arizona Canal Diversion Channel, 47th Drive To Cactus Road," prepared by the COE, Los Angeles District, and dated September 10, 1986

- Sheets 2 and 5 through 19 of 74 of the final construction drawings, entitled "Arizona Canal Diversion Channel, 29th Avenue to 47th Drive," prepared by the COE, Los Angeles District, and dated July 17, 1987

- A letter of certification, dated August 19, 1988, from the COE, Los Angeles District, stating that the reach of the ACDC from 47th Avenue to 29th Avenue was built in conformance with the above-referenced construction drawings

The 100-year flood is contained within the right-of-way of the ACDC in this reach. The Zone A floodplain boundaries for the above-referenced reach of the ACDC have been revised to coincide with the right-of-way limits for the ACDC. The areas outside the right-of-way limits on the north side of the reach of the ACDC have been redesignated as Zone X (shaded).

The construction of the ACDC from 29th Avenue East to Black Canyon Freeway is also shown on FIRM Panel 1655 based on data provided by the COE.

Indian Bend Wash

The LOMA issued on June 16, 1981, for the City of Phoenix for Phases 1 and 2 of Eagles Eyre III is shown on FIRM Panel 1680. The LOMA stated that Lots 1 to 5 and 27 to 36 were not within the SFHA as shown, and that Lots 6 to 26 and 37 to 47 were determined not to be within the SFHA. The 100-year floodplain delineation along Indian Bend Wash was revised to reflect this LOMA.

Tenth Street Wash

The LOMR issued on October 13, 1983, and LOMA issued on October 31, 1983, for the City of Phoenix are shown on FIRM Panel 1660. Based on data submitted by Curtis Engineering on behalf of Villa Santa Fe Condominiums, the SFHA located along Tenth Street Wash upstream of Cheryl Drive was reduced and the floodway eliminated. The LOMA issued for Villa Santa Fe, a condominium conversion of Desert Cove Apartments, stated that the property was not within the SFHA. The 100-year floodplain delineation has been revised to reflect this LOMR and LOMA. In addition, the Floodway Data Table and Profile Panels for Tenth Street Wash have been revised to reflect the LOMR.

Skunk Creek

The LOMA issued on January 15, 1988, for the City of Glendale as shown on FIRM Panel 1190. The LOMA stated that Creekside Market Place located at 67th Avenue and Bell Road was not in the SFHA. The 100-year floodplain delineations along Skunk Creek were revised to reflect this LOMA.

10.2 Second Revision

This study was revised on September 4, 1991, to include the restudy of hydraulic conditions on Cave Creek Wash, Galloway Wash, the Hassayampa River, Centennial Wash, Cemetery Wash, and Waterman Wash, as well as various requests for map revisions. The

restudied streams flow through Maricopa County and several communities within the county including the Cities of Phoenix, Scottsdale, and Goodyear, and the Towns of Buckeye, Cave Creek, Carefree, and Wickenburg. The hydraulic analyses for the restudied streams were completed by Cella Barr Associates in 1989, under Contract No. EMW-88-C-2603. The portions of the streams now studied by detailed methods are shown in Table 1, Detailed-Study Sources.

The Town of Queen Creek, a newly incorporated community in Maricopa County, was incorporated September 5, 1989.

Since the 100-year flood is now contained within the channel, detailed flooding has been removed for this reach of Cave Creek Wash, between the ACDC and Sweetwater Road. Flood Profiles Panels 52, 53P, and a portion of 54P have been eliminated for this reach in addition to cross sections A through S in the Floodway Data Table. Subsequent Profiles were not renumbered and the remaining cross sections for Cave Creek Wash were not relabled.

Discharge values used in the reanalyses for these six streams have been incorporated into Table 3, Summary of Discharges. Roughness coefficients used in this restudy have been incorporated into Table 4, Range of Hydraulic Roughness Coefficients. Revised and additional flood profiles for the reanalyses have been incorporated into Exhibit 1, Flood Profiles. Information concerning the revision of the floodways along each restudied stream has been incorporated into Table 5, Floodway Data Table. The process of converting existing FIRMs from the standard format to the map initiatives format, as described in Section 10.1, is continuing with this revision. Topographic information used in the analysis of these streams was developed in 1988 (References 73 and 74).

The topographic information along Cave Creek Wash and a section of Centennial Wash from River Mile 22.42 to River Mile 31.61 was developed at a scale of 1:2,400, with a contour interval of 2 feet. The other streams restudied under this contract were revised using topographic information at a scale of 1:4,800, with a contour interval of 4 feet. Cross sections for all the streams were located no greater than 500 feet apart. Additional cross sections were located upstream and downstream of constrictions to flow, such as bridges. Hydraulic roughness coefficients (Manning's "n") were selected on the basis of field inspection and engineering judgment. The hydraulic analyses for this revision were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Water-surface elevations for the portions of the streams studied by detailed methods were computed using the COE HEC-2 step-backwater program (Reference 75). Only the 100-year profile was computed for these streams. All elevations are referenced to the

NGVD. Elevation reference marks and descriptions used in this study are shown on the maps.

The floodways determined for the restudied streams were computed on the basis of equal conveyance reduction. No floodway was determined for Cave Creek.

Specifics of the hydrologic and hydraulic analyses for each of the six restudied streams are presented below.

Cave Creek Wash

Cave Creek Wash was restudied from just south of the ACDC to its confluence with the Salt River. The ACDC was designed to convey all of the flow upstream of it northwesterly to the New River watershed. The reanalysis, therefore, considers only the flow generated for that portion of the watershed, 25 square miles, downstream of the ACDC. The Cave Creek Wash watershed downstream of the ACDC is highly urbanized. Street elevations and grades, storm sewers, fences, walls, buildings, railroads, canals, and the freeway system substantially impact and control drainage patterns.

The levees along Cave Creek Wash were constructed using unconsolidated soils. It was determined that the levees would not contain the 100-year flow and were, therefore, not recognized as flood protection structures. The Southern Pacific Railroad embankment was not considered in the hydraulic analysis because it neither contains nor diverts the 100-year flow. Peak discharges for Cave Creek south of the ACDC were computed using the COE HEC-1 computer program. Runoff for the portion of the Cave Creek Wash watershed between the ACDC and Grand Canal does not concentrate to a single flowpath. The flow follows several parallel drainage subarea flowpaths (primarily within streets). This portion of Cave Creek Wash was analyzed using shallow flooding methods. The reach of Cave Creek Wash from the Grand Canal to its confluence with the Salt River was studied by the detailed methods discussed previously.

The starting water-surface elevation for the detailed hydraulic analysis was taken at the confluence of the Cave Creek Wash and the Salt River from the effective Salt River analysis.

The Manning's "n" values established for the urban areas were calculated by methodologies developed by the USGS (Reference 76). Due to lack of a topographical low point for the Cave Creek channel, the floodplain was located in the same general area as was presented in the previously effective Flood Insurance Study report for Maricopa County. Because the entire floodplain of Cave Creek Wash within the City of Phoenix is developed, no floodway was computed for this reach of Cave Creek Wash.

Galloway Wash

Galloway Wash, a tributary of Cave Creek Wash in the upstream portion of its watershed (below Ocotillo Road) in east-central Maricopa County, flows west through Maricopa County and the Town of Carefree. The tributary is formed by a middle and lower branch, which collectively drain an area of approximately 6.2 square miles. The watershed drains a mountainous area with a relatively steep gradient averaging 0.18 foot per mile. The stream was restudied from Pima Road to a point approximately 2.4 miles above Cave Creek Wash. Peak discharges were calculated using the SCS TR-20 computer program. The starting water-surface elevations used in the reanalysis were taken from the effective Flood Insurance Study.

The Hassayampa River

The Hassayampa River is a tributary of the Gila River located in the west-central portion of the county. The Hassayampa River flows south through Maricopa County and the Town of Buckeye to the Gila River. The watershed drains approximately 1,504 square miles in Maricopa and southern Yavapai County with headwaters in the Bradshaw Mountains.

The entire reach of the Hassayampa River within Maricopa County was restudied by detailed methods. Levees have been constructed in the agricultural areas in the lower reaches of the Hassayampa River, upstream and downstream of old U.S. Highway 80. It was determined that these levees would not provide protection from the 100-year flow.

Peak discharges for the Hassayampa River were developed from analyses of historic floods and stream gage records (Reference 77). These records were then used to develop discharge-frequency relationships.

The starting water-surface elevation for the hydraulic analysis was taken at the confluence of the Hassayampa River and the Gila River from the effective Gila River analysis. In areas where levees were present, analyses were performed for conditions with and without the levees containing the 100-year flow. The Floodway Data Tables and Flood Profiles present only the most conservative elevations for the channel and overbank areas.

Centennial Wash

Centennial Wash is a tributary of the Gila River, with headwaters at an elevation of 4,500 feet located in the Date Creek Mountains near Wickenburg, Arizona, approximately 50 miles northwest of Phoenix. Runoff is generated within a 1,870-square-mile area. The Centennial drainage basin tends to flow in a southerly direction and passes through Yavapai, Maricopa, and La Paz Counties. The Centennial Wash watershed is characterized by

mountain ranges of moderate elevation along the entire perimeter of the basin and by numerous poorly defined, highly dynamic, braided washes that create a poorly defined, dominant channel over the majority of the watershed. In most locations, the Centennial Wash channel is wide, shallow, and recognizable only by dense stands of native vegetation. In several other locations, the channel loses its definition and becomes part of the irrigated farmland that is prominent in several areas. The channel does not have the capacity to convey major flows. Large areas of the watershed are susceptible to shallow flooding due to the flatness of the valley floor. Channel slopes range from approximately 0.3 percent to 2.65 percent. Moderate to heavy growth of native vegetation covers most reaches of the channel and associated overbank areas.

Centennial Wash terminates at its confluence with the Gila River, at an elevation of 785 feet. The mean slope is 0.64 percent for the overall Centennial Wash drainage basin.

Flood-control structures within the Centennial Wash basin range from minor features such as spreading dikes and local diversion systems to detention structures and levees. As determined through field investigation and reconnaissance, many of these structures were not designed for, or are not capable of, storing or diverting the 100-year storm runoff. The following is a discussion regarding the more significant flood-control structures in the Centennial Wash basin.

Ritter Dam is located in the northeastern portion of the upper Centennial Wash watershed. Due to its relatively small size, it will provide flood protection only during low-flow events.

In 1956, the U.S. Department of the Interior, Bureau of Land Management, constructed seven detention structures adjacent to Centennial Wash between the Towns of Wenden and Aguila. Field investigation revealed that two of the basins on the upstream area had been breached at some time. No evidence was available to determine the design flow used for their construction. Therefore, these structures were not considered in the hydraulic analysis.

The Narrows Dam is located approximately 8 miles southeast of Salome in the Little Harquahala Mountains. This facility is under the jurisdiction of the Bureau of Land Management and of Maricopa County. As evidenced during field investigation, the dam is presently in good condition and functioning appropriately. However, its capacity to control the 100-year discharge is marginal. The Tiger Wash Detention Structure is located north of Interstate 10, in the central region of the Centennial drainage basin. This facility detains peak runoff generated by the Tiger Wash drainage basin and outlets into Centennial Wash just upstream of Interstate 10. This project provides some flood protection to Interstate 10 and the CAP Canal.

The Harquahala Flood Retention Structure is also located north of Interstate 10 and lies to the east of the Tiger Wash Detention Structure. This facility detains peak runoff generated in the Big Horn Mountains. Outflow from this structure is conveyed to the Centennial Wash by means of the Saddleback Diversion System. This structure provides some flood protection to the downstream properties.

The 100-year peak discharges for Centennial Wash were developed using the COE HEC-1 computer program. The starting water-surface elevation for the hydraulic analysis was determined by the slope-area method at the mouth of Centennial Wash.

Cemetery Wash

Cemetery Wash is a tributary of the Hassayampa River and flows east through Maricopa County and the Town of Wickenburg. The watershed is located in northwest Maricopa County. The wash is well defined, with steep banks, except for an area that lies just upstream from its confluence with the Hassayampa River. In this area, the floodplain widens out before overtopping the Atchison, Topeka and Santa Fe Railway bridge and joining the Hassayampa River floodplain.

The levees along Cemetery Wash, located just upstream and downstream of the Atchison, Topeka and Santa Fe Railway bridge do not contain the 100-year flow. The peak discharges for the Cemetery Wash watershed were computed using the SCS TR-55 computer program. The starting water-surface elevation for Cemetery Wash was computed using the slope-area method. The levees located upstream and downstream of the Atchison, Topeka and Santa Fe Railway were considered in the hydraulic analysis. Separate models were constructed to include the levees along each bank separately. The highest elevations in the channel and each overbank were then presented on the FIRM.

Waterman Wash

Waterman Wash is a tributary of the Gila River with headwaters in the Maricopa Mountains east of Gila Bend, Arizona, approximately 45 miles southwest of Phoenix. The drainage basin is bounded on the southwest by the Maricopa Mountains and on the northeast by the Sierra Estrella and Palo Verde Mountains. The Waterman Wash in this vicinity flows in a northwesterly direction, through the Mobile and Rainbow Valleys, in Maricopa and Pinal Counties.

The Waterman Wash drainage basin is elliptical in shape, with a total basin length of approximately 37 miles and a maximum basin width of about 20 miles, and is estimated at 401.6 square miles. The subject watershed is characterized by mountains of moderate elevation along the entire perimeter of the basin.

The lower portion of the watershed, downstream of the West Prong Waterman Wash, includes a wide, natural channel (approximately 100 to 150 feet wide) with a sandy bottom. Heavy growth of native vegetation, especially salt cedar, covers the primary channel banks and isolated sand bars within the channel. The channel slope in the lower portion is approximately 0.30 percent.

Portions of the Waterman Wash channel have been altered from its natural condition by local farmers who have excavated and widened the natural channel and built earthen dikes along the channel to protect their farms from flooding. Although this channel widening and construction of dikes may provide some protection during low-flow events, they are not considered effective during the 100-year flood. The only area with some isolated, private residential properties located within the Waterman Wash watershed is near Mobile.

The 100-year peak discharges for Waterman Wash were developed using the COE HEC-1 computer program. The starting water-surface elevations for Waterman Wash were determined by the slope-area method at its confluence with the Gila River.

In addition to the aforementioned restudied streams, this revision presents updated information for the following flooding sources:

Agua Fria River

For the reach of the Agua Fria River from the confluence with the Gila River upstream to Waddell Dam, a revised hydraulic analysis for the riverine portions of this study and hydrologic and hydraulic analyses for ponding adjacent to the levees were developed by Jerry R. Jones & Associates, Inc. (JJA), for the FCDMC. The revised hydrology for the riverine portions of this study was developed by the FCDMC. These data are presented in the technical reports entitled "Flood Insurance Study, Agua Fria River, Maricopa County, Arizona," dated January 1989 and prepared by JJA for the FCDMC, and "Agua Fria River Hydrology," prepared by the FCDMC.

Several flood-control levees have been constructed since 1985 along the lower reaches of the Agua Fria by both the FCDMC and the COE. These are found at the following locations:

- Along both sides of the Agua Fria River from Buckeye Road (approximately River Mile 3.7) to immediately upstream of Indian School Road (approximately River Mile 8). These are soil-cement levees built by the FCDMC.

- Along the west bank of the Agua Fria River from just below Lower Buckeye Road (approximately River Mile 1.9) upstream to Buckeye Road. This levee was built by the COE.

- Along the eastern bank of the Agua Fria River just upstream of Lower Buckeye Road at the Rio Vista Subdivision. This levee was also built by the COE.

The hydrologic analysis developed by the FCDMC for the riverine portions of this study was based on modifications to the COE 1984 hydrologic analysis for the Agua Fria River from its confluence with the Gila River to the Waddell Dam site. The COE data were modified to account for the loss of channel storage resulting from channelization, and to provide more gradual attenuation of flow from one reach to the next. Modified discharges are presented in Table 3, Summary of Discharges.

The hydrologic analysis of the ponded areas behind the levees was developed by the use of the COE HEC-1 hydrologic computer model. The discharges used for the analysis of ponding areas were determined using the COE computer program HEC-1. Watershed boundaries were based on a report, prepared by Simons, Li & Associates (SLA), for the determination of the size and number of the levee outlet structures at each ponding location. The watershed boundaries were field checked and modified where necessary to conform to present conditions. SCS methods (curve numbers, lag, unit hydrographs) were used to calculate the hydrograph at each ponding location. In some cases, all or a portion of the hydrograph at an upstream ponding location was added to a downstream ponding location because no ponding physically could occur at the upstream location. The upstream and downstream hydrographs were combined when one of the two scenarios below applied:

- There was no physical barrier to prevent the water ponding at one location from flowing along the landward side of the levee toward the next downstream ponding location;

or,

- The water was unable to discharge through the levee outlet, due to the high water level in the river, and flowed along the landward side of the levee toward the next downstream ponding location.

Level-pool routing was used to route the flow through the outlet and into the main channel of the river. The 100-year, 24-hour precipitation, as determined from the Region VIII NOAA Atlas, was used as the design storm. The following table lists the ponding elevations investigated.

Location	Water-Surface Elevation (Feet NGVD)
East levee, north of Buckeye Road	964.3
West levee, north of Buckeye Road	962.7
East levee, north of Van Buren	971.8
West levee, north of Van Buren	974.2
West levee, north of Interstate 10	*980.0
East levee, north of McDowell Road	983.9
West levee, north of McDowell Road	983.3
West levee, north of Roosevelt Irrigation District Canal	1,000.2
West levee, north of Indian School Road	1,007.9

*Does not appear on maps due to scale.

The revised hydraulic analyses utilized cross section data derived from topographic maps obtained from aerial photographs taken in 1987 and 1988. Bridge, culvert, and flume data were obtained from structural plans and field checked to verify information. Additional elevations were obtained by field survey where necessary.

The hydraulic analyses were conducted by JJA by utilizing the COE HEC-2 hydraulic computer model. The starting water-surface elevations were based on the effective water-surface elevations at the Gila River confluence. Channel and overbank roughness factors (Manning's "n" values) were chosen based on engineering judgment from field observations of the river channel and overbank areas. The channel "n" values ranged from 0.022 to 0.059, and the overbank "n" values ranged from 0.032 to 0.070, as shown in Table 4, Range of Hydraulic Coefficients (Manning's "n"). A clogging factor of 50 percent of the pier width was added to all pier widths to estimate the effects of debris accumulation on the piers.

Ponding elevations for the 100-year flood were calculated using the level-pool routing method within HEC-1. The water-surface elevation within the Agua Fria River was assumed to be the 100-year elevation and was assumed constant for the duration of the ponding. Elevation-discharge relationships were calculated for each outlet using Hydraulic Engineering Circular No. 5, entitled "Hydraulic Charts for the Selection of Highway Culverts," prepared by the U.S. Department of Commerce, Bureau of Public Roads, and dated December 1965. All outlets have one-way flapgates, and no water was assumed to discharge from the river into the ponding area.

The 100- and 500-year floodplain and 100-year floodway boundaries were delineated on topographic maps at a scale of 1:4,800, with a contour interval of 4 feet, entitled "Flood Insurance Study, Work Map, Maricopa County, Arizona," prepared by JJA and dated February 6, 1989. These maps were based on 1:4,800 topographic

mapping prepared by Cooper Aerial Survey Company from photographs taken in May 1987. The 500-year floodplain boundaries were delineated from the April 15, 1988, FIRM for Maricopa County, Arizona and Incorporated Areas.

The modeling of the flows at the Grande Avenue and Atchison, Topeka and Santa Fe Railway bridges was complex due to the inadequate capacity of the bridges to pass large flows. During a flood, water flows under the highway/railroad bridges located at the main channel and in the west overbank, and wier flow over the roadway and railway occurs near the smaller structures located in the west overbank area.

An elevated landfill (the El Mirage Landfill) was built along the west bank of the main channel downstream of the bridge. This landfill effectively separates the flows in the main channel from the flows passing through and over the bridges located in the west overbank. Several split flow analyses and backwater analyses were performed to develop a split flow rating curve.

Floodways were developed on both sides of the landfill. Because the landfill is in the middle of the combined floodplain, encroachment on the west floodplain was only from the west and encroachment on the east floodplain only from the east.

The revised floodway analysis was computed by using both Method 4 and Method 1 in the HEC-2 hydraulic computer model. Method 4, the equal-conveyance reduction method, was initially used with a target of 1.0 foot of rise allowed. After initial runs, Method 1 was used to "smooth out" the floodway and to ensure that the 1.0-foot allowable rise criteria was met.

This revision included the LOMRs issued on August 11, 1989, for the City of Avondale and the unincorporated areas of Maricopa County. These LOMRs were issued based on certification from the COE, Los Angeles District, which stated that the levee along the western bank of the Agua Fria River and the levee located along the eastern bank of the Agua Fria River just upstream of Lower Buckeye Road at the Rio Vista Subdivision can convey the designed Standard Project Flood flow of approximately 140,000 cfs.

The Floodway Data Tables, Tables 1, 3, and 4, and the Profile Panels for the Agua Fria River have been modified to reflect this revised analysis.

Wittmann Watershed Area

The hydrologic and hydraulic analyses for portions of Trilby Wash, McMicken Dam Outlet Wash, and the washes around the Circle City and Wittmann area, including the revision and extended hydraulic analysis of Wittmann Wash, were performed by The WLB Group, Inc., under contract to the FCDMC as part of the Wittmann Area Drainage Master Study (ADMS). This study was completed in December 1988.

This revised analysis included the following streams:

- Trilby Wash, which flows southeasterly from the Hieroglyphic Mountains to the Trilby Wash detention basin behind McMicken Dam in the north-central part of Maricopa County

- The McMicken Dam Outlet Wash, which flows south from the McMicken Dam Outlet channel to the Agua Fria River east of Sun City West

- Wittmann Wash, which flows through the unincorporated community of Wittmann in north-central Maricopa County

- A wash parallel to and along the Atchison, Topeka and Santa Fe Railway, which flows through the unincorporated community of Wittmann to its confluence with Wittmann Wash

- Several small washes, which flow southerly near the unincorporated community of Circle City northwest of Wittmann in Maricopa County

Trilby Wash detention basin (McMicken Dam) was completed in 1956. The detention basin was designed to contain the Standard Project Flood below the spillway with a capacity of 19,300 acre-feet. The capacity was checked with 1:4,800, 4-foot contour interval topographic mapping as part of the Wittmann ADMS. The recomputed capacity was 20,800 acre-feet below the spillway elevation of 1,353.65 feet. The detention basin was found to contain the 100-year flood.

Peak discharge-frequency relationships for the Wittmann ADMS including Trilby Wash, Circle City area washes, Wittmann area washes, and the McMicken Dam Outlet Wash were computed using the COE HEC-1 hydrologic computer model. These are presented in Table 3.

Cross section data for Trilby Wash, McMicken Dam Outlet Wash, Circle City area washes, and Wittmann area washes were taken from topographic mapping at a scale of 1:2,400, compiled for the Wittmann ADMS, prepared by The WLB Group, Inc., dated December 1988.

The hydraulic analyses were conducted by The WLB Group, Inc., by utilizing the COE HEC-2 hydraulic computer model. Channel and overbank roughness factors ("n" values) are shown in Table 4. Water-surface elevations upstream of culverts in the Wittmann and Circle City area washes were computed using the Bureau of Public Roads Hydraulic Engineering Circular Number 5. These elevations were inputted directly into the HEC-2 computer model. The 100-year floodways were computed using Method 4 in the HEC-2 hydraulic computer model.

The 100-year floodplain on Wittmann Wash (formerly called Wittmann Drainage) was revised as a result of the Wittmann ADMS developed

by The WLB Group, Inc. The 100-year floodplain and floodway boundaries were delineated on topographic maps at a scale of 1:2,400, with a contour interval of 2 feet, entitled "Flood Control District of Maricopa County, Aerial Mapping for Wittmann ADMS," prepared by The WLB Group, Inc. These maps were based on aerial topography flown by Cooper Aerial Survey Company between October 6 and December 11, 1986.

Tables 1 through 4 have been modified as a result of this revision, and Floodway Data Tables and Profile Panels have been added.

Gila River from Gillespie Dam to Bullard Avenue

For the reach of the Gila River extending from Gillespie Dam to just downstream of Bullard Avenue, a revised hydraulic analysis was developed by Dames & Moore (DM). This new analysis was performed to incorporate the results of the 1982 COE hydrologic study of the Gila River below its confluence with the Salt River. The additional 100-year discharges developed by the COE are presented in Table 3. New topographic information, including the addition of bridge structures, was also incorporated into the revised hydraulic analysis.

Cross section data for the hydraulic analysis was taken from topographic mapping derived from aerial photography. The aerial topographic mapping was developed by Aerial Mapping Company, Inc. (AMC), and by Kenney Aerial Mapping, Inc. (KAM), based on aerial photography dated March and May 1984, respectively. Selected cross sections were field verified by AMC in April and May of 1987.

Two new bridges and one expanded bridge were also included in the revised hydraulic model. New structures were built for Tuthill Road and Reems Road in 1981 and 1988, respectively. Also, the bridge over the Gila River at Arizona Highway 85 (U.S. Highway 80) was approximately doubled in length in 1982.

Water-surface elevations for the 10-, 50-, 100-, and 500-year floodplains and 100-year floodway were developed by using the COE HEC-2 water-surface profile computer program. Manning's "n" values were determined by field visit along the Gila River by DM and the FCDMC. Notes and photographs were taken and then used with stereoscopic aerial photographs to estimate the "n" values. The selected "n" values are presented in Table 4. Dames & Moore developed the revised 100-year floodway analysis utilizing Method 1 encroachment in the HEC-2 hydraulic computer model.

The 100- and 500-year floodplain and 100-year floodway boundaries were delineated on topographic maps at a scale of 1:4,800, with a contour interval of 4 feet, entitled "Floodplain Delineation, Gila River, Gillespie Dam to Bullard Avenue," prepared by DM, dated May 1988, and revised on April 20, 1989. The maps were based on the aerial mapping produced by AMC and KAM.

Tables 1 and 4, and the Floodway Data Tables, and Flood Profiles for the Gila River have been revised to reflect this revision.

Salt River Between Country Club Drive and Granite Reef Dam

For the reach of the Salt River from Country Club Drive to Granite Reef Dam, a hydraulic analysis was developed by Burgess and Niple, Inc. (B&N), for the FCDMC. This analysis is presented in the technical report entitled "Flood Control District of Maricopa County, Salt River Flood Delineation Study, Country Club Drive to Granite Reef Dam," dated October 1988, and prepared by B&N. As a result of this analysis, new detailed 100-year flooding and floodway delineations for the Salt River are shown on FIRM Panels 1750, 2180, 2185, and 2205.

Existing hydrologic data were utilized in this analysis. Cross section data for the HEC-2 hydraulic analysis were obtained from topographic maps at a scale of 1:4,800, with a contour interval of 4 feet, prepared by KAM, and flown in 1984.

The COE HEC-2 hydraulic computer model was used to develop the 100-year water-surface profiles. The starting water-surface elevation at the upstream face of the Country Club Drive bridge was obtained from the COE. The starting water-surface elevation was equal to the effective 100-year base flood elevation at this location. The floodway was computed on the basis of equal conveyance reduction from each side of the floodplain.

Data shown in Table 1, Floodway Data Tables, and Flood Profiles have been added to the Flood Insurance Study report to reflect this new detailed flooding information.

Salt River Between Scottsdale and Hayden Roads

For the reach of the Salt River between Scottsdale and Hayden Roads, a revised hydraulic analysis was developed by Futura Engineering, Inc. (FE), and Hydrodynamics, Inc. The basis for this revision was better topographic data and a new bridge at Hayden Road. This analysis is presented in the technical report entitled "Documentation for Letter of Map Revision, Salt River between Scottsdale and Hayden Roads, City of Tempe, Maricopa County, Arizona," dated May 13, 1988, and prepared by FE and Hydrodynamics, Inc. The revised 100-year floodplain and floodway delineations were shown on a topographic map entitled "Proposed Encroachments, Salt River, Section 23.398 to 24.196," at a scale of 1:2,400, prepared by FE and dated September 23, 1988.

As a result of these modifications, the base flood elevations increased in the vicinity of Hayden Road as shown on FIRM Panel 2170. These modifications are reflected on the Flood Profiles and Floodway Data Table for the Salt River.

Salt River in the Vicinity of 75th and Southern Avenues

The 100-year floodway delineation along a reach of the Salt River in the vicinity of 75th and Southern Avenues has been modified as shown on FIRM Panel 2115. This modification reflects a revised 100-year floodway analysis developed by Mathews, Kessler & Associates, Inc. (MKA). The revised delineation was submitted on a topographic map entitled "Study Map, Topography and Culture," approximate scale 1:3,600, also prepared by MKA.

As a result of this analysis, the base flood elevations increased slightly, and the floodway width was decreased between cross sections O and S. These modifications are reflected in the Floodway Data Table for the Salt River. Because the increases to the base flood elevations were only approximately 0.1 foot in this reach, no changes to the profiles were practical.

East Maricopa Floodway

The effects of the construction of the East Maricopa Floodway (EMF), an SCS channel, from the Maricopa County/Pinal County boundary north to Brown Road are shown on FIRM Panels 2205, 2215, 2680, 2685, 2690, 2695, and 3075. The EMF, which runs parallel to the Roosevelt Water Conservation District (WCD) canal located to the west of the EMF, was designed to collect floodwaters generated by the East Maricopa Watershed and the Queen Creek Watershed and convey these flows to the Gila River. In addition, the shallow ponded areas behind the Roosevelt WCD canal are collected by the EMF. To support this revision, the following data, all prepared by the SCS, were submitted:

- Sheets 2 through 15 of 24 entitled "R.W.C.P. Floodway - Reach 1," dated July 1979
- Sheets 2 through 14 of 50 entitled "R.W.C.P. Floodway - Reach 2," dated March 1982
- Sheets 2 through 16 of 50 entitled "R.W.C.P. Floodway - Reach 3," dated March 1984
- Sheets 2 through 16 of 36 entitled "R.W.C.P. Floodway - Reach 4," dated February 1986
- Sheets 1 through 14 of 30 entitled "East Maricopa Floodway Reach 5," dated May 1987
- Sheets 1 through 11 of 25 entitled "East Maricopa Floodway Reach 6," dated February 27, 1987

- A letter of certification dated July 10, 1989, from the SCS, stating that reaches 1 through 5 of the EMF, from the confluence with the Gila River (located south of the Maricopa County/Pinal County boundary) to Guadalupe Road, were built in conformance with the above-referenced construction drawings and that reach 6, from Guadalupe Road north to Brown Road, would be completed in July 1989. This letter also stated that the 100-year flood will be conveyed in the channel and no ponding will occur along the east bank of the EMF. Construction of reach 6 of the EMF was confirmed by telephone with the FCDMC on August 10, 1989.

The 100-year flood is contained within the right-of-way of the EMF from the Maricopa County/Pinal County boundary north to Brown Road. The Zone A floodplain boundaries have been revised to coincide with the right-of-way limits for the EMF. The areas outside of the right-of-way limits on the east side of the EMF have been redesignated as Zone X (shaded).

Washes 9 and 10 (Verde River Tributaries)

The LOMR issued on May 24, 1989, for the unincorporated areas of Maricopa County to reflect a channelization and relocation project along Washes 9 and 10 in the vicinity of the Rio Verde Subdivision is shown on FIRM Panel 1300. In support of this request, the following data, all prepared by Wiley and Associates, Inc., were submitted:

- A report entitled "Floodplain Study of Rio Verde, Arizona," dated May 20, 1988

- Sheets 1 through 3 of topographic maps entitled "Rio Verde Flood Study," dated May 20, 1988

- A blueprint of an aerial photograph entitled "Rio Verde Flood Study," showing the Rio Verde Subdivision limits and channel locations, dated February 1987

- A drainage map entitled "Tonto Verde, Master Drainage Map," dated November 1986

- A drainage map entitled "A Map for a Drainage Study, Rio Verde," showing floodplain boundary delineations, dated February 1987

- A report entitled "Preliminary Drainage Report, November 1986, Tonto Verde Master Plan," dated November 1986

- A topographic map entitled "McDowell Mountain Park Channel," dated July 1987

As a result of this project, the 100-year flood boundaries designated as Zone A along Washes 9 and 10 were modified.

Cave Creek

The reach of Cave Creek Wash from its confluence with the ACDC upstream to the Sweetwater Avenue alignment was revised based on data submitted by the FCDMC. The request for the revision was made in order to incorporate the effects of a channel modification project which included a concrete-lined channel along Cave Creek Wash and a sediment basin at the upstream end just below Sweetwater Avenue. This revision was part of a larger request submitted by the FCDMC for Cave Creek Wash from the ACDC upstream to Cave Butte Dam and approved in a Best Available Data Letter dated February 4, 1991.

The revised hydrologic and hydraulic analyses for Cave Creek Wash were performed by Burgess & Niple, Inc. (BN), for the FCDMC. The COE HEC-1 flood hydrograph computer model was utilized to determine the 10-, 50-, and 100-year flood discharges. The modeling was accomplished using the SCS Unit Hydrograph, Initial and Uniform Losses, and routing, combining and diversion of sub-basin hydrographs. The hydraulic analyses were performed with the use of the COE HEC-2 hydraulic computer model. Water-surface profiles were calculated for the 10-, 50-, and 100-year floods. Topographic maps, entitled "Work Map, Middle Cave Creek Floodplain Delineation Study, FCD 88-56, FCDMC," Sheets 1 and 2 of 13, prepared by BN, dated January 31, 1990, were used to determine cross sections for use in the HEC-2 hydraulic computer model and also to plot the resulting 100-year floodplain boundaries. The 100-year flood was determined to be contained within the banks of the newly constructed concrete channel along Cave Creek Wash.

Since the 100-year flood is now contained within the channel, detailed flooding has been removed for this reach of Cave Creek Wash, between the ACDC and Sweetwater Road. Flood Profiles Panels 52P, 53P, and a portion of 54P have been eliminated for this reach in addition to cross sections A through S in the Floodway Data Table. Subsequent profiles were not renumbered and the remaining cross sections for Cave Creek Wash were not relabeled.

As a result of the revisions to Cave Creek Wash, the 100-year floodplain has been greatly decreased. The 100-year floodplain boundaries have been added to the FIRM along the ACDC, from Black Canyon Highway to Dunlap Avenue. The 100-year floodplain boundaries shown for this area follow the designated right-of-way for the ACDC.

All changes previously described for Cave Creek Wash and the ACDC are shown on FIRM Panel 1655. The Summary of Discharges Table, Floodway Data Table, and Flood Profiles have been revised to reflect the revisions to Cave Creek Wash.

The LOMR issued on March 2, 1990, for the City of Phoenix, Arizona, to reflect a channel modification project along Cave Creek Wash from Tierra Buena Lane to 11th Avenue is shown on FIRM

Panel 1215. In support of this request, the following data were submitted by Amwest Engineering Company, Inc. (AEC):

- A copy of the effective HEC-2 hydraulic computer model including input and output listings for the study area along Cave Creek Wash
- A copy of the revised HEC-2 hydraulic computer model including input and output listings for the study area along Cave Creek Wash
- Sheets 1 through 5 of 8 of plans entitled "Paving Plan for Tierra Buena Lane," prepared by AEC, dated July 1987, and revised November 3, 1988
- Sheet 6 of 8 of plans entitled "Culvert Plan, Paving Plan for Tierra Buena," prepared by AEC, dated July 1987, and revised December 8, 1987
- Sheets 1 through 10 of 12 of plans entitled "Paving Plan for Greenway Parkway, 15th Avenue (alignment) to 7th Avenue," prepared by AEC and dated December 1986
- Sheets 1 and 2 of 2 of work maps entitled "Cave Creek Wash Section Location, Point Elevations and 500-Year Limit," and "Cave Creek Wash 100-Year and Floodway Limit," prepared by AEC and dated October 11, 1989
- A topographic map entitled "Channel Cross Section Locations Tierra Buena Lane," at a scale of 1:480, with a contour interval of 1 foot, prepared by AEC and dated March 1988
- Sheet 1 and 2 of 2 of plans entitled "Shirmer Property Engineered Fill Grading Plan," prepared by AEC and dated September 1989
- A copy of FIRM Panel 04013C 1215 E, scale 1:12,000, showing the revised 100- and 500-year flood boundaries and the 100-year floodway boundary
- Revised Flood Profiles
- A community acknowledgment letter

As a result of this channel modification project, the 100-year flood and floodway are contained within the channel for this reach of Cave Creek Wash.

The Floodway Data Table and Flood Profile Panels for Cave Creek Wash have been changed to reflect these modifications.

Skunk Creek

The LOMR issued on March 9, 1990, for the City of Phoenix, Arizona, to reflect channel improvements and grading along a reach of Skunk Creek between Pinnacle Peak Road and 35th Avenue is shown on FIRM Panel 1185. This LOMR was a reissuance of the LOMR dated June 15, 1987. In support of the LOMR, the following data were submitted:

- A request form entitled "Request for Letter of Map Revision Involving Fill," dated January 16, 1990
- A "Community Acknowledgment of Request for Letter of Map Revision" form, signed by the City of Phoenix and dated January 23, 1990
- A copy of FIRM Panel 1185 dated September 29, 1989, showing the approximate location of the North Canyon Ranch Industrial Park Subdivision
- A copy of recorded plat for North Canyon Ranch Industrial Park with an approximation of floodplain and floodway limits scaled from FIRM Panel 1185, dated September 29, 1989
- A copy of the previous LOMR, dated June 12, 1987, based on information from Collar, Williams and White (CWW)
- A copy of Sheet 7 of 9 of "Adobe Mountain Grading and Drainage," prepared by CWW and stamped June 26, 1986, showing as-built spot elevations
- A copy of Sheets 1 through 4 of 4 of "Adobe Mountain--Skunk Creek Floodplain Analysis, Water-Surface Elevations," prepared by CWW (Sheet 1 shows an approximate water-surface profile based on elevations for the 1988 and 1989 Flood Insurance Rate Maps.)
- A copy of "Exhibit: Reflecting Changes in Floodplain Limits Caused by Proposed Grading Construction of Adobe Mountain," prepared by CWW (one sheet)
- A copy of the report entitled "Adobe Mountain--Skunk Creek Floodplain Revision," dated August 1986, prepared by CWW

As a result of these modifications, the 100-year floodplain delineations and base (100-year) flood elevations (BFEs) have been revised.

The Floodway Data Table and Flood Profile Panels for Skunk Creek have been revised to reflect these modifications.

Tempe Canal

The dual zone labels (Zone A and Zone AH) for the designation of the SFHA located upslope of the Tempe Canal within the City of Mesa as shown on FIRM Panel 2635 were corrected. The incorrect zone designation of Zone AH (Elevation 1195) was removed. This zone designation was inadvertently not removed prior to final printing of the April 15, 1988, FIRM. The basis for this modification was notification by the Arizona Department of Water Resources of the dual zone labels.

10.3 Third Revision

This study was revised on December 3, 1993, to provide detailed flood hazard information for areas subject to alluvial fan flooding north of the Central Arizona Project Canal between the McDowell Mountains and Cave Creek, and to include the restudy of hydraulic conditions on Cave Creek, East Fork Cave Creek, Upper Centennial Wash, and Salt River, as well as various requests for map revisions based on newly studied streams and ponding areas. The restudied and newly studied flooding sources are located in the unincorporated areas of Maricopa County, the Cities of Peoria, Phoenix, Chandler, Mesa, Scottsdale, Tempe, and the Towns of Cave Creek, Carefree, Queen Creek, Gilbert, Gila Bend, and El Mirage.

The portions of streams studied by detailed methods were added to Table 1, Detailed-Study Sources.

The process of converting the existing FIRM panels from standard format to map initiatives format as described in Section 10.1 continues with this revision. Zone designations were revised as required by a given study. Additional reference marks and descriptions used in this study are shown on the map panels. Tables 1 through 4, Floodway Data Table 5, and the Flood Profiles have been revised to reflect the new detailed flooding information.

Specifics of the hydrologic and hydraulic analyses for all streams are presented below.

Flooding Effects from Basins 1 through 6 - Alluvial Fan Flooding North of the Central Arizona Project Canal between the McDowell Mountains and Cave Creek

Six major drainage areas were identified as the sources of flooding for the study area. The hydrologic analysis revealed that those six areas contained 13 distinct apexes (concentration points). The streams that drain the basins associated with each of those apexes are identified on the FIRM. Each stream is labeled with a number corresponding to one of the six major drainage areas, followed by a letter for streams draining areas having more than one distinct apex. A label identifying the source of flooding is provided on FIRM panels where the apex corresponding to the major drainage basin is shown on another panel.

The flood-frequency curves in this revision were taken to be log-normal. The means and standard deviations of the curves were computed from the 2- and 100-year discharge values determined at each apex using the COE HEC-1 computer program (Reference 78). Discharge values for selected recurrence intervals are presented in the Summary of Discharges (Table 3).

Floods from Basins 6B and 6C flow within a well-defined network of channel reaches until they are approximately 0.5 to 1.0 mile downslope of Scottsdale Road. There are three points in that network where one reach splits into two. The flood-frequency curves at the three outlets of the network were estimated by simulating 10,000 floods from each of the two basins. The probability density function describing the percentage of flow that takes either the right or left path below each split was taken to be uniform. Floods from each basin were treated as independent. At each outlet, the resulting flow values and their frequency of occurrence from the simulations were fit to a log-Pearson Type III distribution by the method of least squares. Floodwaters passing Apex 5 can follow three different paths to Scottsdale Road. The flood-frequency curves for each of those paths were determined in the same way as those for flows from Basins 6B and 6C.

This revision reflects flood hazards associated with runoff from the watersheds above the apexes only. Therefore, it should be noted that runoff resulting from rain falling directly on the SFHAs has not been considered. Runoff generated on the SFHAs is usually conveyed downslope as shallow overland sheetflow that eventually flows into and down the many channels on the alluvial fan surface. The flood hazards associated with that kind of runoff are usually considered minimal (because of the relatively small drainage area contributing to any one channel). However, if shallow flows, which under natural conditions are distributed over a very large area, are somehow concentrated in a few small channels, the increase in flow depths and velocities and, consequently, the associated flood hazards, may be great.

The SFHAs presented in this revision were delineated using topographic maps, aerial photographs, and soil survey maps (References 66 and 79 through 88). The 100-year flood depths and velocities were determined using the FEMA methodology for analyzing areas subject to alluvial fan flooding. The downslope limits of the SFHAs denote the boundaries, downslope of which the probability of a given point being inundated by more than 0.5 foot of floodwater is less than 0.01 in any given year. That probability will be exceeded within well-defined washes below the limits shown on the FIRM. Because the flood hazards within a well-defined wash are self-evident and because of map scale restrictions, the SFHAs within those individual washes are not delineated on the FIRM. Obviously, sound floodplain management requires that those washes remain unobstructed.

Also note that downslope of the SFHA limits, the hazards associated with alluvial fan flooding are just as severe as those upslope of the limits. The distinction between the zone designations downslope and upslope of the limits should be regarded as a distinction between flooding potentials and not a distinction between the severity of damages to be expected in the event of a flood.

Some of the areas subject to alluvial fan flooding are designated Zone AO. Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year 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.

Cave Creek from Cave Butte Dam to the Arizona Canal Diversion Channel

The revised hydrologic and hydraulic analyses for Cave Creek, which also includes a 1.4 mile reach of East Fork Cave Creek from its confluence with Cave Creek to Central Avenue, were performed by Burgess & Niple, Inc., for the FCDMC. The results of these analyses are presented in Volumes 1 through 2 of 2 of the report entitled "Cave Creek Floodplain Delineation, Cave Buttes Dam to the Arizona Canal Diversion Channel, Final Hydrology Report," dated January 1990, and in the report entitled "Cave Creek Wash, Floodplain Delineation Study, Cave Butte Dam to Arizona Canal Diversion Channel," dated January 1990. The purpose of this revision was to reflect increased urbanization of the watershed and improvements to the Cave Creek Channel. The most distinct channel improvement is the 1.86 mile concrete-lined channel recently constructed by the COE north of the ACDC. A Best Available Data Letter was issued on February 4, 1991, for this study.

The total watershed area is 34.7 square miles, which includes two basins not considered in previous studies. The watershed was modeled using the COE HEC-1 computer model. The Muskingum method was applied in the upper and middle reaches of the watershed where the channel cross section varied substantially within the reach and for routing down urban street alignments. The Normal Depth Channel, Modified Puls Method was used in the channel reaches in the lower portion of the East Fork Cave Creek basin, and for routing of Cave Creek flows from Bell Road South to the confluence with Moon Valley Wash, an area of more uniform cross sections and large storage volume capacity.

Cross-section data for the COE HEC-2 hydraulic computer model were obtained from topographic maps at a scale of 1:2,400, with a contour interval of 2 feet, prepared in 1989 by Aerial Mapping Company, Inc. The starting elevation in the ACDC was obtained using normal depth. The floodway for this study was computed on the basis of equal-conveyance reduction from each side of the floodplain.

The revised BFEs, floodplain boundaries, and floodway boundaries are shown on FIRM Panels 1210, 1215, 1220, and 1655. The data shown in Tables 1, 3, and 4, the Floodway Data Table, and the Flood Profiles for Cave Creek and East Fork Cave Creek have been revised to reflect this revision. The revised floodplain and floodway boundaries along East Fork Cave Creek shown on FIRM Panels 1215 and 1655 concurrently reflect the results of this revision and the determination issued in the LOMA dated November 23, 1992, for Lots 117 through 136, Coral Gables Estates Unit Six.

Cave Creek/Carefree

The hydrologic and hydraulic study for this portion of Cave Creek included Cottonwood Creek and tributaries, Flemming Springs Wash, North Tributary to Galloway Wash, Grapevine Wash, Ocotillo Wash and tributaries, Rowe Wash and tributaries, and Willow Springs Wash and tributaries. These streams are located in the unincorporated areas of Maricopa County, the Town of Cave Creek, and the Town of Carefree. The study entitled "Final Hydrologic and Hydraulic Report for Cave Creek/Carefree, Flood Delineation Study," dated March 1990, and Appendices A-C, were prepared by CH2M Hill for the FCDMC. Partial revisions to the study are dated April, September, and October of 1990, and June, July, and August of 1991. A Best Available Data Letter was issued on January 21, 1992, for this study.

Cave Creek and its tributaries drain the mountainous areas of east central Maricopa County flowing southwesterly to the confluence with the ACDC. Cave Creek flows are regulated by Cave Creek Dam located just north of Phoenix. This study area extends from Cave Creek River Mile 35.49 approximately 3.3 miles to the Tonto National Forest boundary.

Cottonwood Creek is the uppermost tributary to Cave Creek within the study area, along with two small tributaries. The Cottonwood system includes a total of 4.9 miles and flows westerly within well defined channels to Cave Creek.

The Willow Springs drainage system includes Willow Springs and Tributaries 1, 1-A, 2, 2-A, 3-A, 4, and Flemming Springs. This drainage system includes a total of approximately 14.7 miles. The channels are generally well incised, steep mountainous streams.

Ocotillo Wash and its Tributaries 1, 1-A, 2, 3, and 4 extend from the previous study limits easterly to the headwaters of the basin. A total of approximately 10.1 miles were mapped. The lower portion of Ocotillo Wash is a wide, poorly defined, braided stream system. The tributaries are generally well-defined streams draining small watersheds.

The wash shown on USGS quadrangle maps as Grapevine Wash is included in this study extending from its confluence with Rowe Wash, easterly approximately 1.4 miles. Rowe Wash and Rowe Wash Tributaries 1 and 2 study reaches begin at the study limit of the previous Flood Insurance Study. These streams extend easterly, to the Pima Road extension, totaling approximately 4.3 miles. The Rowe system is generally well incised and steep.

The North Tributary of Galloway Wash study reach extends from the confluence with Galloway Wash approximately 2.9 miles northeasterly to the Pima Road extension. The previous Flood Insurance Study included a study stream referred to as Grapevine Wash, which was a tributary to the current study reach of the North Tributary of Galloway. USGS quadrangle mapping and local anecdotal information, indicates that this small tributary, which originates at Grapevine Spring, was misnamed and should be referred to as Unnamed Tributary to Galloway.

No significant flood control levees or other control measures have been constructed within the area being studied.

The watershed was modeled using the COE HEC-1 computer model. For areas studied by detailed methods, BFEs were computed using the COE HEC-2 hydraulic computer model. Flood limits for the approximate study of Willow Springs Tributary 3-A were estimated using Manning's equation for normal depth.

The cross-section data for each of the streams were derived from topographic maps at a scale of 1:200, with a contour interval of 4 feet, prepared by Aerial Mapping Company, Inc., and from stereo topography dated August 1989. Ground control surveys and check profiles were provided by Greiner Engineering.

Starting water-surface elevations for those study reaches that are extensions of previously studied streams were taken from the effective Flood Insurance Study profiles. The starting water-surface elevations for all other streams were developed by using the slope-area method.

Floodways were modeled using Encroachment Method 6. This method was selected due to high velocities and incidence of critical and supercritical flow in the study reaches. The floodway was finalized by using Encroachment Method 1 at each cross section.

The 100-year flood boundaries were designated as Zone A for the upstream reaches of Rowe Wash and Willow Springs Wash, and for the entire reaches of Rowe Wash Tributary 1 and 2, and Willow Springs Wash Tributary 3. These boundaries were developed from approximate hydrologic and hydraulic analyses.

The reach of Ocotillo Wash from Cross Section T at mile 2.03 on the profile of Ocotillo Wash to the upstream limit of study is shown on the map panels as Zone A, because of the uncertainty of

the direction of the flows. This includes the 1.10 mile braided area of Ocotillo Wash upstream of mile 2.03.

As a result of this study, the 100-year flood boundaries designated as Zone A and the detailed 100-year floodplain and floodways for all of the above-studied streams, are shown on FIRM Panels 0414, 0415, 0418, 0419, 0802, 0804, 0805, 0806, 0807, 0808, and 0809.

Data shown in Tables 1, 2, 3, and 4, the Floodway Data Table, and the Flood Profiles have been revised to reflect this new flooding information.

Centennial Wash-Grass Wash-Aguila Farm Channel

The hydrologic and hydraulic study for Centennial Wash, Grass Wash, and Aguila Farm Channel, which includes the North Branch Centennial Wash, all located within the unincorporated areas of Maricopa County, was developed by URS Consultants. The results of their study are presented in the technical reports entitled "Flood Control District of Maricopa County, Hydraulic Report for Floodplain Delineation Study of Upper Centennial Wash, Grass Wash and Aguila Farm Channel," dated May 1990, and "Flood Control District of Maricopa County, Hydrology Report for Floodplain Delineation Study of Centennial Wash, Grass Wash and Aguila Farm Channel," dated April 1990. Portions of the Aguila Farm Channel and Grass Wash study reaches are restudied areas, while this reach of Centennial Wash and the North Branch are new detailed study reaches. A Best Available Data Letter was issued on April 26, 1991, for this study.

The contributing watershed and associated basins are located within the extreme northwest corner of Maricopa County. The watershed is bounded on the north by Harcuvar and Date Creek Mountains, on the east by Sols Wash watershed (not part of this study) and the Aguila Farm Channel watershed, and on the west by the Maricopa County/La Paz County Line. The combined runoff drains in the southwesterly direction to the county line. The watershed terrain varies widely. Mountain slopes range between 5 and 60 percent. The less steep areas within the study of the major drainage channels being studied have slopes ranging from 0.2 to 0.3 percent.

U.S. Highways 60/70 and 93, and State Route 71 do not alter the natural direction of the flow. The Atchison, Topeka and Santa Fe Railroad (AT&SF) drainage structures are adequately sized to allow runoff to pass throughout the elevated railbed. The numerous man-made structures of training dikes, spreader dikes, and stock tanks located throughout the watershed, generally consisting of unprotected fill, are poorly maintained and have no erosion protection. Historically, these structures have failed during significant flow events.

The COE HEC-1 computer program was used to estimate peak discharges and channel routing of flows within the study area. Field measurements of the watershed's physical and hydrologic characteristics were applied in the HEC-1 modeling.

Cross sections were digitized from aerial topographic mapping at a scale of 1:48,000, with a contour interval of 4 feet, prepared by Cooper Aerial of Phoenix, Inc., flown in July 1989. The COE HEC-2 hydraulic computer model was used to compute the water-surface profiles.

The starting water-surface elevations for Centennial Wash were computed using the slope-area method. The starting water-surface elevations for Grass Wash were estimated using an iterative approach beginning with the slope-area method. Immediately downstream (north) of the AT&SF railroad trestle over Grass Wash is an uncompacted berm or training dike without erosion protection, which serves to turn low flows to the west for several hundred feet. The HEC-2 analyses showed that the 10-year flood would not overtop the berm; however, the 50- and 100-year floods would. The analyses for the 50- and 100-year floods used the top of the berm elevation as the starting water-surface elevation.

The starting water-surface elevations for Aguila Farm Channel were taken from water-surface elevations computed in the HEC-2 model at the confluence with Centennial Wash. The starting water-surface elevations for the North Branch Centennial Wash were computed using the slope-area method.

Flood profiles and flood boundaries were not estimated for the 500-year flood for any of the detailed reaches herein.

Floodways were computed for each of the detailed study reaches on the basis of equal-conveyance. The North Branch Centennial Wash floodway and Grass Wash floodway were extended to join with the Centennial Wash/Aguila Farm Channel floodway.

The principal flood hazards within the study area result from a broad, sheetflow type of floodplain with multiple, distributary low flow channels or flow paths.

The BFEs and floodplain and floodway delineations for Centennial Wash, Grass Wash, Aguila Farm Channel, and the North Branch Centennial Wash are shown on FIRM Panels 0135, 0145, 0155, 0160, 0165, 0170 and 0190. Data shown in Tables 1, 2, 3, and 4, the Floodway Data Table, and Flood Profiles have been revised to reflect this revised flooding.

Morgan City Wash-Cline Creek-Rodger Creek

The revised hydrologic and hydraulic analyses for these streams located in the unincorporated areas of Maricopa County were developed by Michael Baker Jr., Inc., for the FCDMC. Information is presented in the following reports: "Flood Delineation Study

of Cline Creek and Tributary Washes," dated April 1990, "Exhibit 5, Printout of Floodway Calculation, Flood Delineation Study of Cline Creek and Tributary Washes," dated April 1990, "Morgan City Wash, Flood Delineation Study," dated April 1990, "Exhibit 5, Printout of Floodway Calculation, Morgan City Wash," dated April 1990, "Exhibit 5, Printout of Floodway Calculation, Rodger Creek, Flood Delineation Study," dated August 1990, and separate hydrology reports for Morgan City Wash and Rodger Creek, both dated December 1989, and Cline Creek, dated January 1990, and separate floodplain delineation maps for each of these three streams, dated August 16, 1990. A Best Available Data Letter for the data provided in these reports was issued on November 5, 1990.

The Morgan City Wash watershed is comprised of approximately 23 square miles of land in the Hieroglyphic Mountains, a complex series of low hills and ridges, between 1,500 and 3,500 feet in elevation with an intricate pattern of deep washes and sharp divides. General stream flow is east-southeast on a gravel bed with near vertical banks. The only drainage structures are concrete box culverts at road crossings of the Lake Pleasant Road and Castle Hot Springs Road.

The Cline Creek watershed, an area of 16 square miles, with eight tributaries to Cline Creek, has an elevation range from 2,000 feet at the Skunk Creek confluence to 4,600 feet along the rim of New River Mesa. General stream flow is in the west to southwesterly direction. The tributaries are increasingly steep upstream from Cline Creek, with slopes ranging from 1 to 20 percent with supercritical flows in parts of the reach. Cline Creek crosses New River Road and Circle Mountain Road via dip crossings. No drainage structures exist in the watershed.

The Rodger Creek watershed has a drainage area of approximately 5.13 square miles with the land slope being generally westerly. Elevations range from 1,900 feet at the confluence with Skunk Creek to 3,600 feet on Elephant Mountain. The only drainage structure is a double 96" fiberglass pipe culvert where New River Road crosses. The steep stream slope results in subcritical and supercritical flow with high velocities predominant throughout the reach.

No structural flood protection measures exist or are planned within the watersheds of Morgan City Wash, Cline Creek, and Rodger Creek.

The hydrologic analyses for the watersheds of Morgan City Wash, Cline Creek, and Rodger Creek were performed using the COE HEC-1 computer model to establish 100-year peak flow rates for each stream and tributary delineated.

Cross-section data for the COE HEC-2 hydraulic model were stereoscopically digitized from aerial photographs. Topographic maps, at a scale of 1:200, with a contour interval of 4 feet, prepared in 1989 by McLain-Harbers Company, Inc., were also used

for this study. The geometrics of Lake Pleasant Road and Castle Hot Springs Road culverts on Morgan City Wash, and the geometry for the New River Road on Rodger Creek were obtained by field survey.

The water-surface elevations for the 100-year flood were computed using the COE HEC-2 hydraulic model. The starting water-surface elevations for Morgan City Wash at the confluence with Agua Fria River were interpolated from the effective profiles for the Agua Fria River.

The starting water-surface elevations for Cline Creek and for Rodger Creek at the confluence with Skunk Creek were interpolated from the effective BFEs for Skunk Creek.

Floodways for these streams were developed from the HEC-2 hydraulic model using Encroachment Method 1.

The BFEs and floodplain and floodway delineations for the three streams studied are shown on the following FIRM panels for Morgan City Wash: 0320, 0340, 0730, and 0735; for Cline Creek: 0390 and 0395; and for Rodger Creek: 0395, 0415, 0780, and 0785. Tables 1, 3, and 4, the Floodway Data Table, and Flood Profiles for Morgan City Wash, Cline Creek, and Rodger Creek have been added to reflect this new detailed flooding information.

Gila River from north of Gila Bend to Gillespie Dam

For the 19.9 mile reach of the Gila River north of the Town of Gila Bend (at the east boundary of the Gila River Indian Reservation) upstream to Gillespie Dam, a new hydraulic analysis dated November 1990, was developed by Cella Barr Associates, for the FCDMC. The entire reach of the Gila River flows south through the unincorporated areas of Maricopa County. A Best Available Data Letter was issued on January 29, 1992, for this study.

New topographic mapping was used for this study reach at a scale of 1:400, with a contour interval of 2 feet. This served as the basis for establishing ground elevations along the modeled cross-sectional alignments. For the existing bridge crossing of the Gila River at old U.S. Highway 80 near Gillespie Dam, field surveys and measurements to determine "as-built" conditions were obtained.

The hydrologic data utilized for this study were developed by the COE, Los Angeles District, and are presented in their report entitled "Gila River and Tributaries," dated May 1982. The COE HEC-2 hydraulic model was used to develop the 100-year water-surface profile. Backwater ponding extends for roughly 2.0 miles upstream of Painted Rock Dam. The floodway delineation for this study was computed using Encroachment Method 1 in the HEC-2 hydraulic model for the entire reach.

As a result of this analysis, new data are shown in Tables 1, 3, and 4, and on FIRM Panels 2835, 2855, 2865, 3230, 3235, 3240, 3245, and 3480. Flood Profiles and the Floodway Data Table have been added for this study.

Gila Bend Canal

The 23 mile-long reach of the Gila Bend Canal floodplain located east of Gila River, between Old U.S. Highway 80 and State Route 85 in the unincorporated areas of Maricopa County and the Town of Gila Bend, was revised based on data submitted by the FCDMC, and approved in a Best Available Data Letter dated March 26, 1992. The revised hydrologic and hydraulic analyses for the Gila Bend Canal were performed by Donohue and Associates, Inc., for the FCDMC, in November 1991 (Revised March 8, 1992). The results of their analyses are presented in Volumes 1 and 2 of 2 of the reports entitled "Gila Bend Canal Floodplain Delineation Study Gillespie Dam to Gila Bend," dated November 1991, and the reports entitled "Hydrology Report, Gila Bend Canal Floodplain Delineation Study, Gillespie Dam to Gila Bend," dated November 1991, and the report entitled "Hydraulic Analysis and Floodplain Delineation, Gila Bend Canal Floodplain Delineation Study, Gillespie Dam to Gila Bend," dated November 1991. The COE HEC-1 model was used to compute the 100-year flood discharges and flood elevations. For a 1.25 mile reach of defined channel flow, the COE HEC-2 hydraulic computer model was used to compute flood elevations.

The peak 100-year flows arriving at the canal generally exceed the capacities of the cross-drainage structures, and excess flow is stored in ponding areas adjacent to the east berm of the canal. Major floods often result in some erosion or overtopping damage to the canal berms. The only measures in place which serve to reduce flood heights in the study area are the cross-drainage structures in the canal. Representative channel cross sections at intervals of 400 and 1,200 feet were obtained electronically from the three-dimensional CAD drawings.

New detailed 100-year flood boundaries designated as Zone AE and Zone AO are shown on FIRM Panels 2855, 2865, 2870, 3235, 3245, 3480, and 3485. Data for Tables 1, 3, and 4, and Flood Profiles for the 1.25 mile reach have been added to reflect these revisions.

Gilbert-Chandler Area

The hydrologic and hydraulic analyses in the Gilbert-Chandler area developed to study the effects of the Eastern Canal, Consolidated Canal, the Southern Pacific Railroad (SPRR) Rittenhouse Branch, and the SPRR along Arizona Avenue on flooding, were prepared for the FCDMC by Franzoy-Corey Engineering Company. The results are presented in the report entitled "Gilbert-Chandler Area, Maricopa County, Arizona," revised September 1990, and in the submitted design notebooks. A Best Available Data Letter was issued on February 21, 1991.

The study area of about 98 square miles, is bounded by the Superstition Freeway (SR 360) on the north, by Hunt Highway (Maricopa County Line) on the south, the East Maricopa Floodway on the east, and the SPRR paralleling Arizona Avenue on the west. The study covers the incorporated areas of the Town of Gilbert, parts of the Cities of Chandler and Mesa, and the unincorporated areas of Maricopa County.

The hydrologic analyses of the study area were performed using the COE HEC-1 computer model modified by Haestad Methods Version 3.2c. Flow patterns in this study area, which contains no natural drainage channels, tend to develop ponds behind man-made roads, railroads, and canals. Outflow from the ponds is either by overflow of the road and canal embankments, which was computed using the weir formula, or by flows through culverts, which were computed by assuming inlet control.

Water-surface elevations at ponded locations were computed utilizing the level pool reservoir routing routines in the COE HEC-1 computer model. Water-surface elevations of flow along the hydraulic barriers between ponding sites were computed using the COE HEC-2 hydraulic computer model.

Cross-section data were compiled from topographic mapping at a scale of 1:400, with a contour interval of 2 feet. Bridges and culverts were field surveyed to obtain elevation data and structural geometry.

The Letters of Map Revision issued on August 6, 1991, for the City of Gilbert; on August 23, 1991, and January 21, 1992, for the City of Chandler; on August 27, 1991, for the City of Mesa; and on September 5, 1991, and January 21, 1992, for the unincorporated areas of Maricopa County, were based on this study.

As a result of this study, the SFHAs have increased and decreased. Previously published SFHAs designated as Zone A have been revised to Zone AH with elevations, except for the revised 100-year floodplain designated as Zone A between Superstition Freeway (SR 360) and Baseline Road and the Eastern and Consolidated Canals. These latter areas are within the City of Mesa. A new profile was added for the reach along SPRR from approximately 2,600 feet southeast of Baseline Road to Consolidated Canal. The modifications are shown on FIRM Panels 2190, 2195, 2215, 2655, 2660, 2665, 2670, 2680, 2690, and 3050. Data for Tables 1, 2, and 3, and the Flood Profile have been added to reflect these modifications.

The Letters of Map Revision issued on December 18, 1992, for the Town of Gilbert, Arizona, and the unincorporated areas of Maricopa County, Arizona, were included in this update. These two Letters of Map Revision show the effects of the construction of the Town of Gilbert's Cross Road Park Detention Basin. The basin is located at the intersection of the Eastern Canal and the SPRR in

Section 21, Township 1 South, Range 6 East. As a result of the project, the SFHAs have been decreased along the SPRR, SPRR spur, the Consolidated Canal East Branch, and the Eastern Canal, except for the area located west of the intersection of McQueen Road and Western Canal. The modifications are shown on FIRM Panels 2190, 2655, 2660, 2670, and 2680.

Caterpillar Tank and Twin Buttes Washes

This study for Caterpillar Tank and Twin Buttes Wash from the Agua Fria River to the CAP Canal is for the area approximately 3 miles west of Lake Pleasant and six miles north of Deer Valley Drive, all in the unincorporated areas of Maricopa County. The watershed is 12.2 square miles, of which 3.4 miles is for Caterpillar Tank Wash, and 8.8 square miles is for Twin Buttes Wash with tributaries of White Peak Wash, West Fork of White Peak Wash, and East and West Garambullo Wash. The watershed drains generally from north to south. The study was performed by AGK Engineers, Inc., for the FCDMC, and approved in a Best Available Data Letter dated August 23, 1991. The results are presented in the report entitled "Flood Insurance Study for Caterpillar Tank and Twin Buttes Washes from Agua Fria River to C.A.P. Canal, Maricopa County, Arizona," and Appendices, dated June 1991, and the report entitled "Hydrologic Report for C.A.P. Overchutes, Agua Fria Floodplain Delineation Study, Maricopa County, Arizona," dated May 1991.

The watershed has rolling hills on the east and isolated rock hills north of the CAP Canal. There are no existing flood control structures or measures within the study area. Caterpillar Tank collects runoff from Caterpillar Tank Wash for stock grazing only.

The U.S. Bureau of Reclamation has certified the embankments associated with the CAP construction up to the top of the concrete lining. The levee analysis conclusion is that the canal is assumed to be adequate for withholding the flow resulting from a 100-year storm. However, the pipe culverts under the canal will cause backwater and ponding effects to the area immediately north of the canal during the 100-year event. A portion of the runoff from the upper watershed is shown intercepted by the canal and routed along the canal to Caterpillar Tank and Twin Buttes Washes through six pipe culverts under the canal.

Hydrologic modeling was performed by means of the COE HEC-1 computer model. For computing the 100-year water-surface elevations, the COE HEC-2 hydraulic computer model was used. Starting water-surface elevations for both Caterpillar Tank and Twin Buttes Wash were obtained from the January 1989 Agua Fria River Flood Insurance Study for the FCDMC.

The relationship among stage, storage, and outflow at the existing CAP culverts were developed from topographic maps at a scale of 1:200, with a contour interval of 2 feet, prepared in September 1990, by Aerial Mapping Company, Inc. Cross-section data for

backwater analyses were also determined from the same topographic maps. Field verification supplemented mapping inadequacies in the determination of sub-area boundaries.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the floodplain.

As a result of this study, the 100-year flood boundaries designated as Zone A along the CAP Canal were modified to Zone AH. New detailed 100-year floodplain and floodway delineations for all of the above-studied streams, are shown on FIRM Panels 0740, 0745, 1155, and 1160. Data for Tables 1, 3, and 4, the Floodway Data Table, and Flood Profiles have been added to reflect this new detailed flooding information.

Jackrabbit Wash, Star Wash Tributary and Unnamed Tributary to Jackrabbit Wash

The area included in this new hydrologic and hydraulic study for Jackrabbit Wash, from the CAP Canal to Vulture Mine Road, is located within the unincorporated areas of Maricopa County. The drainage area for the watershed is approximately 442 square miles, and is bounded on the north by the Vulture Mountains, on the east by the Vulture Mountains and the Hassayampa River, on the south by Interstate 10, and on the west and southwest by Belmont Mountains.

The watershed is characterized by steep rugged mountainous terrain along the edges of the watershed, and much flatter desert valley in the middle and southerly portion of the watershed. The study was performed by Burgess and Niple, Inc., for the FCDMC with detailed floodplains developed for Jackrabbit Wash from CAP Canal to Vulture Mine Road, along with two tributaries, Star Wash and an Unnamed Tributary. Also included were ponding areas along the CAP Canal for approximately 3.5 miles southwest and northeast of Jackrabbit Wash. A Best Available Data Letter was issued on April 25, 1991. The results of the analyses are presented in the reports entitled "Jackrabbit Wash, Floodplain Delineation Study, Technical Data Notebook, Hydraulics," dated February 1991, and "Jackrabbit Wash, Floodplain Delineation Study, Technical Data Notebook Hydrology," dated February 1991.

No flood protection measures exist upstream of the CAP Canal. The watershed was modeled utilizing the COE HEC-1 computer model. Reservoir routing where water ponds against the CAP Canal was performed using the Modified Puls Method.

Only the 100-year profile was computed for these streams using the COE HEC-2 hydraulic model. The hydraulic analysis for the 100-year flood is based upon unobstructed flow conditions. Flood elevations are valid only if the CAP Canal structures remain unobstructed and its embankment does not fail. Starting water-surface elevations were obtained using normal depth. CAP Canal structures serve to reduce downstream flood peaks by storing floodwater upstream of the canal.

Cross sections for the hydraulic analyses were digitized from aerial mapping at a scale of 1:4,800, with a contour interval of 4 feet, prepared in 1990 by Aerial Mapping Company, Inc.

The floodways determined for the studied streams were computed on the basis of equal-conveyance reduction.
As a result of this study, the 100-year flood boundaries designated as Zone A along the CAP Canal were modified to Zone AH. New detailed 100-year floodplain and floodway delineations for the three streams are shown on FIRM Panels 1035, 1055, 1065, 1070, and 1510. Data have been added to Tables 1, 3, and 4, the Floodway Data Table, and Flood Profiles to reflect this new detailed flooding information.

Trilby Wash

The hydrologic and hydraulic study for Trilby Wash, from the CAP Canal for approximately 6.7 miles upstream to Grand Avenue near Circle City, was performed by P&D Technologies for the FCDMC. A Best Available Data Letter was issued for this study on May 14, 1992.

The results are presented in Books 1 through 2 of 2 entitled "Flood Insurance Study for Trilby Wash, from the CAP AQUEDUCT to Grand Avenue Near Circle City," dated February 6, 1992.

The watershed is located in the central portion in the Central Arizona Desert, approximately 30 miles northwest of Phoenix. Trilby Wash, with an elevation range from 1,543 feet at the downstream end to 1,849 feet at the upstream end, on an approximate slope of 1 percent, carries flow southeasterly into the McMicken Dam Storage Basin. There are no flood control structures. The CAP overchute and Patton Road Crossing are the two major man-made obstructions to the floodwater from the natural water courses. The Patton Road Crossing has 8-68 inch corrugated metal pipe culverts under the roadway and will cause backwater effects to the area immediately north during a 100-year event.

Hydrologic analyses were conducted using the COE HEC-1 computer model. The previous hydrologic analysis of Trilby Wash, dated August 1991, and prepared by the Hydrology Division for the FCDMC was also used as part of this study. Computations of the water-surface elevation were calculated only for the 100-year storm by the use of the COE HEC-2 hydraulic computer model. The starting water-surface elevation was assumed to be at critical depth.

Cross sections were digitized from topographic maps, at a scale of 1:200, with a contour interval of 2 feet, prepared specifically for this project by Cooper Aerial Mapping of Phoenix, Inc. The Patton Road Culvert Crossing and CAP overchute were surveyed to obtain elevation data and structural geometry.

The floodway delineation for this study was computed with the use of Encroachment Method 1 for the entire 6.7 river mile reach of Trilby Wash.

As a result of this study, new detailed 100-year floodplain and floodway delineations for Trilby Wash are shown on FIRM Panels 0679, 0687, 0689, 0695, and 1110. Data have been added to Tables 1, 3, and 4, the Floodway Data Table, and Flood Profiles to reflect this new detailed flooding information.

Queen Creek

The hydrologic and hydraulic analyses in the Queen Creek area of the unincorporated areas of Maricopa County, the City of Mesa, and the Towns of Gilbert and Queen Creek, were prepared for the FCDMC by Wood and Associates, Inc. The results are presented in the technical report entitled "Flood Insurance Study for Southern Pacific Railroad, Queen Creek Area, Maricopa County, Arizona," dated December 1989, revised February 1990, and in the Addendum No. 1 to this report, dated June 1990. A Best Available Data Letter for this study was issued on August 21, 1990.

The study area is traversed by a perched SPRR in a northwesterly-southeasterly direction (approximately 8.6 miles). Flows collect along the northeast side of the track and are conveyed northwesterly to the East Maricopa Floodway (EMF). Several flood control structures have been constructed which affect flooding in the study area. The SCS-sponsored Powerline and Vineyard Road Flood Retarding Structures, and the COE-sponsored Whiflow Ranch Dam were constructed for the purpose of providing flood protection to the study area.

Discharges for the flooding sources studied in detail were developed using the COE HEC-1 model. The Muskingham Flood Routing option was employed to simulate flood wave movement through stream reaches and reservoirs.

The COE HEC-2 hydraulic computer model was used to develop the water-surface elevations.

The starting water-surface elevation for the delineation shown on the work maps was based on computations started at critical depth. Cross-section data for the hydraulic analysis were obtained from topographic maps at a scale of 1:200, with a contour interval of 2 feet, prepared by Wood and Associates, Inc., dated October and November 1986.

As a result of this study, the 100-year flood boundaries designated as Zones A and AH along the perched SPRR are added to FIRM Panels 2690, 2695, and 3060. Data shown have been added to Tables 1, 3, and 4 to reflect these modifications.

Wagner Wash

The new hydrologic analyses for a reach of Wagner Wash, from its confluence with the Hassayampa River upstream 8.3 miles to the CAP Canal, and the determination of ponding of floodwaters on the north side of the CAP Canal, were performed by the FCDMC Hydrology Division Watershed Management Branch. These analyses are presented in the report entitled "Hydrology Analysis of Wagner Wash Watershed," dated April 1990, revised January 1991, prepared by the FCDMC. The hydraulic analyses were prepared by HDR Engineering, Inc., in April 1991. A Best Available Data Letter for this study was issued on September 26, 1991.
The watershed has a drainage area of 42 square miles and is located east of the Hassayampa River, all in the unincorporated area of Maricopa County. The elevation range is from 1,400 to 2,700 feet mean sea level, and is characterized with broad alluvial slopes prone to sheetflow. There are no flood protection measures, and none are planned in the foreseeable future.

The hydrologic modeling was performed using the COE HEC-1 computer model. The normal-depth routing of the HEC-1 model was used for channel routing. The two overchutes located along the CAP allow the upper watershed to be drained to the lower watershed. The design storage capacity and peak flows obtained from the U.S. Bureau of Reclamation (design data dated 1980), were used in the model. One foot contour mapping, obtained from The Adams Group, a consulting firm, was used to obtain storage information for the contributing area behind the CAP.

Cross-section data for the hydraulic analyses were obtained photogrammetrically from aerial photographs obtained by aerial survey in September 1990. The topographic maps were prepared at a scale of 1:2,400, with a contour interval of 2 feet. All culvert crossings were field surveyed to obtain elevation data and structural geometry. Water-surface elevations were computed using the COE HEC-2 hydraulic computer model. The starting water-surface elevation for Wagner Wash was determined using the slope-area method.

The floodways shown in this study were computed on the basis of equal conveyance reduction from each side of the floodplain.

As a result of this study, the 100-year floodplain boundaries designated as Zone A along the CAP Canal were modified to Zone AH with elevations. New detailed 100-year floodplain and floodway delineations for Wagner Wash are shown on FIRM Panels 1095, 1530, and 1550. Data have been added to Tables 1, 2, 3, and 4, the Floodway Data Table, and Flood Profiles to reflect this new detailed flooding information.

Scatter Wash

The 100-year SFHA was revised and BFEs were deleted for Scatter Wash, upstream of Interstate 17 (I-17) based on our re-examination of a determination made in a report prepared by the COE, entitled "Draft Report, Flood Insurance Study, New River and Scatter Wash, Maricopa County, Arizona," dated September 1985. In their report, the COE determined that the area upstream of I-17 should be designated as Zone B because of the numerous braided channels in the area and because no single channel could accurately be described as conveying all of the flow to I-17. The COE supported their conclusion based on their field observations of the runoff pattern in the watershed. However, the COE report acknowledged that the 100-year flood ponds behind I-17, which results in overtopping of the highway. The area of ponding upstream of I-17 is based on the elevation of the top of the I-17 roadway (elevation 1,416 feet). Accordingly, the SFHA ponded upstream of I-17, with an elevation of 1,416 feet, remains as shown on the FIRM, while the SFHAs upstream of I-17, which are above elevation 1,416 feet, have been removed. The modifications are shown on FIRM Panel 1205.

Washes 1 through 8 Downstream of Sun Valley Parkway

The new hydrologic and hydraulic analyses for Washes 1 through 8 were performed by A-N West, Inc., for the FCDMC. The results of these analyses are presented in the reports entitled "Sun Valley Parkway North Flood Insurance Study Hydrology Report," dated January 24, 1991, revised March 6, 1991; "Flood Insurance Study Sun Valley Parkway North Portion of Town of Surprise and Unincorporated Areas of Maricopa County, Arizona," dated September 1991, revised October 10, 1991; and "Technical Data Notebook for Sun Valley Parkway North Flood Insurance Study (Portion of Town of Surprise and Unincorporated Areas, Maricopa County, Arizona)," dated October 1991," all prepared by A-N West, Inc. The purpose of this revision was to develop the 100-year floodplain delineation for eight washes north of White Tank Mountains, areas not previously studied. Two Letters of Map Revision were issued on April 15, 1993, for the unincorporated areas of Maricopa County, Arizona, and for the Town of Surprise, Arizona, to incorporate the results of this study.

The total watershed area of the study is approximately 28 square miles. The watershed is bounded on the south by the White Tank Mountains, on the west by the divide between McMicken Dam and Hassayampa River, on the north by the CAP Canal and the floodplain of Trilby Wash and its tributaries, and on the east by the McMicken Dam floodpool. The watershed is currently unpopulated and undeveloped, except for the Sun Valley Parkway.

The COE HEC-1 computer program was used to estimate peak discharges and channel routings of flow within the study area.

Cross sections were obtained from topographic maps prepared by Cooper Aerial of Phoenix, Inc., at a scale of 1:4,800 and a contour interval of 4 feet, flown September 28, 1990, and from topographic maps prepared by the WLB Group, Inc., and Cooper Aerial Survey Company, at a scale of 1:4,800 and a contour interval of 4 feet, compiled photogrammetrically from aerial photos flown on December 11, 1986.

The starting water-surface elevations were computed in the HEC-2 hydraulic computer model using the slope-area method.

As a result of this study, 100-year floodplain boundaries designated as Zone A were added to FIRM Panels 1105, 1115, 1120, and 1140.

The following Letters of Map Revision are also included in this revision:

Skunk Creek

The Letters of Map Revision issued on May 14, 1992, for the City of Peoria, Arizona, and on May 19, 1992, for the unincorporated areas of Maricopa County, Arizona, to show the effects of a channel improvement and bridge construction project along the reach of Skunk Creek from its confluence with the New River to approximately 600 feet downstream of its confluence with the ACDC. Based on a revised hydraulic analysis, submitted by the FCDMC, the SFHA has been decreased and the 100-year flood is now contained in the channel for the above-mentioned reach. The modification is shown on FIRM Panels 1190 and 1630.

Agua Fria River

The LOMR issued on February 20, 1992, for the Town of El Mirage, Arizona, to show the effects of a newly constructed levee along the western side of the Agua Fria River between Olive Avenue and Northern Avenue. Based on data submitted by the City of El Mirage, the 100-year floodplain has been modified and the SFHA located landward of the levee has been removed. This modification is shown on FIRM Panels 1605 and 1615.

New River

The LOMR issued on April 21, 1992, for the City of Peoria, Arizona, to show the effects of the COE detailed hydraulic analysis of the newly constructed levee and channelization of the New River from Olive Avenue to approximately 1,300 feet upstream of Grand Avenue. As a result of this project, the 100-year flood and floodway are now contained in the channel from Olive Avenue to approximately 1,300 feet upstream of Grand Avenue. Based on this hydraulic analysis, the modification is shown on FIRM Panel 1610. The Floodway Data Table and Flood Profile panels from Cross Sections AV to CV have been deleted.

Arizona Canal Diversion Channel

The LOMR issued on May 5, 1992, for the City of Phoenix, Arizona, to show the effects of the ACDC, built by the COE, from Dunlap Avenue to the zone break for the Tenth Street Wash just upstream of Butler Drive. Based on the submitted data from the FCDMC, the SFHA increases in the vicinity of Central Avenue and Ruth Avenue, but flooding is still contained within the right-of-way of the ACDC for this reach. The modification is shown on FIRM Panels 1655 and 1665.

Salt River

The LOMR issued on September 4, 1991, for the City of Phoenix, Arizona, to reflect the flood control levee along the north bank of the Salt River from Interstate 10 for 4,800 feet upstream to 40th Street as shown on FIRM Panels 2145 and 2165. The revised analysis for this reach of Salt River was prepared by Cella Barr Associates on July 3, 1990, and August 22, 1990. The revised analysis shows an increase in the SFHA along the boundaries of the Salt River and a maximum increase in the BFEs of 0.63 feet at approximately 2,200 feet upstream of 32nd Street. The floodway width decreases within the entire restudied part of this reach. These modifications are shown on FIRM Panels 2145 and 2165, the Floodway Data Table, and Profile Panels 282P and 283P.

The LOMR issued on December 7, 1989, for the City of Phoenix, Arizona, for Lots 8 and 12, Arizona Industrial Park, Unit One, and Central Avenue Parcel 1, and Arizona Industrial Park Parcel 1, has been included in this update. The LOMR stated that Lot 8 and Central Avenue Parcel 1 have been removed from the SFHA based on fill. The 100-year floodplain delineation along the Salt River was revised to reflect the fill in Lot 8 and is reflected on FIRM Panel 2145. No change was made, however, to reflect the fill in Central Avenue Parcel 1, since this parcel is located on FIRM Panel 2140, a panel which is not included in this update.

The LOMR issued on March 1, 1990, for the City of Phoenix, Arizona, for Lot 12, Arizona Industrial Park, Unit One, and Arizona Industrial Park Parcel 1, has been included in this update. The LOMR stated that the property would not be inundated by a 100-year flood. The 100-year floodplain delineation along the Salt River was revised on FIRM Panel 2145 to reflect these changes.

The LOMR issued on April 3, 1991, for the City of Phoenix, Arizona, for Lots 16 and 17, Arizona Industrial Park Unit One, and Arizona Industrial Park Parcels 2 and 3, has been included in this update. The LOMR stated that the property would not be inundated by a 100-year flood. The 100-year floodplain delineation along the Salt River was revised on FIRM Panel 2145 to reflect these changes.

The LOMR issued on June 11, 1991, for the City of Phoenix, Arizona, for Lots 14 and 15, Arizona Industrial Park, Unit One, stated that the property would not be inundated by a 100-year flood. The 100-year floodplain delineation along the Salt River was revised on FIRM Panel 2145 to reflect these changes. A portion of Lot 14 is located on FIRM Panel 2140, a panel which is not included in this update. Therefore, no change was made for that portion of Lot 14.

Western Canal

The LOMR issued on October 25, 1991, for the City of Tempe, Arizona, to reflect the revised hydrologic and hydraulic analyses for the Zone A ponding SFHA located on the northern side of the Western Canal between McClinton Drive and Brice Road. Supporting data required to evaluate this request were submitted by Mr. James E. Bond, P.E., Senior Engineer, City of Tempe, and by Mr. Vincent A. Pedotto. This revision is shown on FIRM Panel 2635.

East Maricopa Floodway

The LOMR issued on January 21, 1992, for the Cities of Gilbert and Mesa, Arizona, and for the unincorporated areas of Maricopa County, to reflect the effects of a detailed hydraulic analysis of a 3-mile section of the East Maricopa Floodway channel between Guadalupe Road and Broadway Road. The East Maricopa Floodway is a joint effort between the SCS and the FCDMC. The analyses were prepared in September 1991. The modification is based on additional data regarding the alignment of flows leaving the culvert under Higley Road down to Broadway Road and the location of the East Maricopa Floodway right-of-way limits. Based on these hydraulic analyses, the SFHAs have both decreased and increased, as shown on FIRM Panels 2215, 2680, and 2685.

Highline Canal

The LOMR issued on November 13, 1992, for the City of Phoenix, Arizona, to show the effects of the removal of the Highline Canal west of 44th Street and north of Chandler Boulevard, is shown on FIRM Panel 2640. As a result of the removal of the canal, the Zone A ponding west of 44th Street has been removed.

The LOMR issued on December 5, 1991, for the City of Phoenix, Arizona, for Lots 95 through 108, Mountain Crest Subdivision, has been included in this update. The LOMR stated that the property would not be inundated by a 100-year flood. The 100-year floodplain delineation along the Highline Canal was revised on FIRM Panel 2640 to reflect these changes.

The LOMR issued on March 19, 1992, for the City of Phoenix, Arizona, for portions of Lots 85 through 94, Mountain Crest Subdivision, has been included in this update. The LOMR stated that portions of the property would not be inundated by a 100-year

flood. The 100-year floodplain delineation along the Highline Canal was revised on FIRM Panel 2640 to reflect these changes.

The LOMR issued on March 19, 1992, for the City of Phoenix, Arizona, for portions of Lots 1 through 23, Monarch Subdivision, has been included in this update. The LOMR stated that portions of the property would not be inundated by a 100-year flood. The 100-year floodplain delineation along the Highline Canal was revised on FIRM Panel 2640 to reflect these changes.

Indian Bend Wash/Interceptor Channel

The LOMR issued on October 16, 1992, for the City of Scottsdale, Arizona, to show the effects of the construction of the Indian Bend Wash/Interceptor Channel from Indian Bend Wash to Pima Road, is shown on FIRM Panel 1695. This LOMR reissued the results of the LOMR dated November 7, 1986. As a result of the project, the 100-year floodplain boundary has been revised to extend along the north side of the Interceptor Channel from Indian Bend Wash to Pima Road.

East Fork Cave Creek

The LOMR issued on October 1, 1992, for the City of Phoenix, Arizona, to show the effects of channel improvements along East Fork Cave Creek from Central Avenue to Seventh Street, construction of a six-barrel 12' x 12' reinforced concrete box culvert at Seventh Street, and the Greenway Channel improvements approximately 1,000 feet upstream of Seventh Street, has been included in this update. As a result of this project, the 100-year flood is now contained in the channel from Central Avenue to a point approximately 1,000 feet upstream of Seventh Street. The modifications are shown on the FIRM Panels 1215 and 1220, and the Flood Profiles and Floodway Data Table for East Fork Cave Creek.

The LOMR issued on May 19, 1992, for the City of Phoenix, Arizona, for portions of Coral Manor Units I and II, has been included in this update. The LOMR stated that these portions of Coral Manor Units I and II would not be inundated by a 100-year flood. The 100-year floodplain delineation along East Fork Cave Creek was revised on FIRM Panel 1215 to reflect these changes.

The LOMA issued on March 15, 1991, for the City of Phoenix, Arizona, for Lots 1 through 91, Canyon View Subdivision, has been included in this update. The LOMA stated that Lots 38 through 52 and 54 through 91 would not be inundated by the 100-year flood and were currently shown outside the SFHA. In addition, Lots 1 through 37 and 53 would not be inundated by the 100-year flood. The 100-year floodplain delineation along East Fork Cave Creek was revised on FIRM Panel 1220 to reflect these changes.

The LOMR issued on January 12, 1993, for the City of Phoenix, Arizona, for Lot 88, Greentrails Subdivision, has been included in this update. The LOMR stated that the property would not be

inundated by a 100-year flood. The 100-year floodplain delineation along East Fork Cave Creek has been revised on FIRM Panel 1220 to reflect this change.

The LOMA issued on May 14, 1993, for the City of Phoenix, Arizona, for Lot 87, Greentrails Subdivision, has been included in this update. The LOMA stated that the property would not be inundated by a 100-year flood. The 100-year floodplain delineation along East Fork Cave Creek has been revised on FIRM Panel 1220 to reflect this change.

The LOMR issued on May 26, 1993, for the City of Phoenix, Arizona, for Lots 133 through 281, Moonlight Cove Two, has been included in this update. The LOMR stated that Lots 133 through 139, 173 through 176, 182, 183, 184, 204 through 219, 221 through 228, 255, 256, 263, 269, and 270 would not be inundated by a 100-year flood and are already correctly shown outside the SFHA. In addition, the LOMR stated that Lots 140 through 172, 177 through 181, 185 through 203, 220, 229 through 254, 257 through 262, 264 through 268, and 271 through 281, would not be inundated by the 100-year flood. The 100-year floodplain delineation along East Fork Cave Creek was revised on FIRM Panel 1215 to reflect these changes.

10.4 Fourth Revision

This study was revised on September 30, 1995, to include the restudy of hydraulic conditions on the Consolidated Canal East Branch, East Fork Cave Creek, Basin 5, Grand Avenue, an unnamed tributary to Cave Creek Wash, Indian Bend Wash, Salt River, Arizona Channel, and Tenth Street Wash, as well as various requests for map revisions based on newly studied streams and ponding areas. The restudied and newly studied flooding sources are located in the unincorporated areas of Maricopa County, the Cities of Avondale, Glendale, and Litchfield Park, and the Towns of Buckeye, Goodyear, Guadalupe, Paradise Valley, and Surprise.

The portions of streams studied by detailed methods were added to Table 1, "Detailed-Study Sources."

The process of converting the existing FIRM panels from standard format to map initiatives format as described in Section 10.1 continues with this revision. Zone designations were revised as required by a given study. Additional reference marks and descriptions used in this study are shown on the map panels. Tables 1 through 4, Floodway Data Table 5, and the Flood Profiles have been revised to reflect the new detailed flooding information.

Specifics of the hydrologic and hydraulic analyses for all streams are presented below.

Gila Bend Area

The areas included in this new hydrologic and hydraulic study for Sand Tank Wash, Scott Avenue Wash, Bender Wash, Unnamed Wash No. 1, Unnamed Wash No. 2, and ponding areas upstream of the Gila Bend Canal are located within the Town of Gila Bend and the unincorporated areas of Maricopa County.

The study was performed by Burgess & Niple, Inc., for the FCDMC. A Best Available Data Letter was issued on March 5, 1993. The results of the analyses are represented in the reports entitled "Gila Bend Area Floodplain Delineation Study, Technical Data Notebook, Hydraulics," Books 1 and 2, both dated March 1992.

The hydrologic analysis for the Gila Bend Area was conducted using the COE HEC-1 hydrologic model.

Only the 100-year profile was computed for these streams using the COE HEC-2 hydraulic model. The starting water-surface elevations were obtained using normal depth. Elevations are referenced to the NGVD. Ponded flood boundaries for structures through the Gila Bend Canal not modeled above were obtained by routing the 100-year storm through the structures.

Cross sections for the backwater analysis are digitized from aerial mapping at a 1:4,800 scale with a contour interval of 4 feet and a 1:2,400 scale with a contour interval of 2 feet. Manning's "n" values were obtained during a field reconnaissance October 4, 1991. Values ranged from 0.025 to 0.08.

The streams are shown on FIRM Panels 3480 F, 3485 F, 3490 E, and 3491 E.

Luke Wash

The areas included in this new hydrologic and hydraulic study for Luke Wash are located in the unincorporated areas of Maricopa County.

The study was performed by Coe & Van Loo Consultants, Inc., for the FCDMC. A Best Available Data Letter was issued on July 2, 1993. The results of the analyses are represented in reports entitled "Luke Wash Flood Insurance Study, Technical Data Notebook," dated March 19, 1993; "Luke Wash Flood Insurance Study, Survey Data," dated December 1, 1992; "Luke Wash Flood Insurance Study, Hydrologic Analysis, Technical Data Notebook Section 3," dated November 30, 1992; "Luke Wash Flood Insurance Study, Hydraulic Analysis, Technical Data Notebook Section 4," dated March 18, 1993; and "Luke Wash Flood Insurance Study, N-Value Determination Report," dated November 23, 1992.

The hydrologic analysis for Luke Wash was conducted using the COE HEC-1 hydrologic model. Portions of the Jackrabbit Wash HEC-1 model for which a Best Available Data Letter was issued on April 25, 1991, were used as a base for the Luke Wash hydrology.

Only the 100-year profile was computed for Luke Wash using the COE HEC-2 hydraulic model. Starting water-surface elevations were determined using the slope-area method. The water surface from Gila River was not used because of the difference in the time of peak flow. No floodway was delineated for this wash.

Manning's "n" values were established based on field investigations, topographic mapping, and photographs of the area.

The floodplain was delineated by interpolating between each cross section using topographic maps at a scale of 1" = 200' with a contour interval of 2 feet. Bank stations at each cross section were offset from the channel thalweg based on aerial photographs, 1" = 200' topographic maps, and field investigation.

The stream is shown on FIRM Panels 2460 F and 2470 F.

Apache Wash and Tributaries

The areas included in this new hydrologic and hydraulic study for Apache Wash, Apache Wash (West Overflow Area), Apache Wash West Branch, Desert Hills Wash, Desert Hills Wash West Branch, Unnamed Wash (tributary to Desert Hills Wash), Jonathan Wash, Mesquite Tanks Wash, Paradise Wash, Paradise Wash West Branch, and Ranieri Wash are located within the City of Phoenix and the unincorporated areas of Maricopa County.

The study was performed by Jerry R. Jones & Associates, Inc., for the FCDMC. A Best Available Data Letter was issued on September 8, 1993. The results of the analyses are represented in the reports entitled "Apache Wash, Flood Insurance Study, Exhibit 1," "Apache Wash, Flood Insurance Study, Contract FCD 89-66," and "Apache Wash Hydrologic/Hydraulic, Technical Data Notebook, Exhibit 4," dated August 1992.

The hydrologic analysis for Apache Wash was conducted using the COE HEC-1 hydrologic model.

Only the 100-year profile was computed for these streams using the COE HEC-2 hydraulic model. Floodways were delineated for all streams.

Cross-section data were obtained in the field. Topographic maps of the study area were generated from aerial photos flown from July to November 1990.

The streams are shown on FIRM Panels 0785 G, 0790 E, 0795 F, and 1210 F.

Rainbow Wash and Tributaries

The areas included in this new hydraulic study for Rainbow Wash and its tributaries are located within the unincorporated areas of Maricopa County.

The study was performed by Simons, Li & Associates, Inc. (SLA), for the FCDMC. A Best Available Data Letter was issued on January 10, 1994. The results of the analyses are represented in the reports entitled "Rainbow Wash, Flood Insurance Study, Gila River through S.R. 95, Hydraulics Report," Volumes 1 and 2, both dated November 1992.

The hydrologic analysis for Rainbow Wash was provided to SLA by the FCDMC. The original hydrologic analysis was performed by Donahue & Associates and presented in a report entitled "Gila Bend Canal Floodplain Delineation Study Hydrology Report." The analysis was conducted using the COE HEC-1 hydrologic model and was approved by FEMA with a Best Available Data Letter issued on March 26, 1992.

Only the 100-year profile was computed for these streams using the COE HEC-2 hydraulic model. The starting water-surface elevations for the Rainbow Wash tributaries were obtained from the 100-year water-surface elevation in the Rainbow Wash mainstem. Floodways were delineated for these washes.

Cross-section data and topographic mapping for the study reach of Rainbow Wash were developed from a digital terrain model for the aerial photography performed in October 1991.

The streams are shown on FIRM Panel 2515 E, 2855 F, 2860 F, 2865 F, and 2880 E.

Powerline Wash and Tank Wash

The areas included in this new hydraulic study for Powerline Wash and Tank Wash are located in the unincorporated areas of Maricopa County.

The study was performed by Stanley Consultants, Inc., for the FCDMC. A Best Available Data Letter was issued on April 5, 1994. The results of the analysis are represented in the report entitled "Flood Control District of Maricopa County, Powerline Wash and Tank Wash, Flood Delineation Study," dated September 1993. The hydrology for this study was approved in a previous study for Jackrabbit Wash; the hydrology for Tank Wash did, however, need to be amended to estimate the separate peak flow for the South Branch. This amendment was performed by FCD staff using the COE HEC-1 hydrologic model and the results provided to Stanley Consultants, Inc.

Only the 100-year profile was computed for these washes using the COE HEC-2 hydraulic model. Starting water-surface elevations for the two washes were taken from the Star Wash Study. The starting water-surface elevation for the South Branch of Tank Wash was analyzed using two methods: the tributary option in HEC-2 and the slope-area option in HEC-2. The slope-area method resulted in higher water-surface elevations. The study used this method. Floodways were delineated for both washes.

Cross sections were laid out by Stanley Consultants, Inc., on aerial topography provided by Kenney Aerial Mapping, Inc., and Aerial Mapping Company, Inc. The companies then digitized and compiled the cross sections into HEC-2 format. The mapping scale is 1" = 200', with a contour interval of 2 feet.

The washes are shown on FIRM Panels 1035 F, 1055 F, 1060 F, and 1065 F.

Star Wash and Tributaries

The areas included in this new hydraulic study for Star Wash and its five tributaries (Tributaries A, B, C, D, and E) are located within the unincorporated areas of Maricopa County.

The study was performed by Wood, Patel & Associates, Inc., for the FCDMC. A Best Available Data Letter was issued on March 3, 1994. The results of the analyses are represented in the reports entitled "Star Wash & Tributaries, Flood Delineation Study, Technical Data Notebook, Hydraulics," Books 1 and 2, both dated August 1993. The hydrology for this area was approved with a Best Available Data Letter issued on April 25, 1991.

Only the 100-year profile was computed for these streams using the COE HEC-2 hydraulic model. The hydraulic analysis for the 100-year flood is based on unobstructed flow conditions. Starting water-surface elevations for Star Wash match the computed water-surface elevations for the Jackrabbit Wash Study. Starting water-surface elevations for the tributaries were obtained by matching the water-surface elevations of the mainstem wash. Floodways were delineated for all streams.

Cross sections for the hydraulic analyses were digitized from aerial mapping at a scale of 1:2,400, with a contour interval of 2 feet, prepared in 1992 by Aerial Mapping Company, Inc.

The streams are shown on FIRM Panel 1060 F.

Daggs Wash

The areas included in this new hydraulic study for Daggs Wash are located in the unincorporated areas of Maricopa County. The study area is located west and northwest of the White Tank Mountains, and west of the Hassayampa River.

The study was performed by A-N West, Inc., for the FCDMC. A Best Available Data Letter was issued on March 28, 1994. The results of the analyses are represented in a report entitled "Daggs Wash Floodplain Delineation Study, FCDMC No. 92-08, Technical Data Notebook," dated August 1993.

The hydrology for Daggs Wash was performed as part of a previous study of Jackrabbit Wash that included delineating ponding along the Central Arizona Canal at Daggs Wash. It was approved with a Best Available Data Letter issued on April 25, 1991.

Only the 100-year profile was computed for these streams using the COE HEC-2 hydraulic model. The starting water-surface elevations were obtained using the slope-area method. Floodways were delineated for this wash.

Cross sections were digitized from topographic mapping that was compiled photogrammetrically from aerial photos. For the streams studied in detail, the 100-year flood boundaries were delineated using topographic maps at a scale of 1:4,800, with a contour interval of 2 feet. Water-surface elevations for floods for the 100-year recurrence interval were computed using the COE HEC-2 step-backwater computer program. Starting water-surface elevations were determined using the slope-area method.

The wash is shown on FIRM Panels 1070 F, 1080 G, 1085 G, 1090 G, 1510 G, and 1530 G.

White Tanks/Agua Fria Area

The areas included in this new hydrologic and hydraulic study for the White Tanks/Agua Fria area are located in the City of Avondale, Town of Buckeye, Town of El Mirage, City of Glendale, Town of Goodyear, City of Litchfield Park, City of Phoenix, Town of Surprise, and the unincorporated areas of Maricopa County.

The study was performed by The WLB Group, Inc., for the FCDMC. A Best Available Data Letter was issued on April 18, 1994. The results of the analyses are represented in Volumes 1 through 15 of the report entitled "Flood Study Technical Data Notebook for White Tanks/Agua Fria Drainage Master Study," dated May 28, 1992.

The hydrologic methodology incorporated in the White Tanks/Agua Fria Area Drainage Master Study (ADMS) used the new "Hydrologic Design Manual for Maricopa County, Arizona," dated April 1990. The COE HEC-1 hydrologic model was used.

Only the 100-year profile was computed using the COE HEC-2 hydraulic model. This was prepared for the following streams, which were studied in detail: Beardsley Canal Wash; Cholla Wash; North Fork Cholla Wash; Waterfall Wash; White Tank #3 Wash; Bedrock Wash; North Fork Bedrock Wash; Jackrabbit Trail Wash; Tuthill Dike Wash; Bulldozer Wash; Osborn Road Wash; Tractor Wash; Diversion Dike Wash; White Granite Wash; North Fork White Granite

Wash; 191st Avenue Wash; Perryville Road Wash; Bullard Wash; Atchison, Topeka and Santa Fe (AT&SF) Railway Channel; Lower El Mirage Wash; Lower El Mirage Wash Tributary; Interstate 10; and Dale Creek Wash. Floodways were delineated for these washes.

Detailed studies of ponding areas using the HEC-1 computer model were delineated for the following areas: Roosevelt Irrigation District Canal, Southern Pacific Railroad, Buckeye Canal, Agua Fria River Dike - West Side, and Litchfield Park Detention Facility.

Approximate delineations were computed using the HEC-2 model for the following areas: Cotton Lane Wash from Indian School Road to Olive Avenue, Cotton Lane Wash from Olive Avenue to Waddell Road, Bullard Wash from Gila River to the south end of Phoenix-Goodyear Municipal Airport, Bullard Wash from the south end of Luke AFB to Reems Road, Interstate 10 from Perryville Road to Jackrabbit Trail, Interstate 10 from RID Canal to Cotton Lane, Dysart Drain from Agua River to Reems Road, and AT&SF Railroad Spur from Northern Avenue north to Waddell Road.

Approximate delineations were also computed using normal depth calculations, approximation techniques, and the HEC-1 model for the following areas: ponding behind White Tanks Flood Retarding Structures #3 and #4, ponding behind Interstate 10, ponding behind Airport Canal, conveyance corridors behind Interstate 10, behind Southern Pacific Railroad where appropriate, Bullard Wash breakout west of Estrella Parkway and south of State Route 80, breakouts along the Dysart Drain onto Luke AFB, and Reems Road from Northern Avenue to Beardsley Road.

Cross sections for each stream studied in this ADMS were constructed from topographic mapping at a scale of 1" = 400', with a contour interval of 2 feet, prepared for this study.

A section of the 100-year floodplain for Bullard Wash was not delineated because of current development in this area. A LOMR will be submitted to add flooding in this area.

The streams are shown on FIRM Panels 1145 F, 1165 G, 1560 E, 1570 E, 1580 F, 1585 F, 1590 F, 1595 F, 1605 G, 1615 H, 2035 F, 2045 F, 2050 F, 2055 E, 2060 E, 2065 F, 2070 F, 2080 G, and 2090 F.

Roosevelt Canal, Buckeye Canal, and Southern Pacific Railroad

The areas included in this new hydrologic and hydraulic study for Roosevelt Canal, Buckeye Canal, and the Southern Pacific Railroad from Hassayampa River to Dean Road are located in the Town of Buckeye and the unincorporated areas of Maricopa County.

The study was performed by McLaughlin Kmetty Engineers, Ltd., for the FCDMC. A Best Available Data Letter was issued on June 17, 1994. The results of the analyses are represented in reports entitled "Buckeye Area Flood Delineation Study, Hydrology Report,"

dated May 1992 and revised July 1992, and "Buckeye Area Flood Delineation Study, Hydraulic Report and Technical Data Notebook," dated September 1992 and revised December 1992.

The hydrologic analysis for Roosevelt Canal, Buckeye Canal, and the Southern Pacific Railroad was conducted using the COE HEC-1 hydrologic model.

Since flooding occurs as the result of ponding against raised embankments for the revised areas, the water-surface elevations were determined by using HEC-1 for the level-pool routing routine based on stage-storage-discharge data for each sub-basin where ponding occurs. The hydraulic analyses for this study were based on unobstructed flow through the railroad trestles, using existing conditions at the time of survey. The flood elevations shown on the profiles are considered valid only if the hydraulic structures remain unobstructed, operate properly, do not fail, and the railroad embankment does not fail. The canal roads are earthen, and the flood elevations presented are considered valid only if the canal low points remain unobstructed and the canal embankment does not fail.

The ponding areas for the canals and the railroad are shown on FIRM Panels 2015 F, 2020 F, 2025 F, 2040 E, 2045 F, 2480 F, 2485 F, and 2505 F.

Consolidated Canal East Branch

A LOMR was issued on October 4, 1993, for the City of Chandler to reflect updated topographic information for Cooper Road and updated hydrologic analysis of the ponding areas just east of the Consolidated Canal East Branch. It is shown on FIRM Panel 2670 F. As a result of this revision, the floodplain was reduced along the ponding area east of the Consolidated Canal East Branch from just upstream of Frye Road to just downstream of Chandler Boulevard. This LOMR was not incorporated into FIRM Panel 04013C2670 E because the revised panel was in the process of being reprinted. This LOMR was, therefore, reissued on February 7, 1994.

East Fork Cave Creek

The LOMR issued on January 11, 1994, for the City of Phoenix to reflect the construction of a detention basin and the channelization of East Fork Cave Creek, is shown on FIRM Panel 1220 G. As a result of this LOMR, the floodplain was reduced along East Fork Cave Creek from Beardsley Road to Cave Creek Road. The 100-year floodplain is now contained in the concrete, channelized portion of East Fork Cave Creek from Beardsley Road to Union Hills Drive and in the earthen, channelized portion of East Fork Cave Creek from Union Hills Drive to Cave Creek Road.

Basin 5

The LOMR issued on February 18, 1994, for the City of Scottsdale to reflect an incorrect zone designation along Basin 5, is shown on FIRM Panel 1230 F in Section 33. The SFHA designated Zone A along Basin 5 alluvial fan flooding was changed to Zone AO (depth 1 foot and a velocity of 3 feet per second). The basis for this modification was a letter submitted by the FCDMC which stated that the effective map was labeled incorrectly.

Grand Avenue

The LOMR issued on March 4, 1994, for the City of Glendale to reflect more detailed topographic information along Grand Avenue is shown on FIRM Panel 1645 E. As a result of this request, the floodplain width was decreased along Grand Avenue from approximately 4,000 feet southeast of the intersection of Bethany Home Road and Grand Avenue to approximately 3,000 feet northwest of this intersection, by a maximum of 1,000 feet. In addition, the floodplain from the intersection of Bethany Home Road and Grand Avenue to approximately 3,000 feet northwest of this intersection, was redesignated from Zone AO (depth 2 feet) to Zone AO (depth 1 foot). Street names shown on this panel were corrected based on a street map submitted by the Arizona Department of Water Resources.

Unnamed Tributary to Cave Creek Wash

A letter was issued on March 25, 1994, for Maricopa County and Incorporated Areas.

The study was performed by Gilbertson Associates, Inc. The results of the analysis are represented in the report entitled "Final Hydrologic and Hydraulic Study for Carefree Mountain Estates Unit One," dated December 23, 1992. As a result of this request, an SFHA has been added for the wash near the proposed Unit 1 of the Carefree Mountain Estates subdivision. This revision is shown on FIRM Panel 0815 G.

Indian Bend Wash

The LOMR issued on April 22, 1994, for the Town of Paradise Valley reflects the channel modifications along Indian Bend Wash from just upstream to approximately 2,000 feet upstream of Scottsdale Road. These modifications include the placement of fill in the floodway fringe along the south side of Indian Bend Wash, and excavation of the channel. As a result of this request, the BFEs, SFHA, and floodway topwidth have decreased for the revised reach of Indian Bend Wash. This revision is shown on FIRM Panel 1695 F.

The LOMRs issued on June 7, 1994, for the Town of Paradise Valley and the City of Phoenix reflect a channelization project along Indian Bend Wash from approximately 300 feet upstream to approximately 1,800 feet downstream of Shea Boulevard. As a

result of this channelization project, the 100-year flood will be contained within the identified channel banks from approximately 200 feet upstream to approximately 200 feet downstream of Shea Boulevard. The SFHA has been reduced along the remainder of the revised reach. This revision is shown on FIRM Panel 1680 F.

Salt River

The LOMRs issued on May 17, 1994, for the City of Phoenix and the City of Tempe reflect a channelization project on Salt River from approximately 6,600 feet downstream of State Route 143 to the Southern Pacific Railroad bridge. As a result of this request, the BFEs have decreased along the study reach, and the SFHA reduced because the 100-year flood will be contained in the improved channel. This revision is shown on FIRM Panels 2145 F, 2155 E, and 2165 F, and Flood Boundary and Floodway Map Panel 2155.

Arizona Channel

The LOMRs issued on June 3, 1994, for the Town of Paradise Valley and the City of Phoenix reflect the ACDC project along the Arizona Canal from 17th Street to the Limit of Detailed Study of Flynn Lane Wash and from approximately 30th Street to the Limit of Detailed Study of Echo Canyon Wash (Cudia City Wash). As a result of this revision, the SFHA is reduced and is now contained within the ACDC right-of-way along the revised reach. This revision is shown on FIRM Panels 1670 E and 1690 E.

East Fork Cave Creek

The LOMA issued on May 14, 1993, for the City of Phoenix removes Lot 87, Greentrails Subdivision, 948 East Grandview Road, from the SFHA. The property is shown on FIRM Panel 1220 G.

The LOMR issued on May 26, 1993, for the City of Phoenix was based on placement of fill. This request determined that Lots 133 through 139, 173 through 176, 182 through 184, 204 through 219, 221 through 228, 255, 256, 263, 269, and 270 were located outside of the SFHA and that Lots 140 through 172, 177 through 181, 185 through 203, 220, 229 through 254, 257 through 262, 264 through 268, and 271 through 281 would not be inundated by the 100-year flood and were, therefore, removed from the SFHA. The property is shown on FIRM Panel 1215 H.

The LOMR issued on March 8, 1994, for the City of Phoenix was a reissuance of the LOMR issued on May 26, 1993.

Point Loma

The LOMR issued on February 1, 1994, for the City of Phoenix was based on placement of fill in the Point Loma subdivision. This request determined that Lots 33 through 38 were located outside the SFHA. The existing structures on Lots 9, 10, and 11 were also

located outside the SFHA. Lots 15 through 32 would not be inundated by the 100-year flood and were removed from the SFHA. Finally, it was determined that the existing structures on Lots 2 and 3 would not be inundated by the 100-year flood and were, therefore, removed from the SFHA. The property is shown on FIRM Panel 1670 E.

Moon Valley Wash

The LOMR issued on January 24, 1995, for the City of Phoenix to reflect a restudy completed under the Limited Map Maintenance Program is shown on FIRM Panels 1655 H and 1660 F. The revised area, previously designated as Zone AO (depth 2), has been modified to show BFEs along the revised reaches. The revised area includes Moon Valley Wash-North Branch, Moon Valley Wash South Branch, Moon Valley Wash-North Split, and the Diversion Channel.

Discharges used in this restudy were taken from previous flood insurance studies. No floodways were determined in this restudy. The downstream limit of Moon Valley Wash-North Branch is at Thunderbird Road. The starting water surface elevation was taken from the effective Flood Profile Panel for Moon Valley Wash at Thunderbird Road.

Tenth Street Wash

During the review of a LOMR for the City of Phoenix, a discrepancy was discovered between FIRM Panel 1660 E and Flood Profile Panel 336P: the street distances did not match. After a closer look, the map was determined to be correct. We have, therefore, corrected the profile to show the correct distances between the roads.

Indian Bend Wash

During the review of a LOMR for the City of Phoenix, a discrepancy was discovered between FIRM Panel 1680 E and Flood Profile Panels 216P and 217P with regard to the street distances and the locations of the cross sections. The profiles were corrected.

Kyrene Branch Canal

The LOMR issued on July 21, 1994, for the City of Chandler was based on the effects of the construction of Ray Road and a 48-inch concrete pipe from Ray Road to approximately 1,700 feet downstream of Ray Road that conveys the flooding associated with Kyrene Branch Canal through the Warner Ranch 4 subdivision. This LOMR follows up on a February 24, 1994, CLOMR and is shown on Panel 2630 E. As a result of this revision, a portion of the 100-year flood discharge is contained within Ray Road and the remaining flood discharge continues downstream within the 48-inch pipe and along Kyrene Branch Canal. The depth of the 100-year flood within Ray Road and along Kyrene Branch Canal is less than 1 foot;

therefore, the Special Flood Hazard Area, designated as Zone A, has been changed to Zone B.

Granite Reef Aqueduct

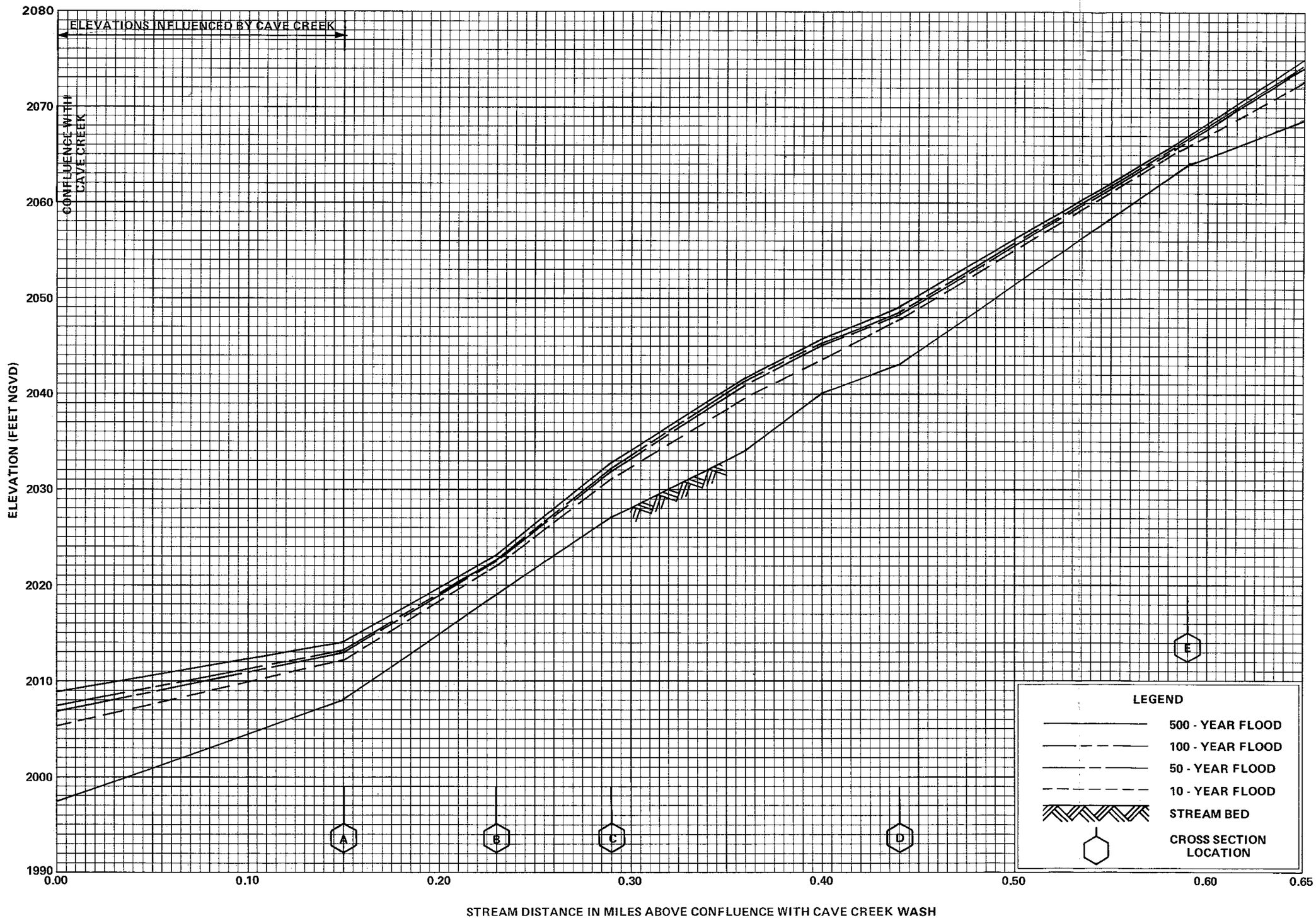
The LOMR issued on July 12, 1994, for the City of Scottsdale was based on the effects of updated hydrologic analysis to incorporate more detailed data for unnamed desert washes upstream of Granite Reef Aqueduct encompassing the area along Granite Reef Aqueduct from approximately 2,400 feet northwest of Cactus Road to approximately 3,700 feet southeast of Cactus Road. As a result of this revision, the Special Flood Hazard Area has shifted northwesterly by a maximum of 800 feet. This revision is shown on Panel 1705 E.

Cave Creek Wash

The LOMR issued on April 12, 1994, for the City of Phoenix was based on the correction of a computational error in the determination of the shallow flooding depths along Cave Creek Wash between Bethany Home Road and Northern Avenue. As a result of this revision, the zone designation has been changed from Zone AH to Zone X (shaded). This revision is shown on Panel 1665 G.

The LOMR issued on May 26, 1995, for the City of Phoenix was based on the effects of construction of Cave Creek Wash Overflow Channel (also known as Bellvue Wash Channel) and lowering of 7th Avenue along Cave Creek Wash. As a result of this revision, the BFEs decrease along Bellvue Channel. The SFHA increased and decreased along Cave Creek Wash Overflow Channel. An area previously designated as Zone AE was redesignated as Zone X. This revision is shown on Panel 1215G, Profile Panel 57P, and the Floodway Data Table. New Profile Panels 57PA and 57PB were added.

The LOMR issued on May 26, 1995, for the City of Phoenix was based on the effects of a cut and placement of fill along Cave Creek Wash, from approximately 200 feet upstream to approximately 800 feet upstream of Bell Road. As a result of this revision, the BFEs increased and decreased and the SFHA and floodway decreased along the revised reach. This revision is shown on Panel 1215 G, Profile Panel 57P, and the Floodway Data Table.



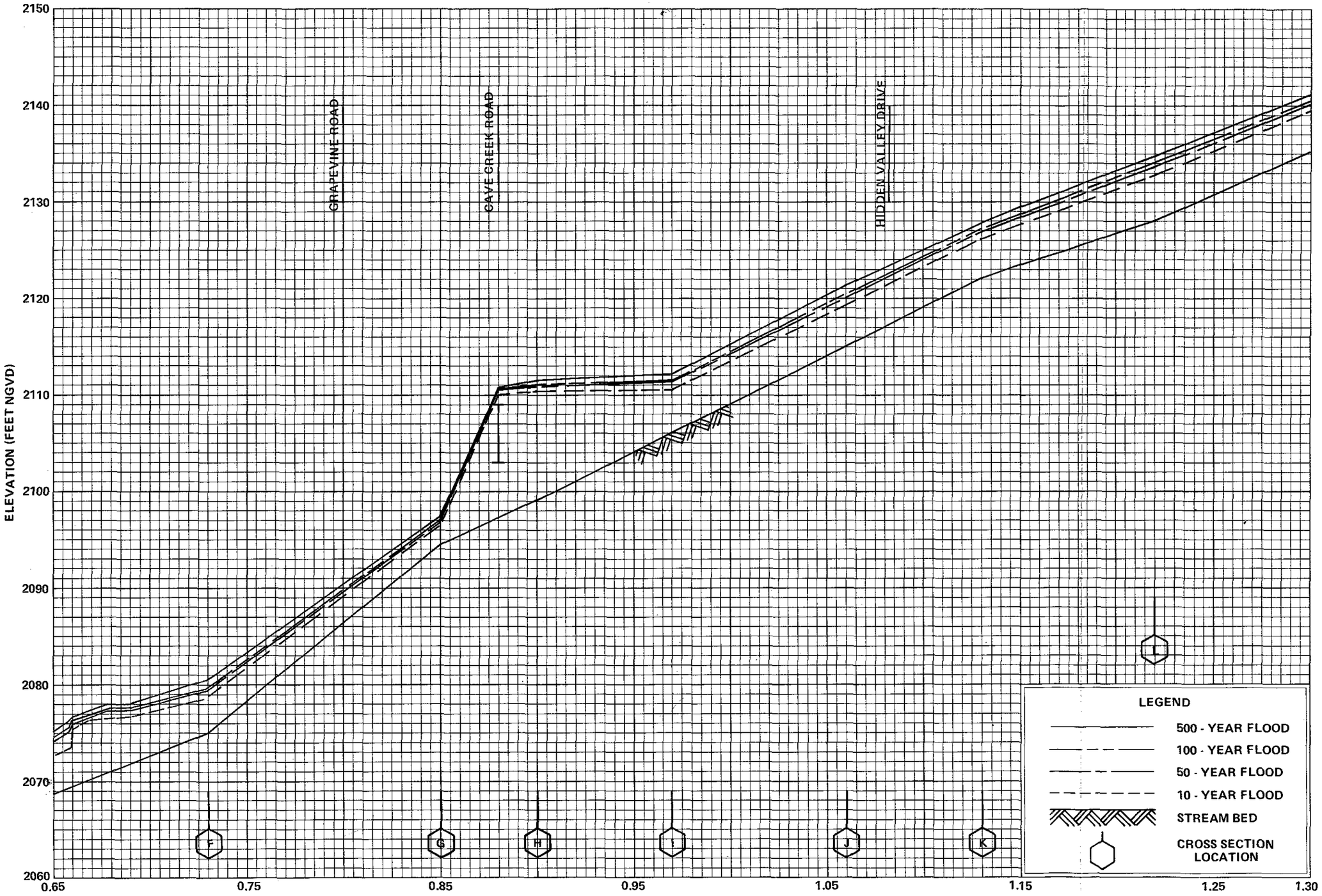
FLOOD PROFILES

ANDORA HILLS WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

01P



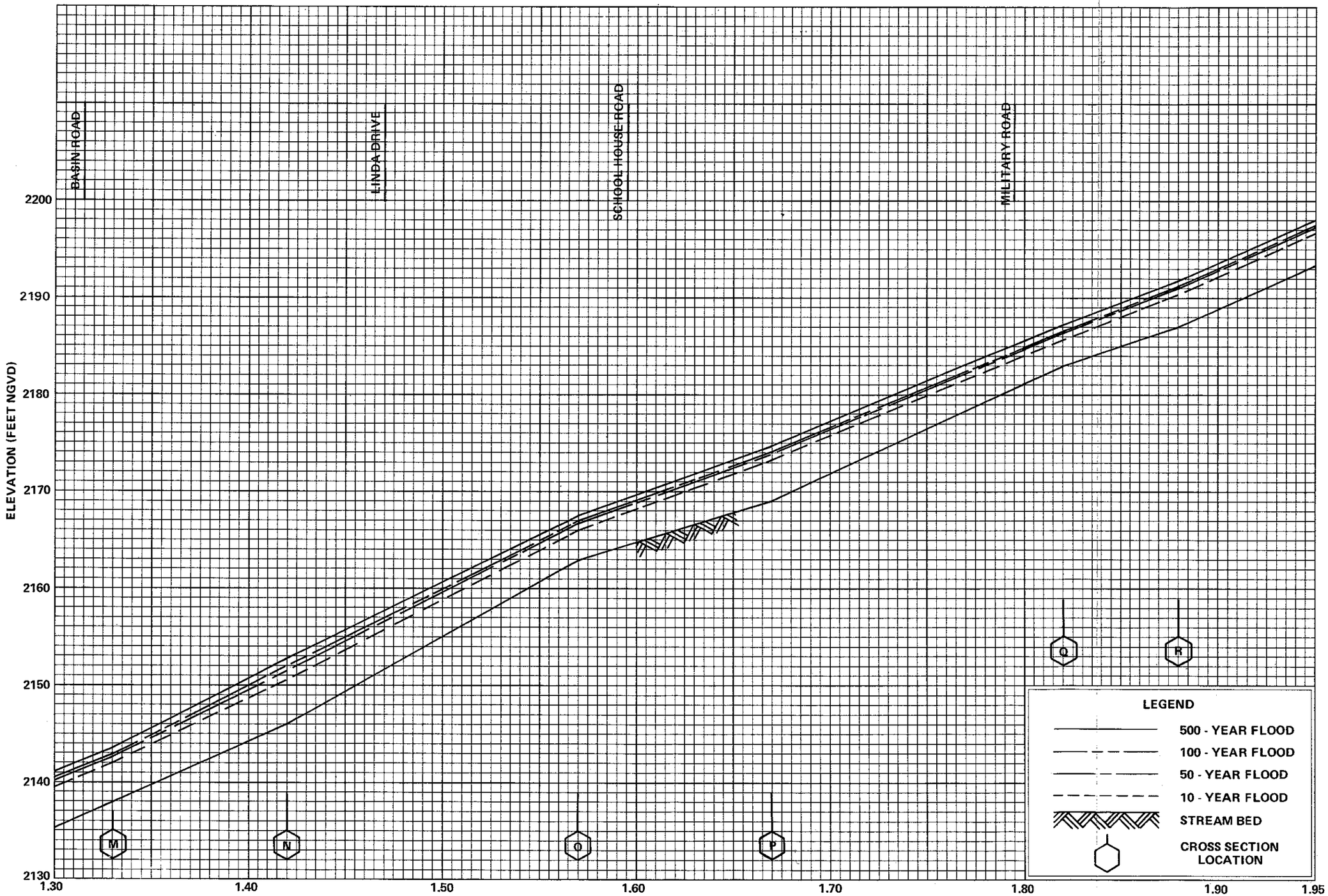
FLOOD PROFILES

ANDORA HILLS WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

02P



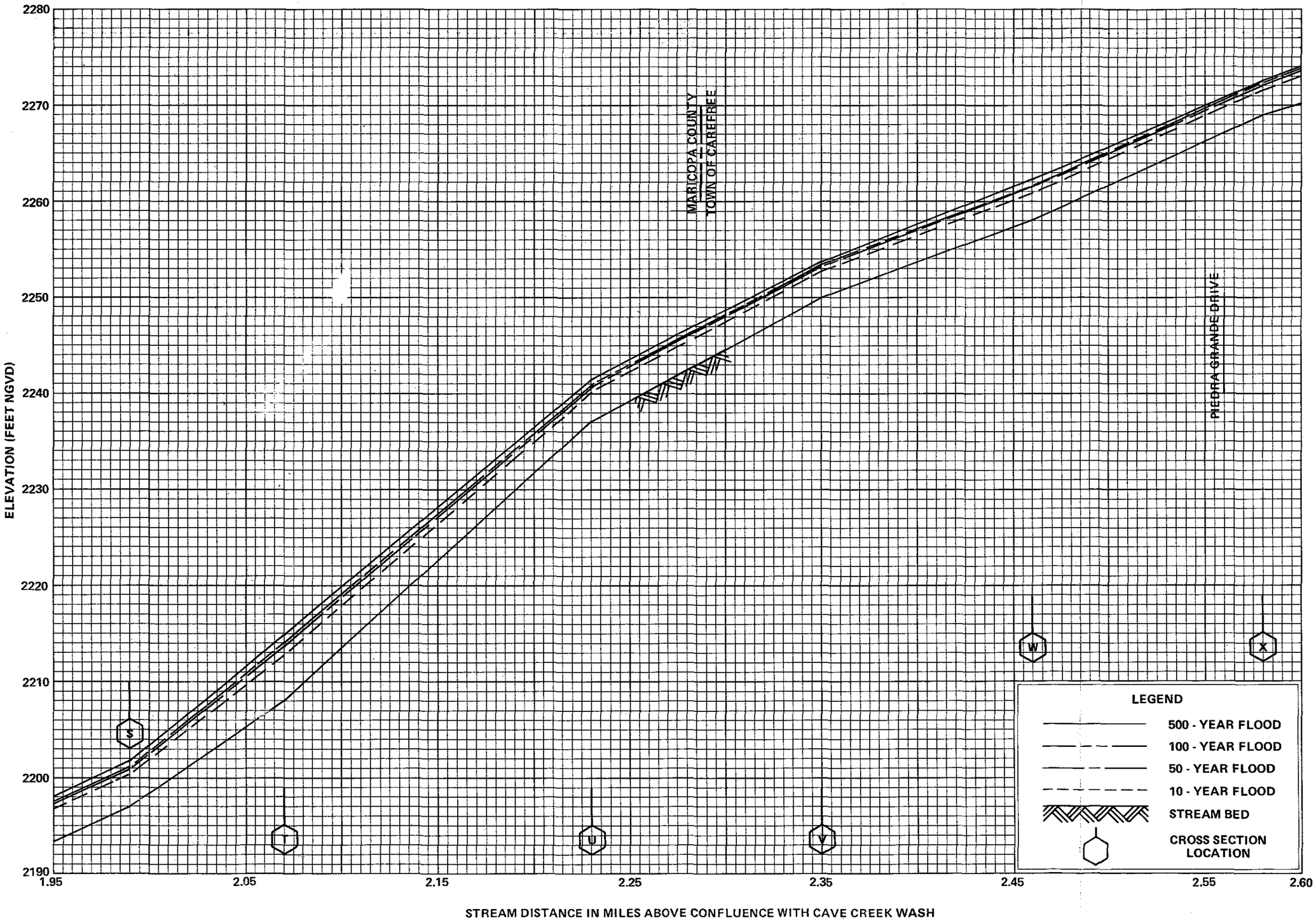
FLOOD PROFILES

ANDORA HILLS WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

03P



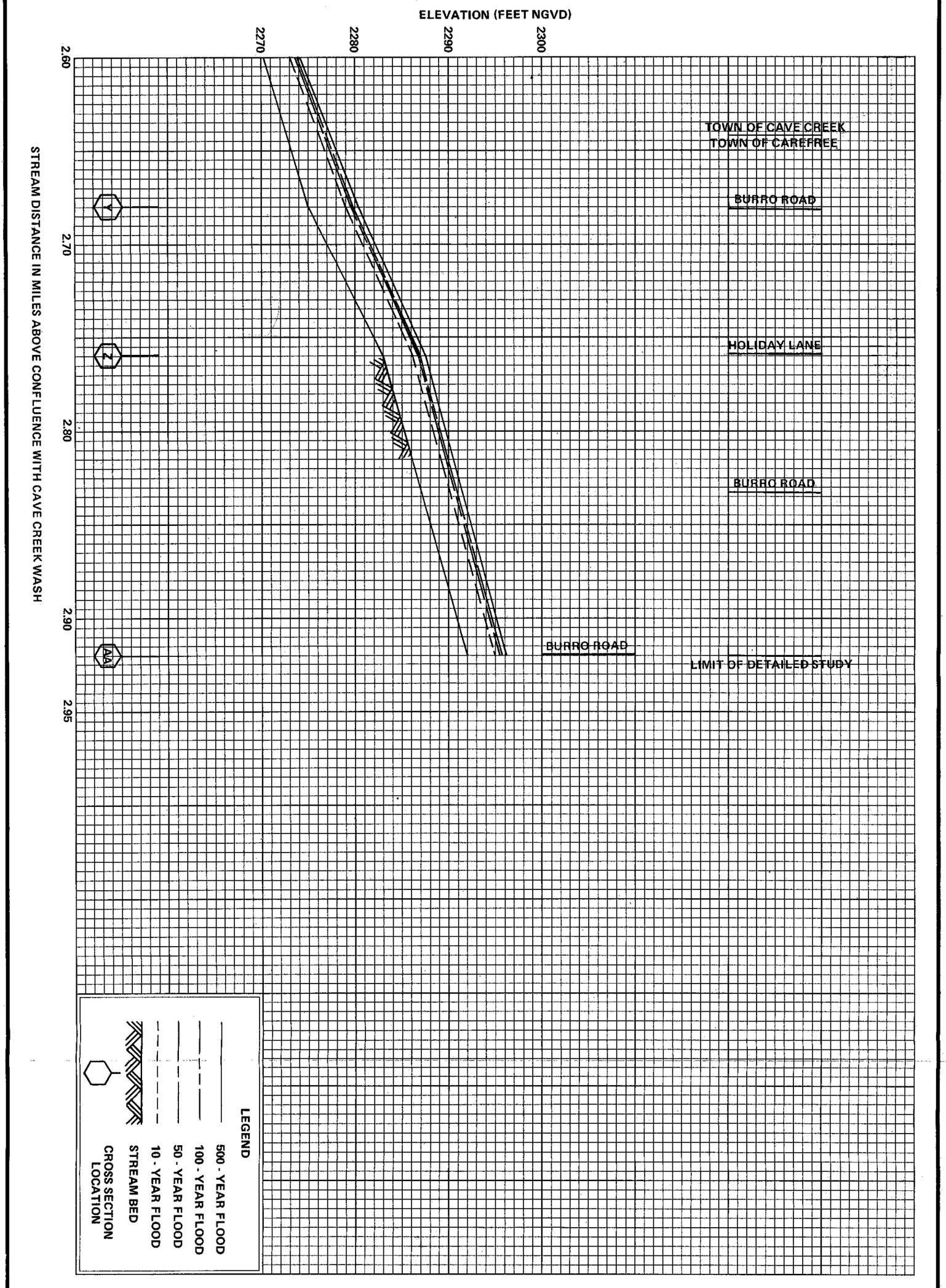
FLOOD PROFILES

ANDORA HILLS WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

04P



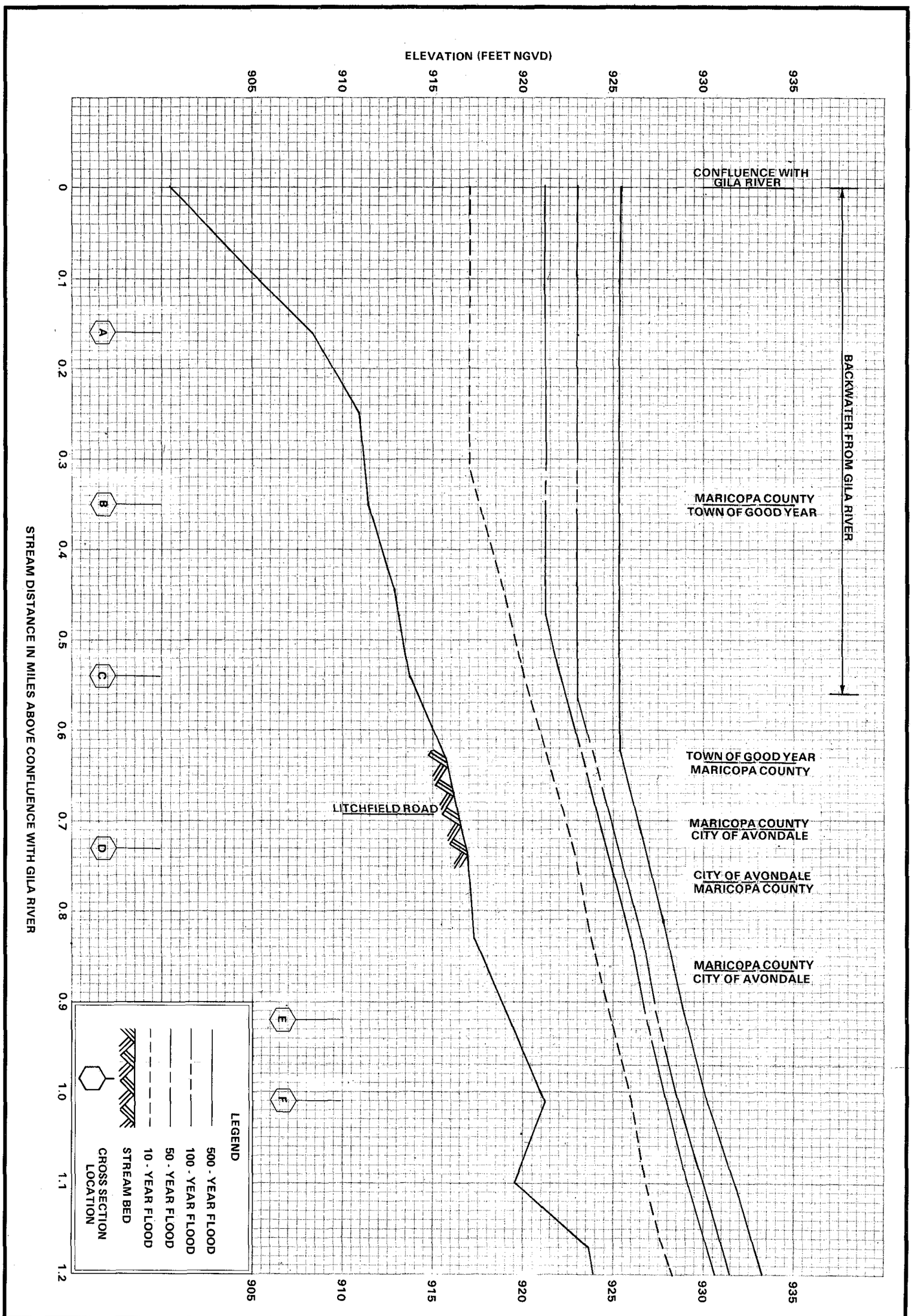
05P

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOOD PROFILES

ANDORA HILLS WASH



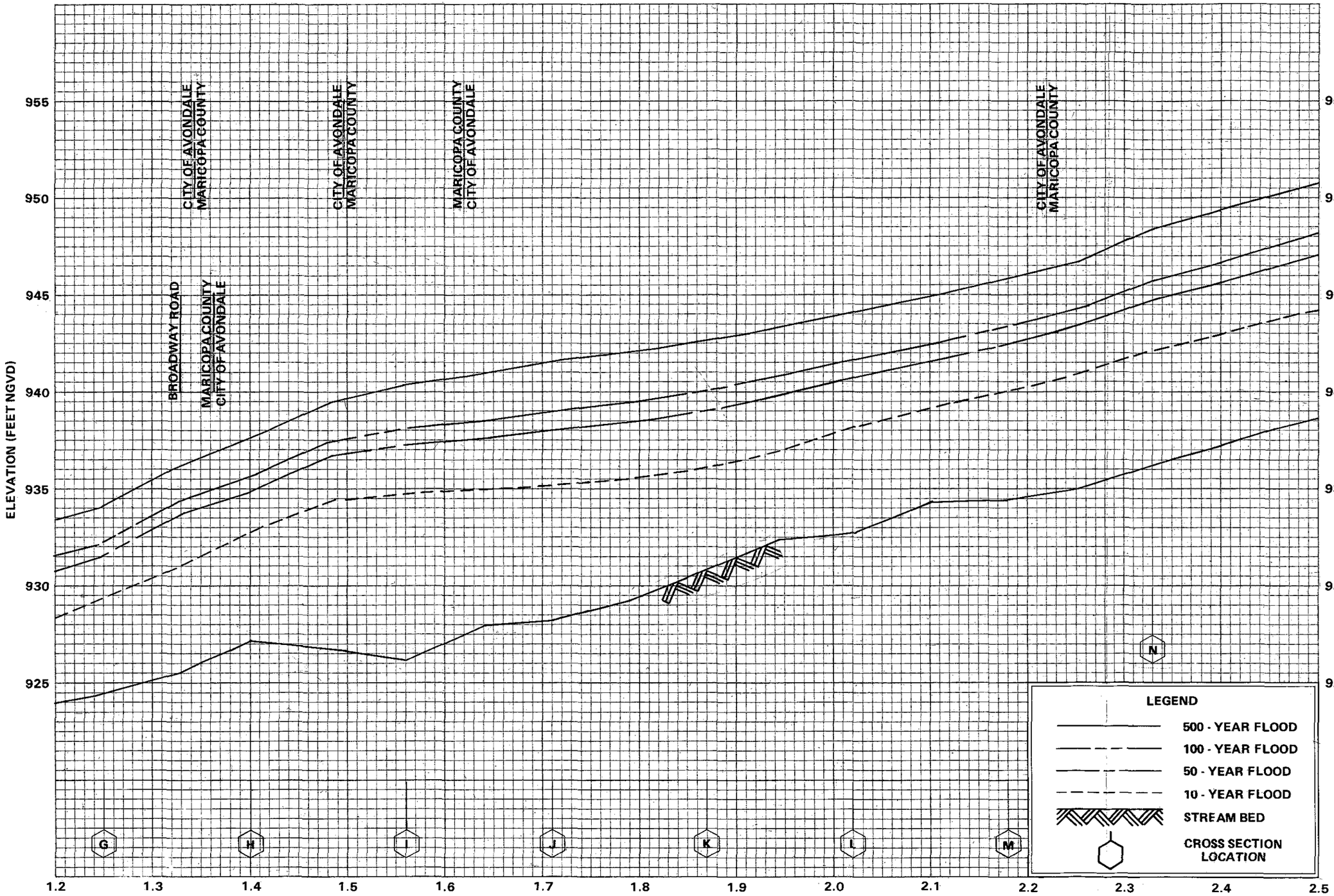
06P

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOOD PROFILES

AGUA FRIA RIVER



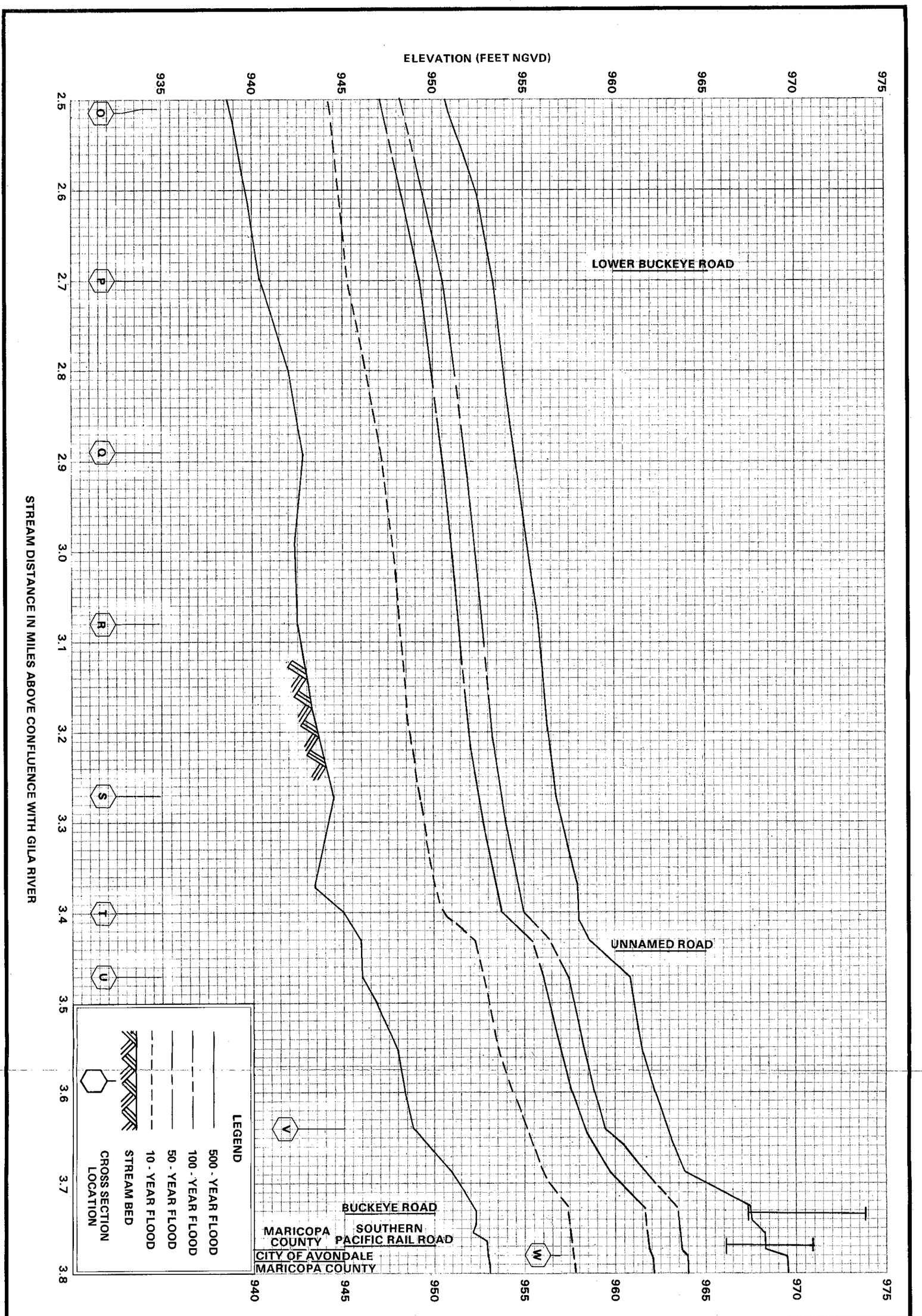
FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

07P



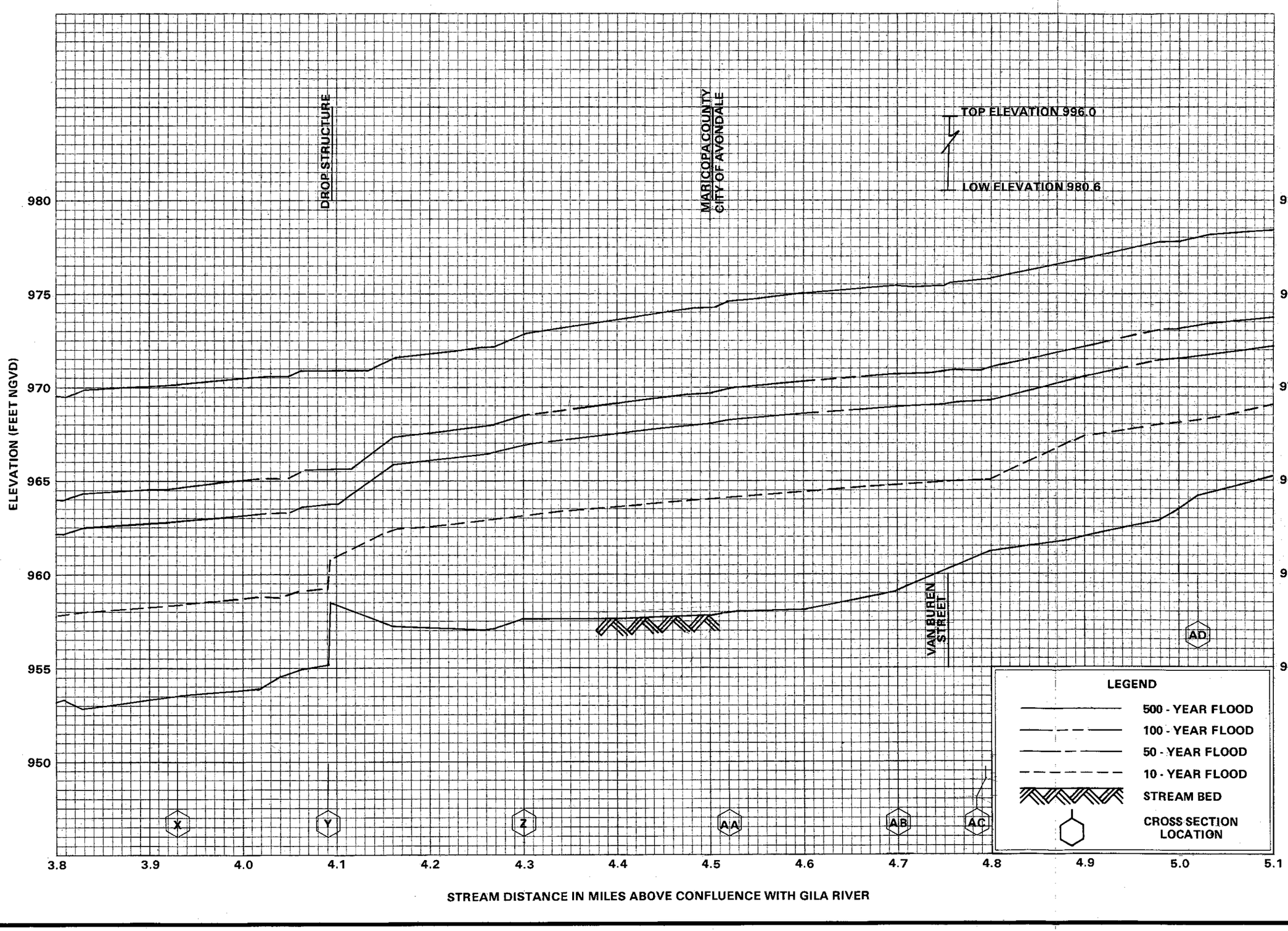
FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOOD PROFILES

AGUA FRIA RIVER

08P



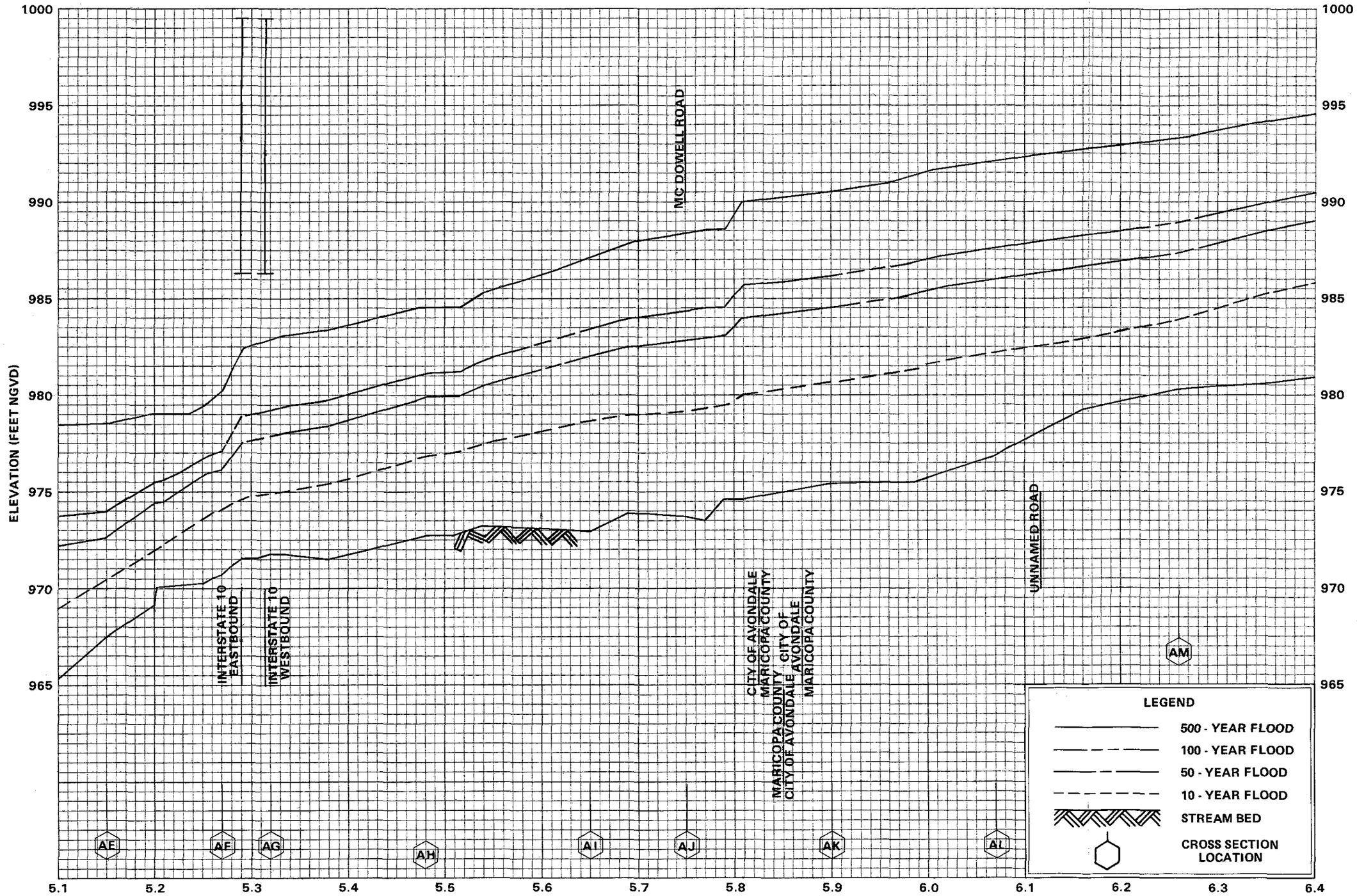
FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

09P



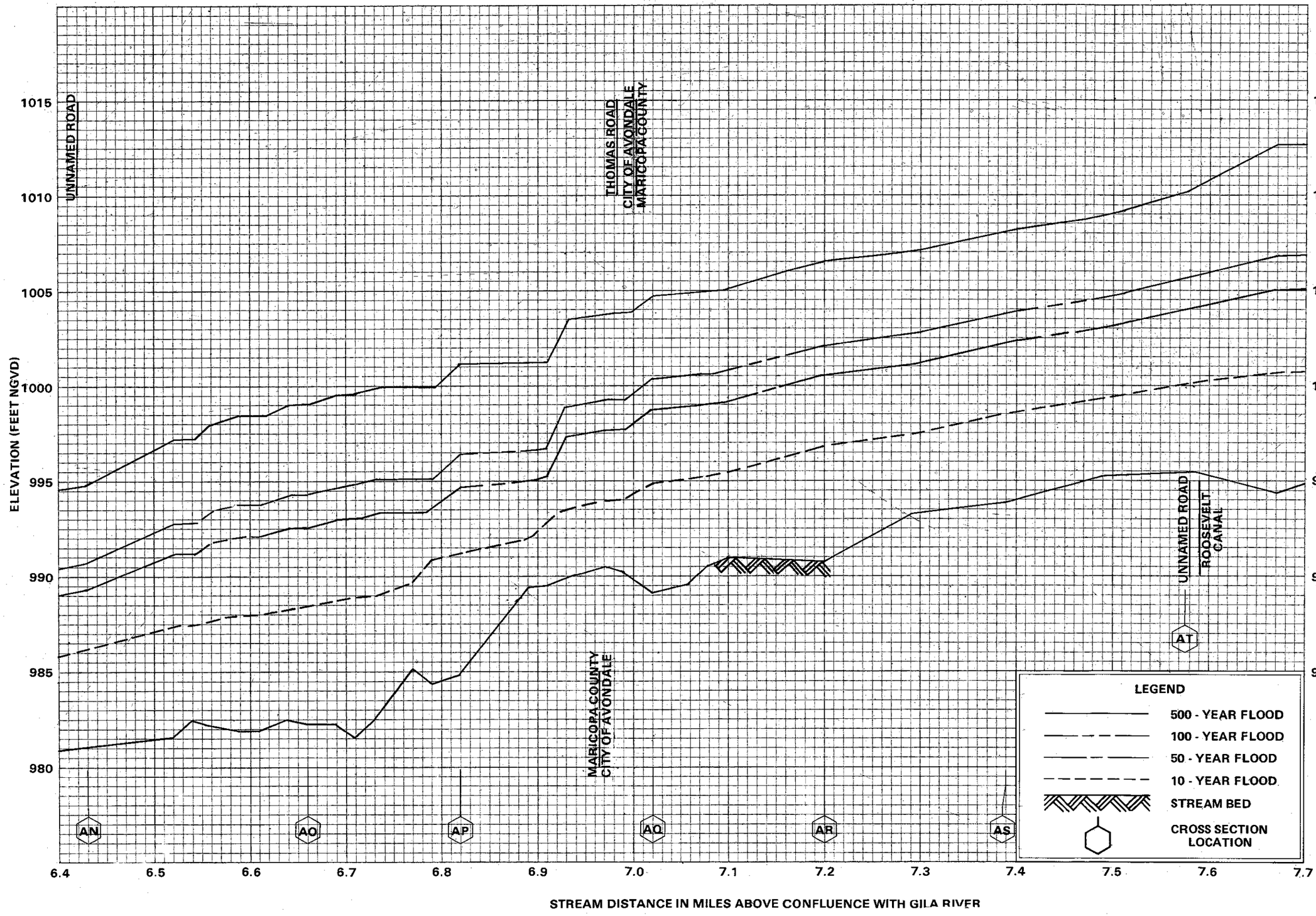
FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

10P



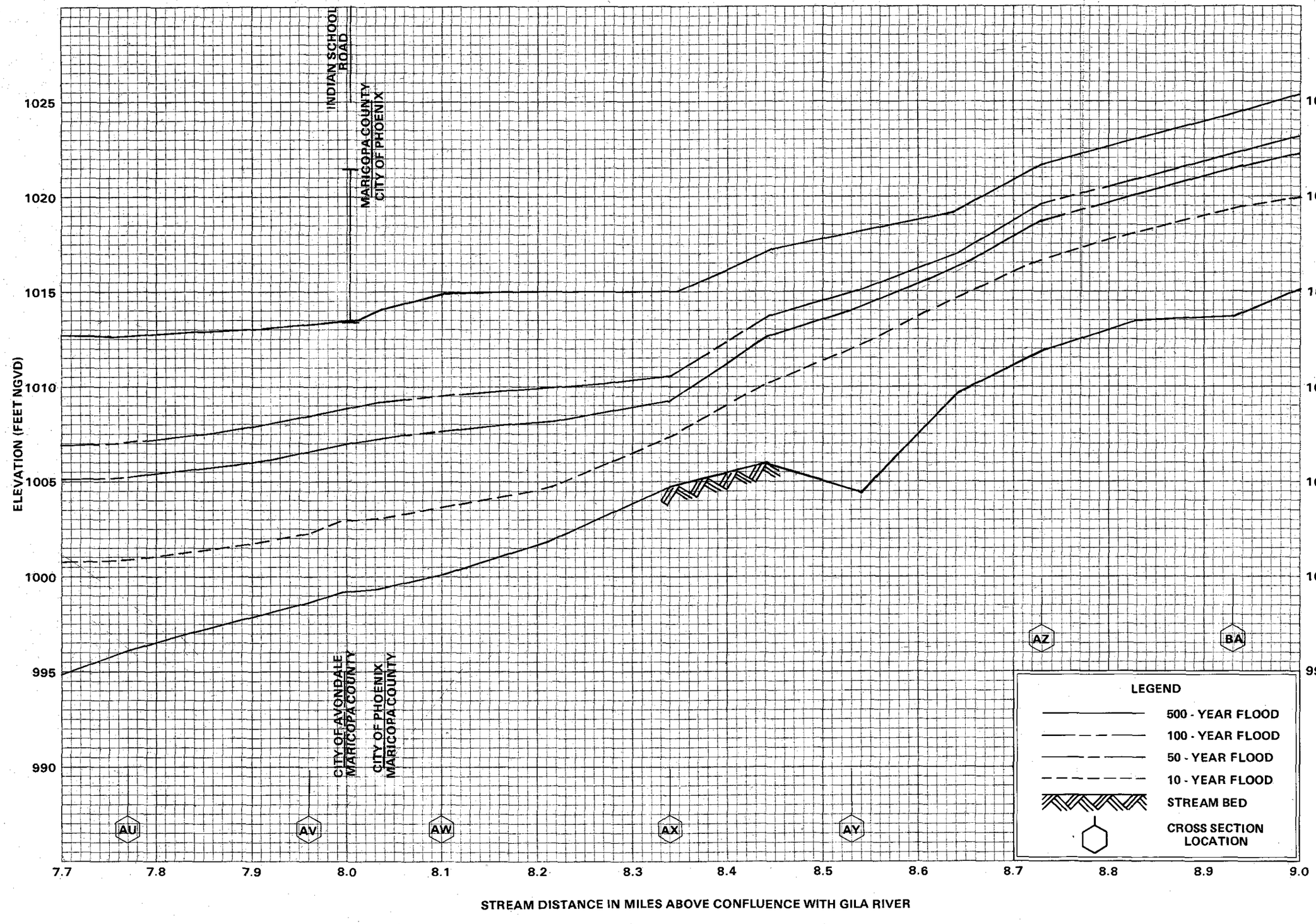
FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

11P



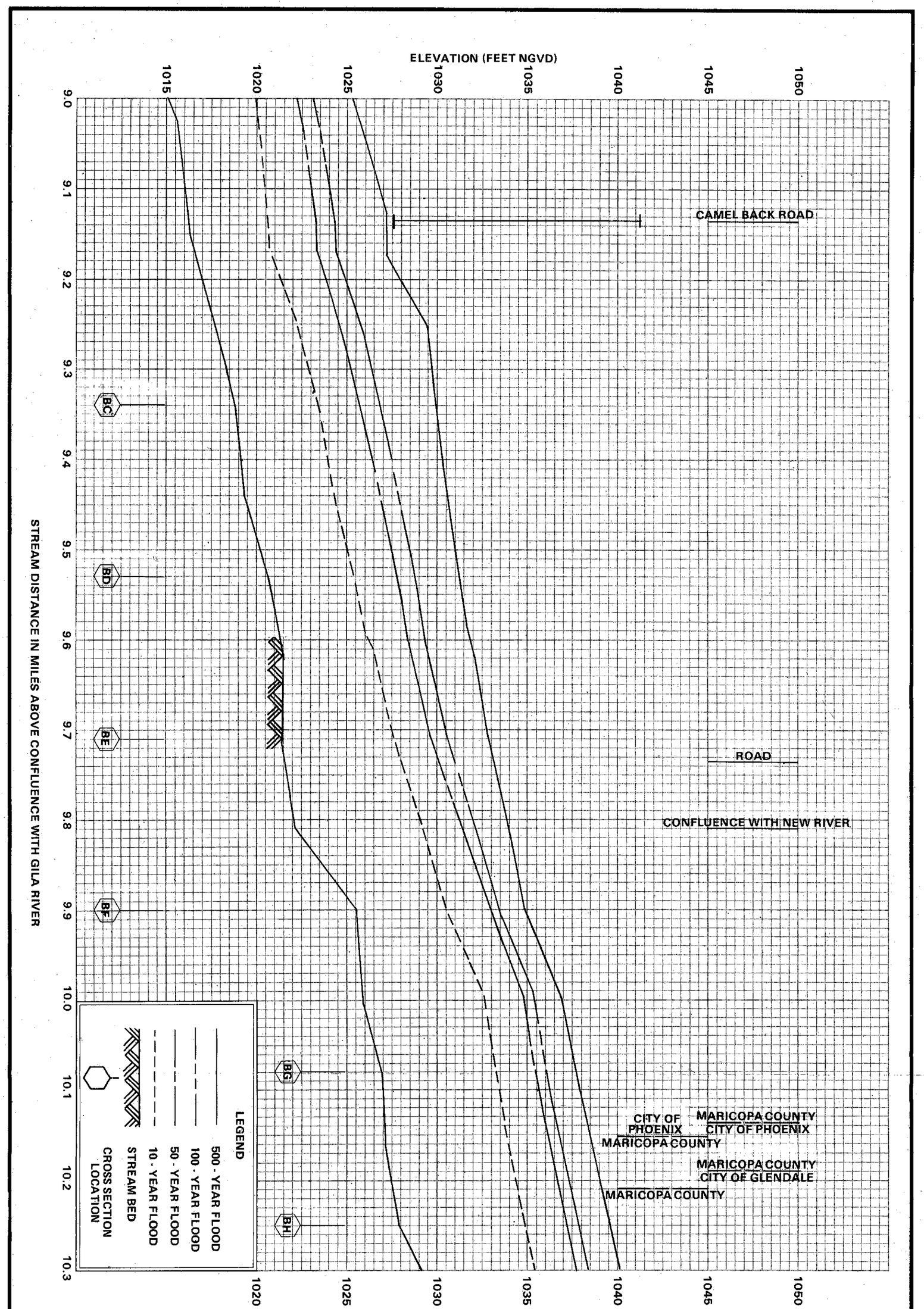
FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

12P



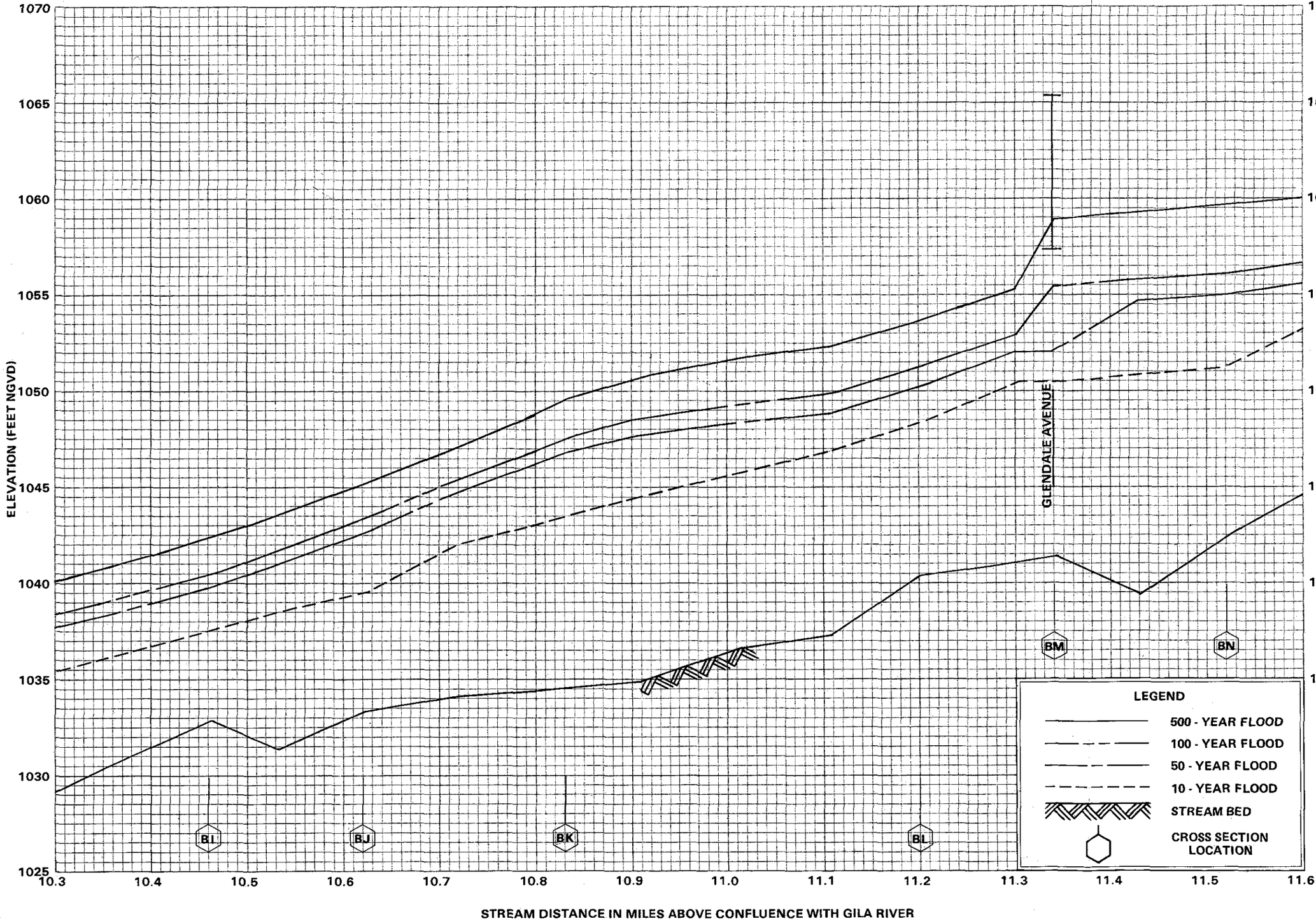
13P

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOOD PROFILES

AGUA FRIA RIVER



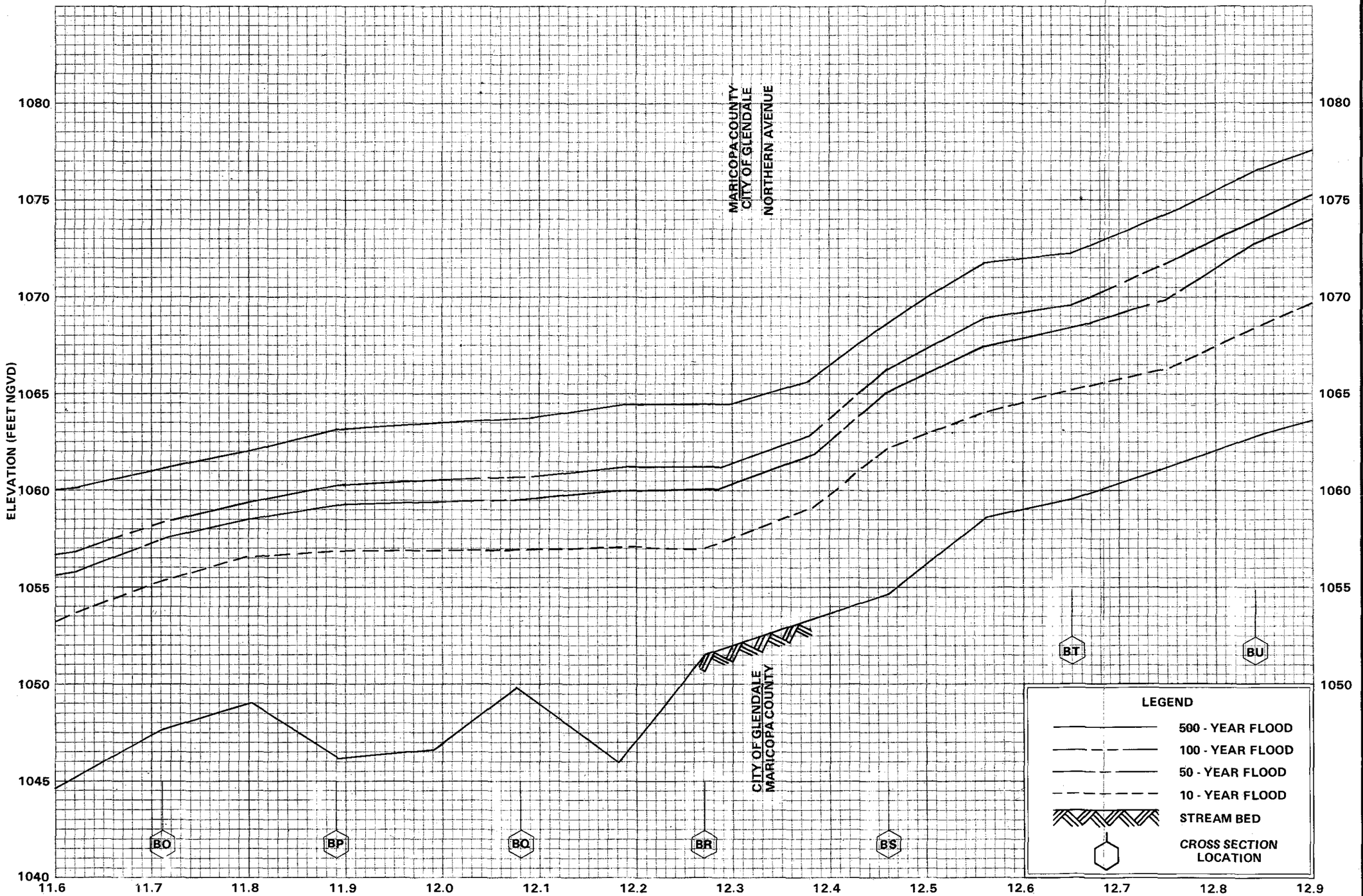
FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

14P



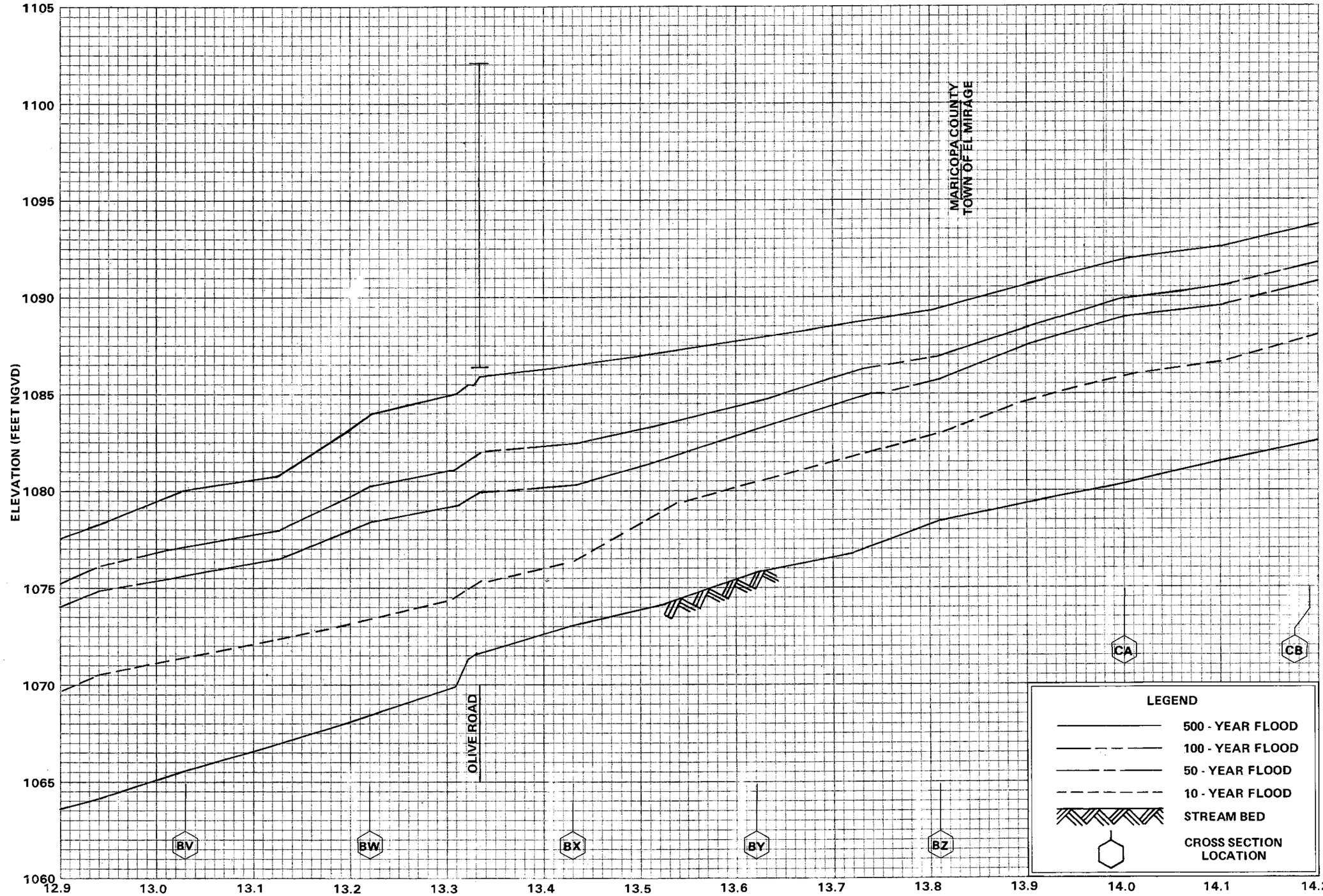
FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

15P



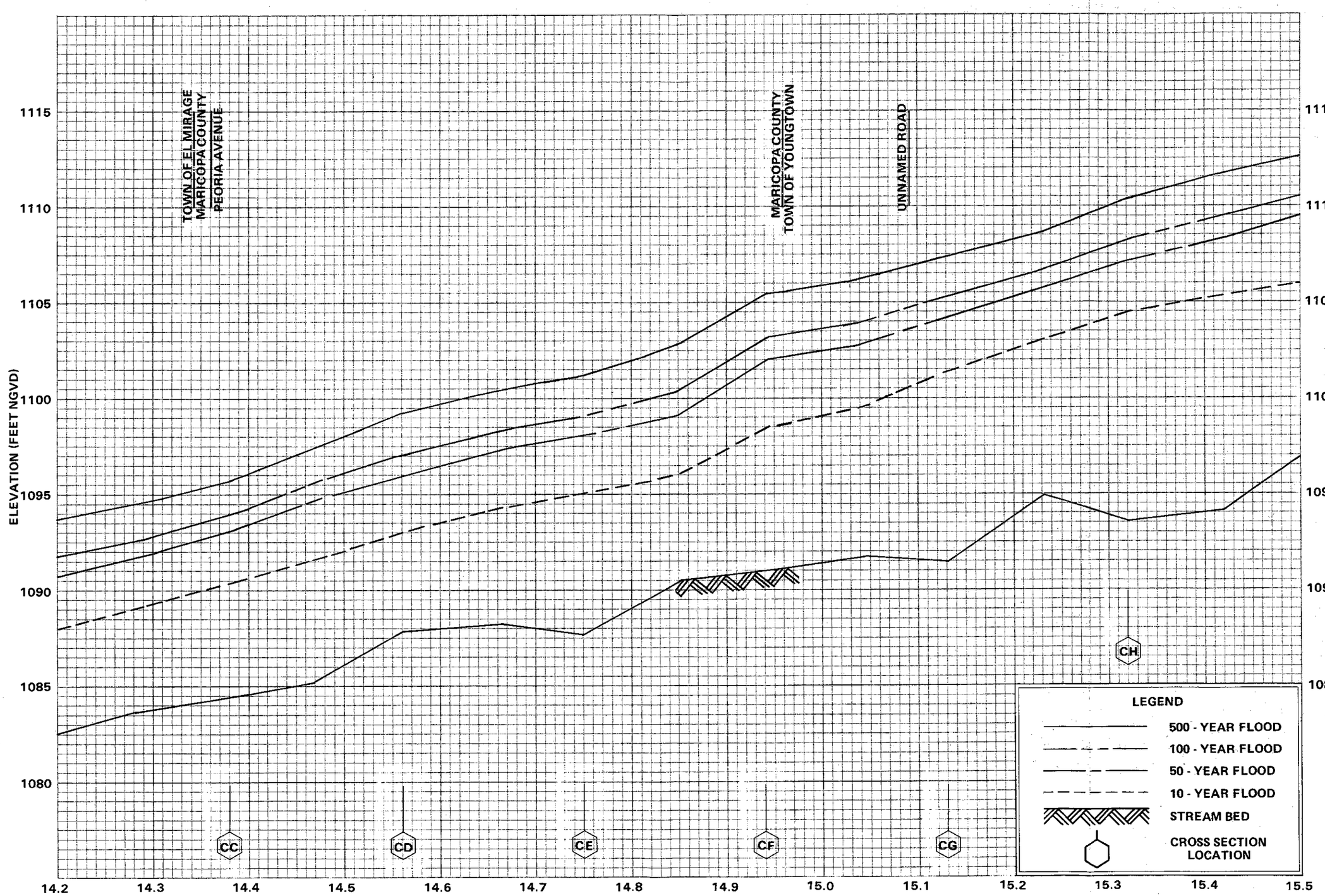
FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

16P



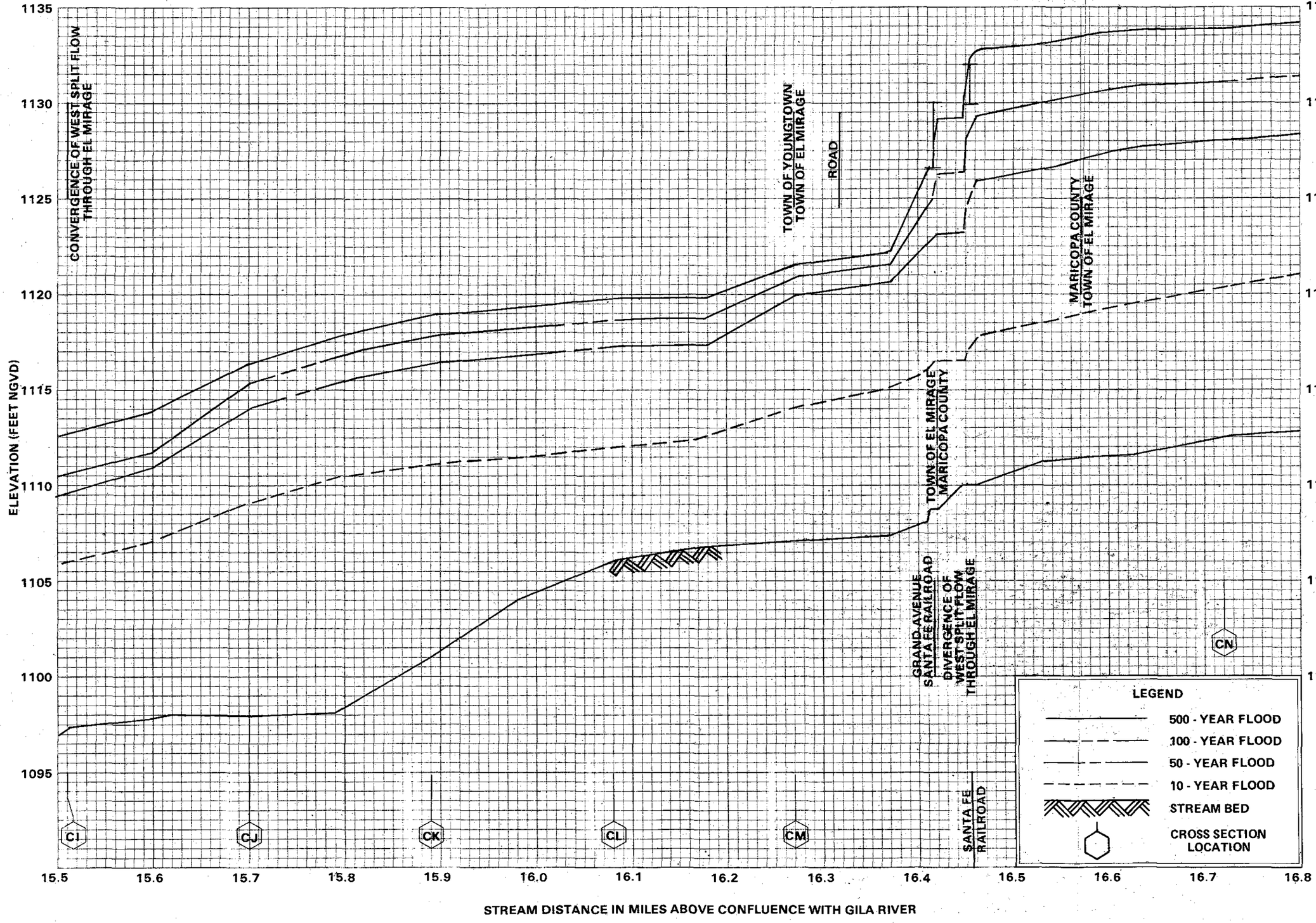
FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

17P

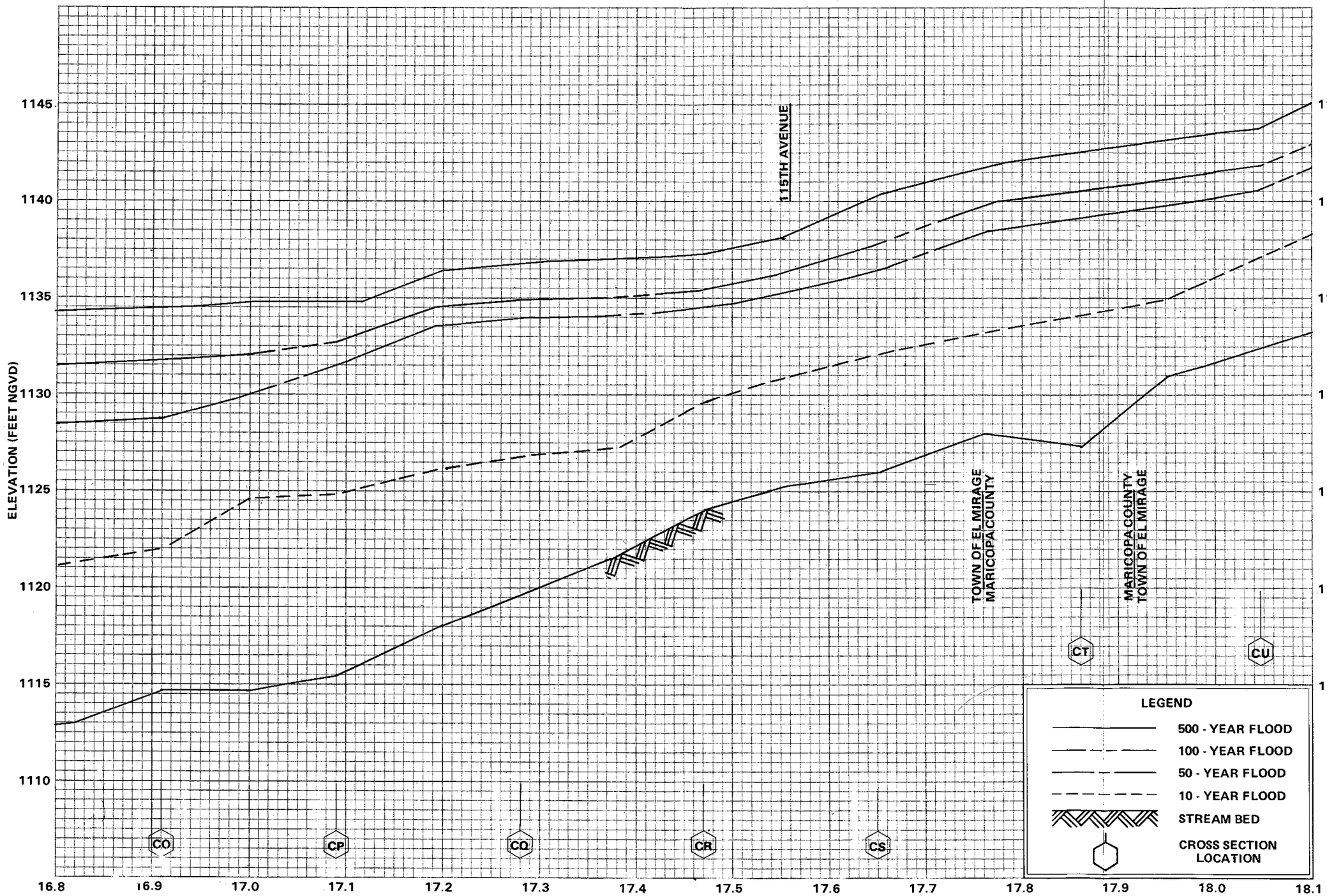


FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

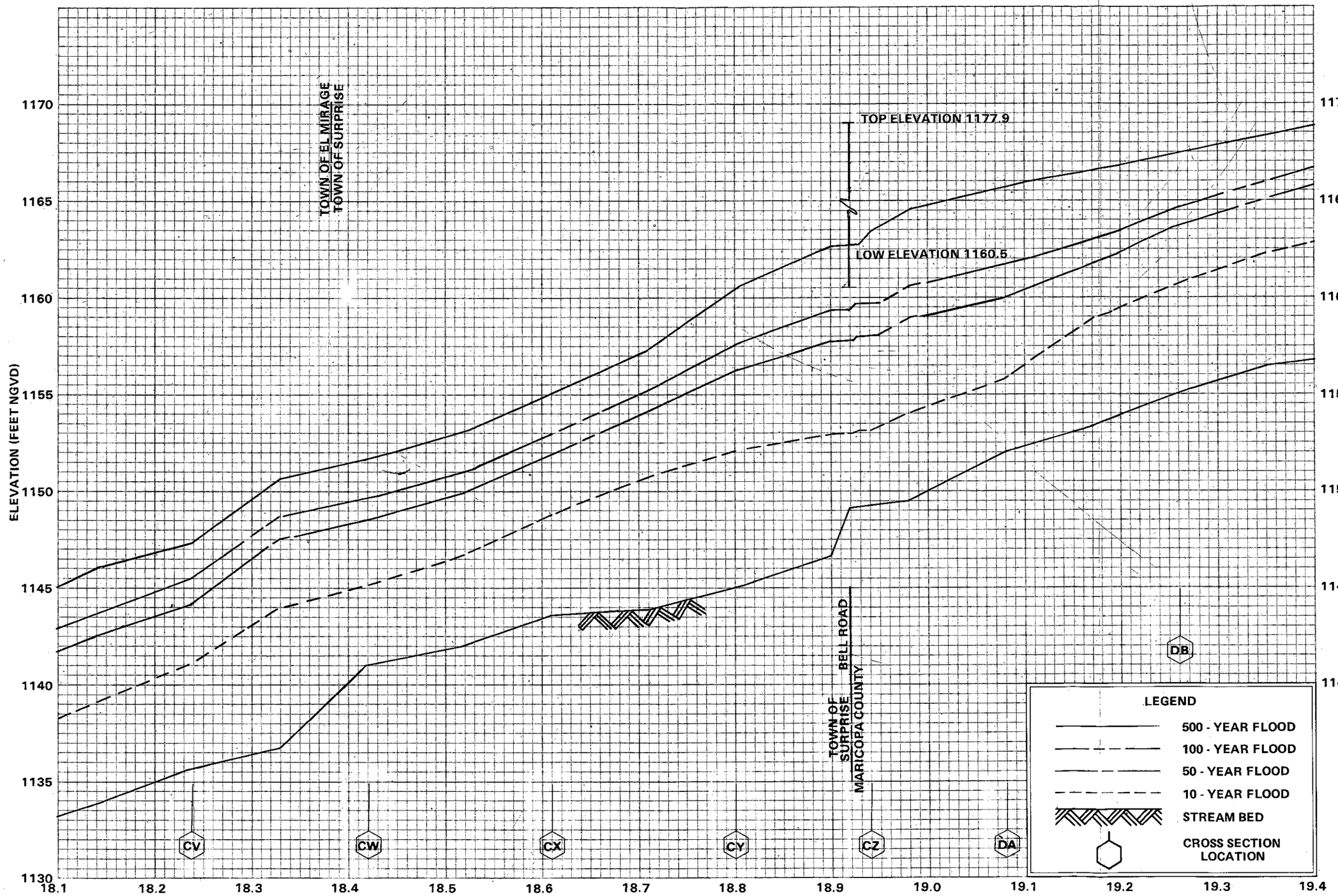


FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS



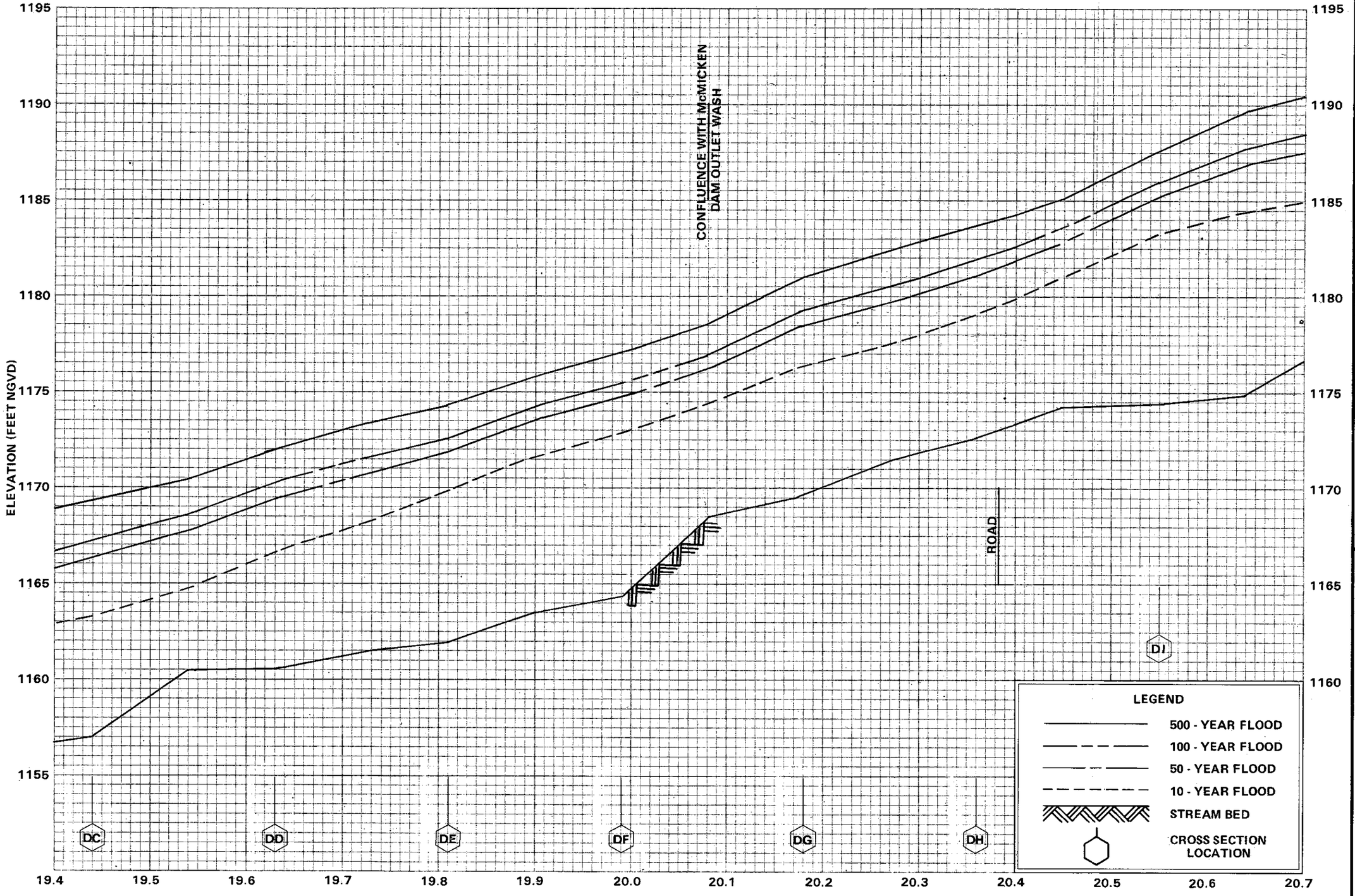
FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

20P

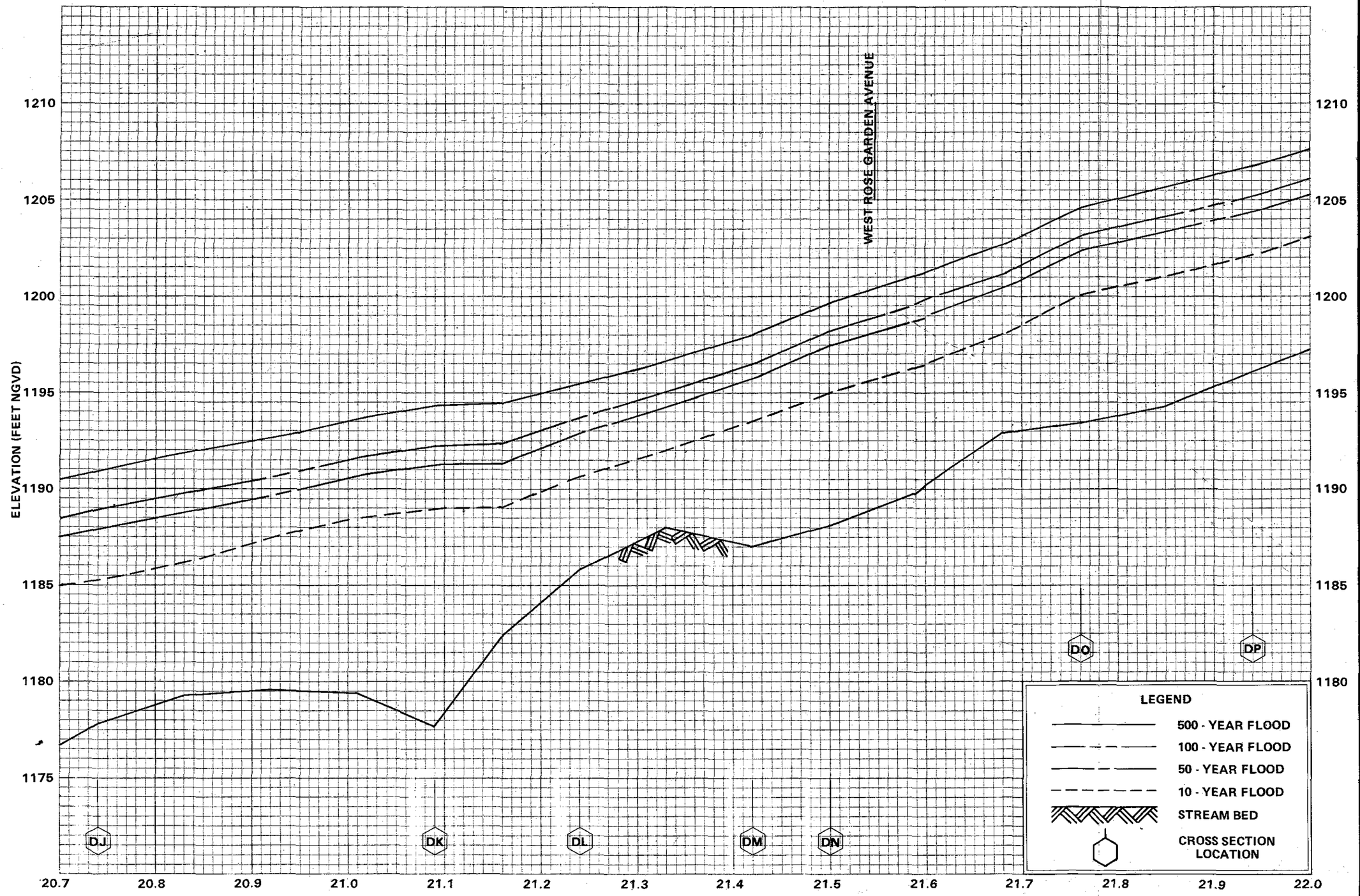


FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

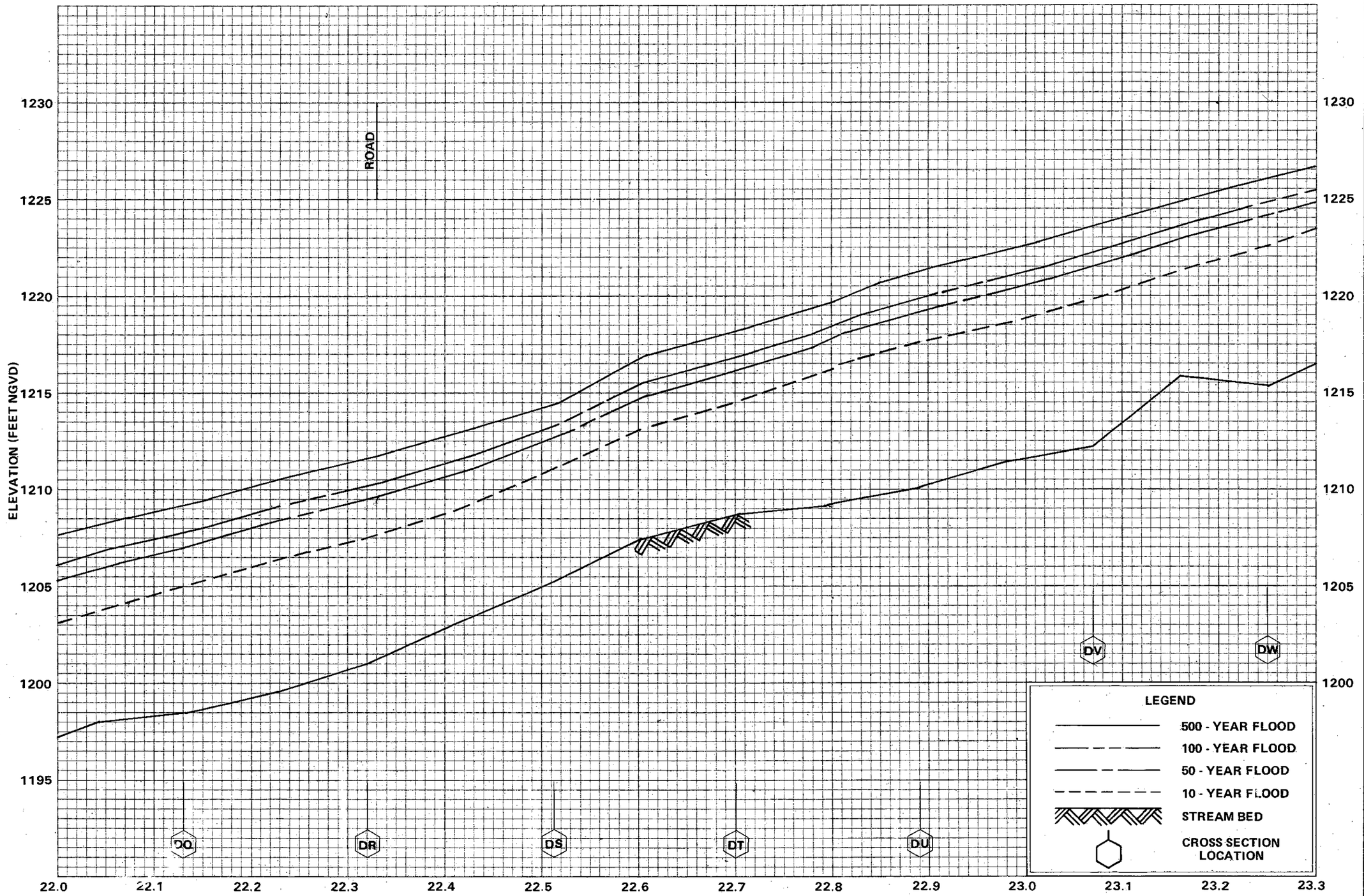


FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS



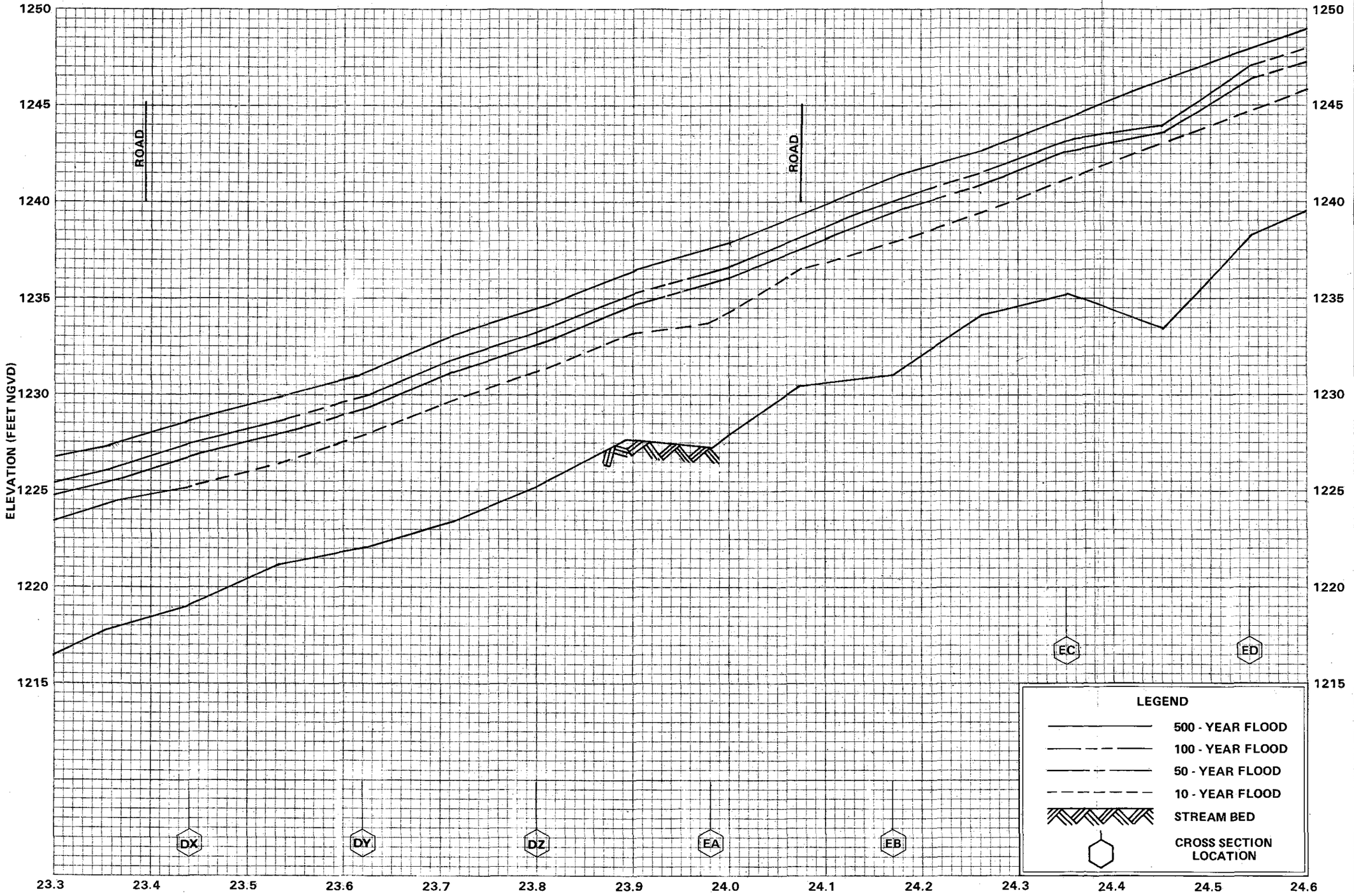
FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

23P



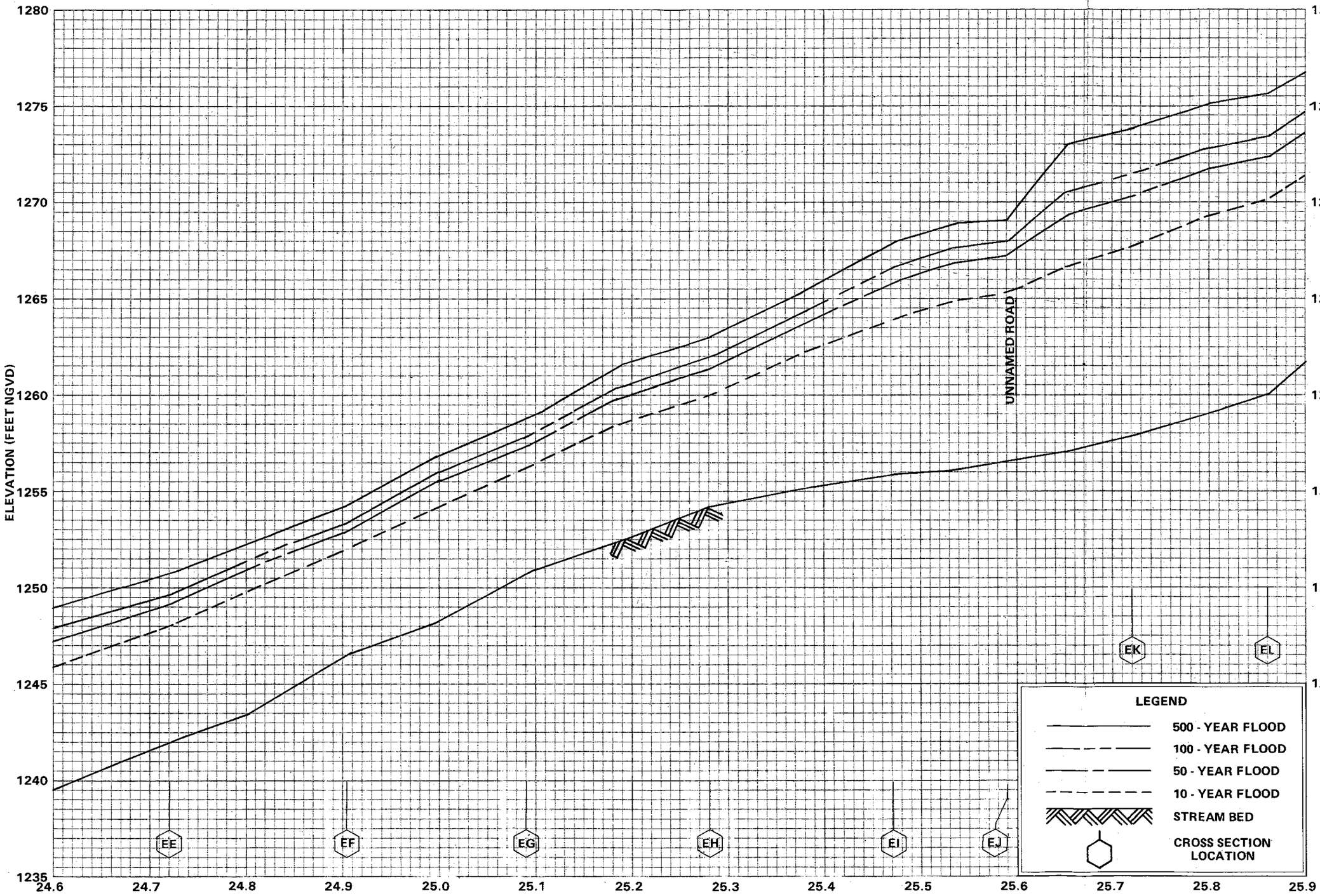
FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

24P



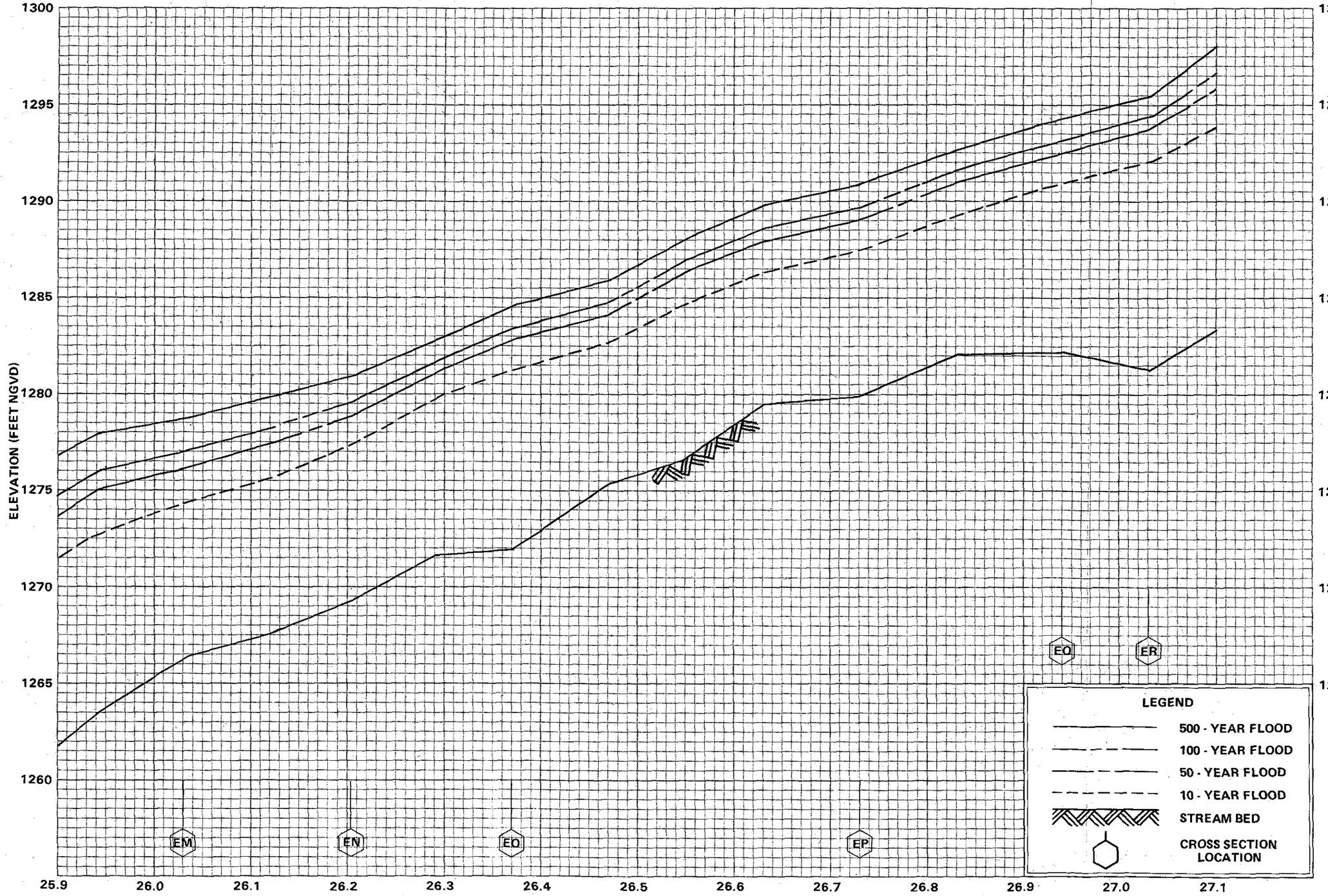
FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

25P



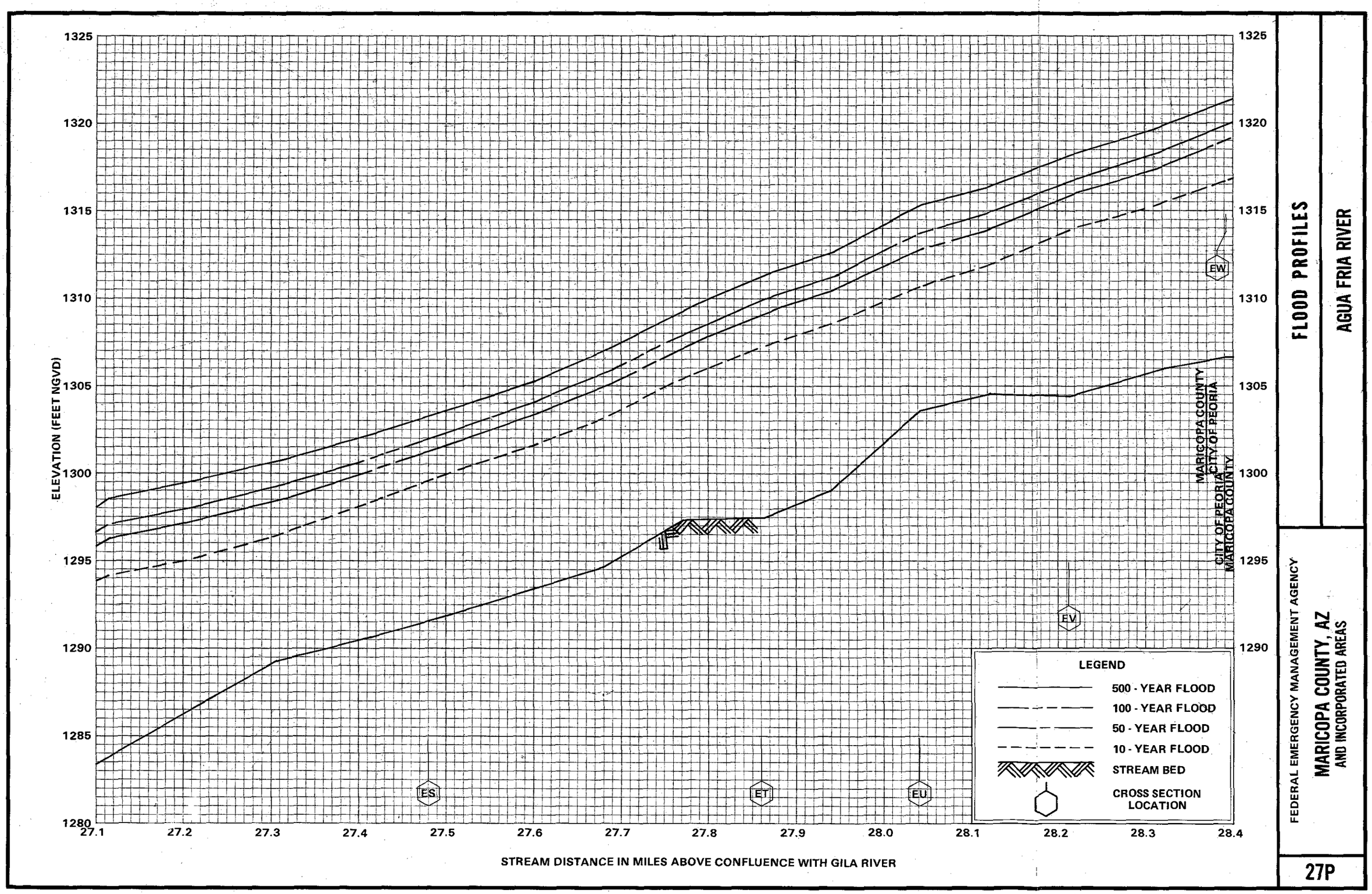
FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

26P



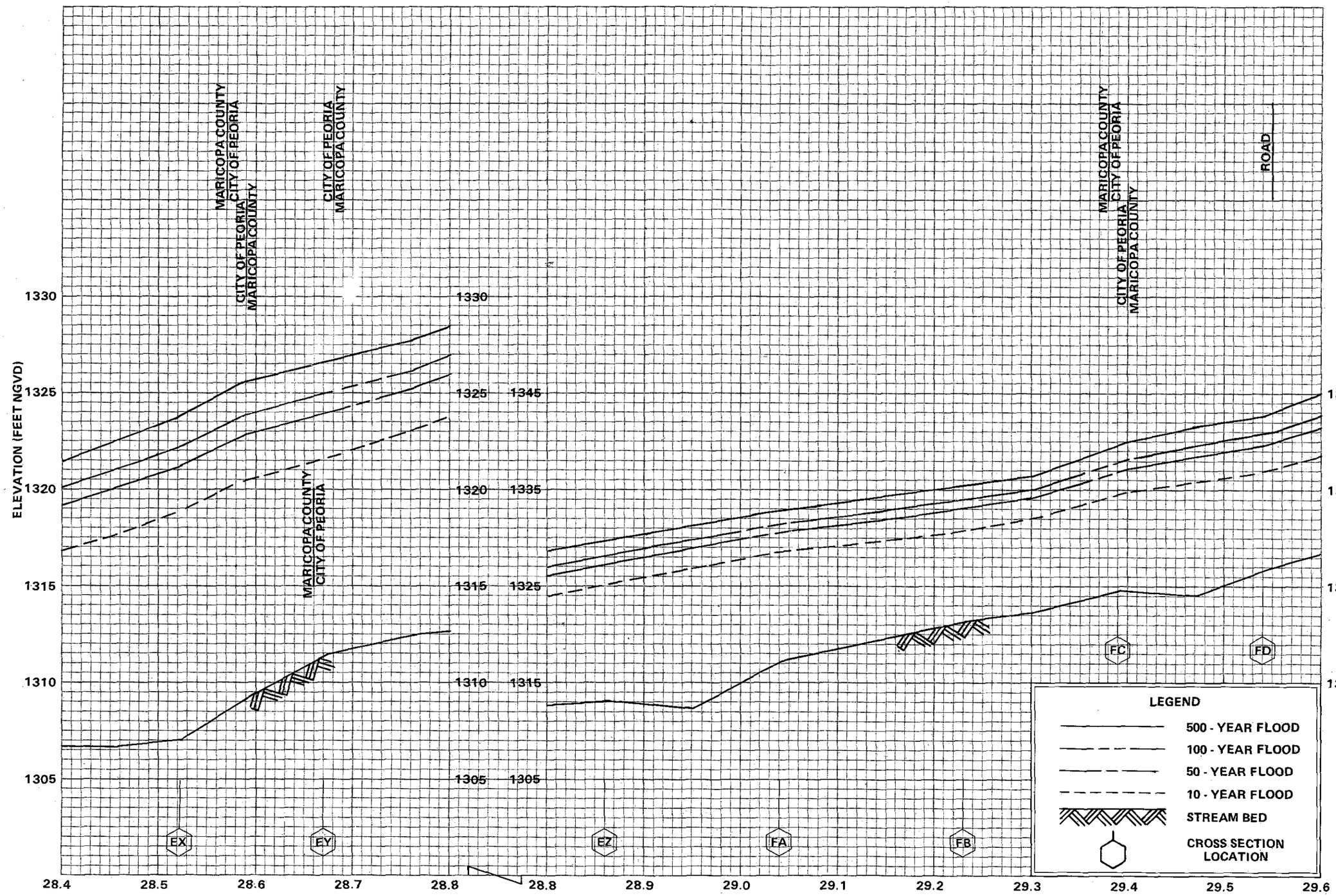
FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

27P



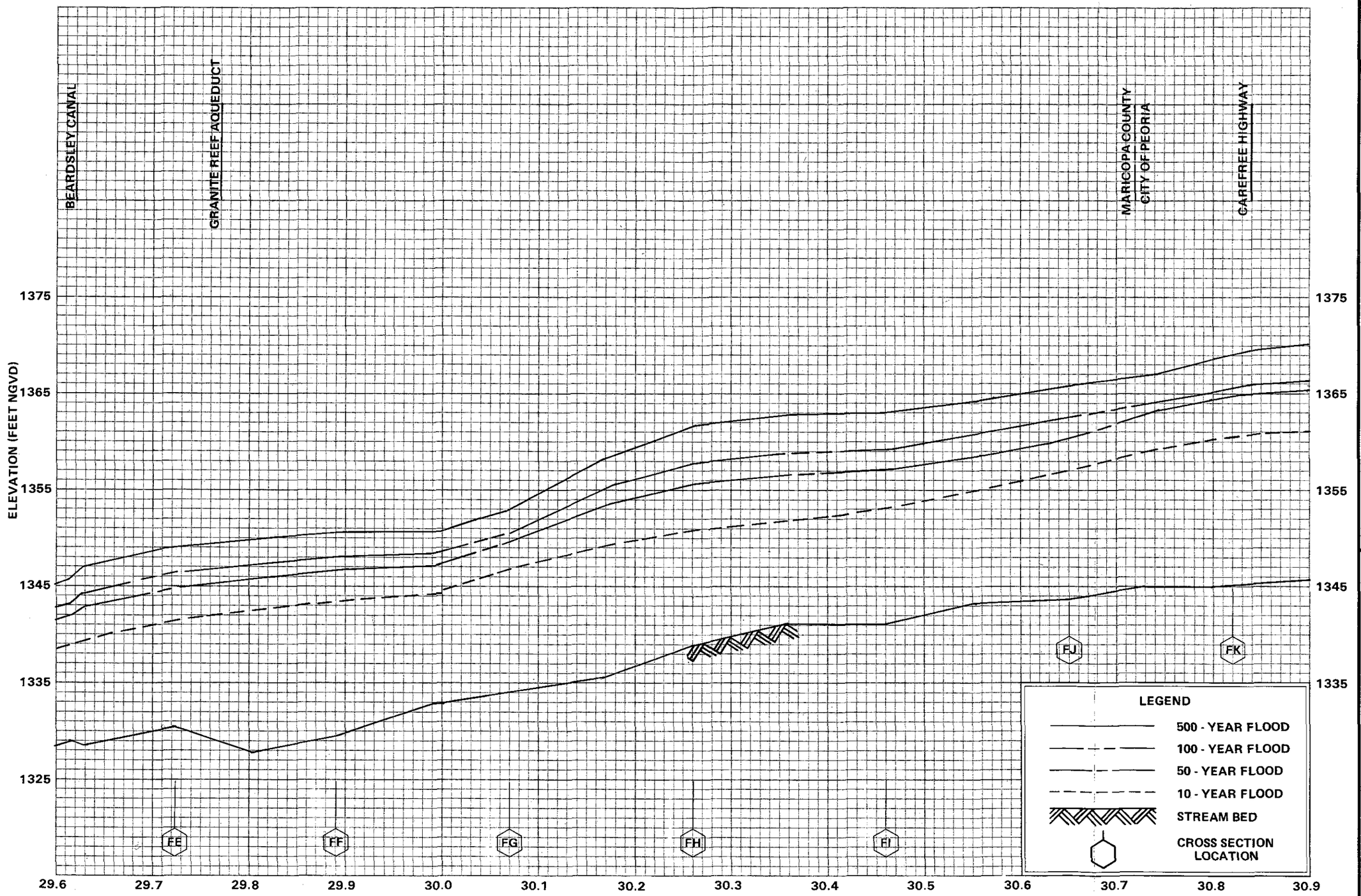
FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

28P

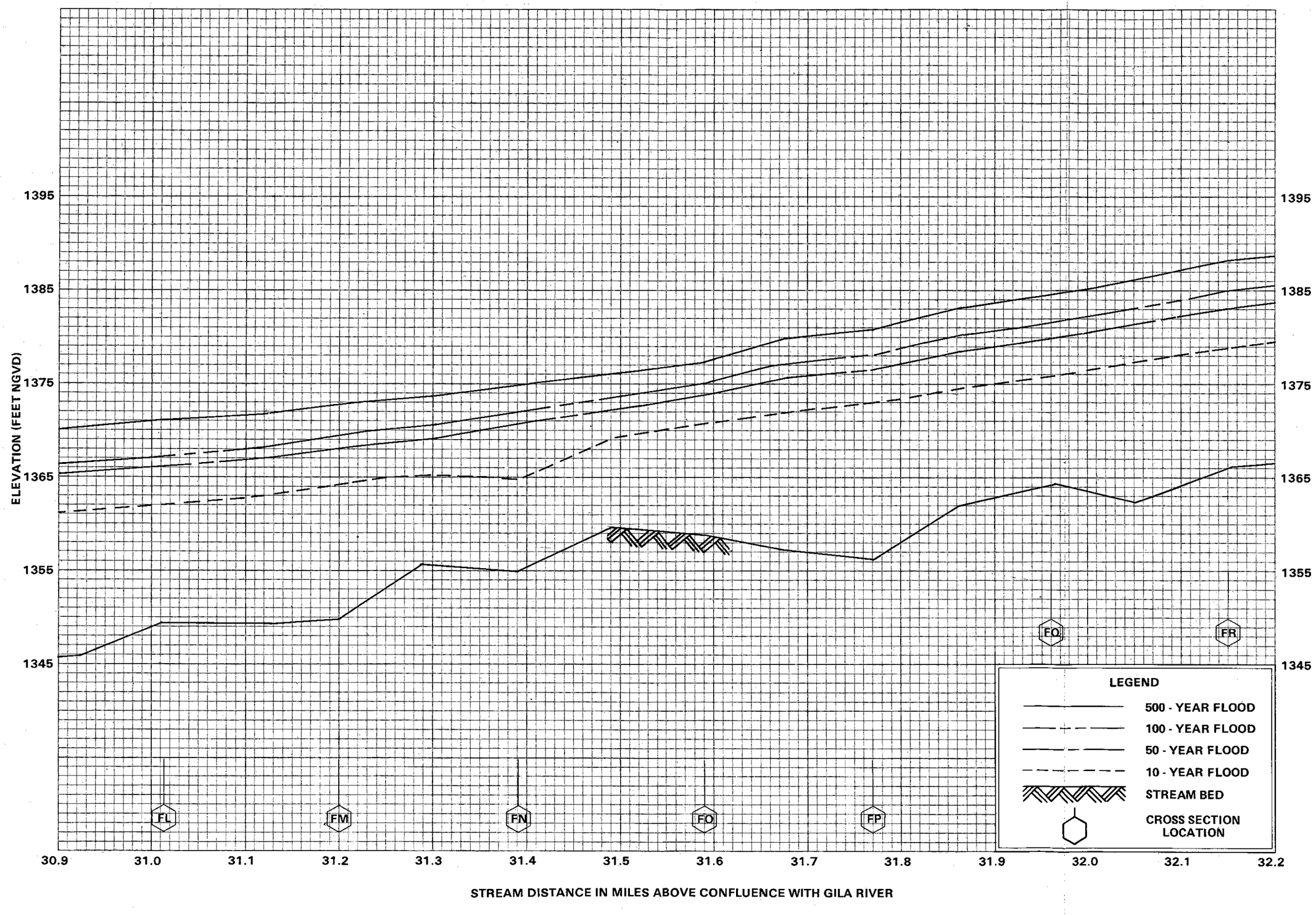


FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

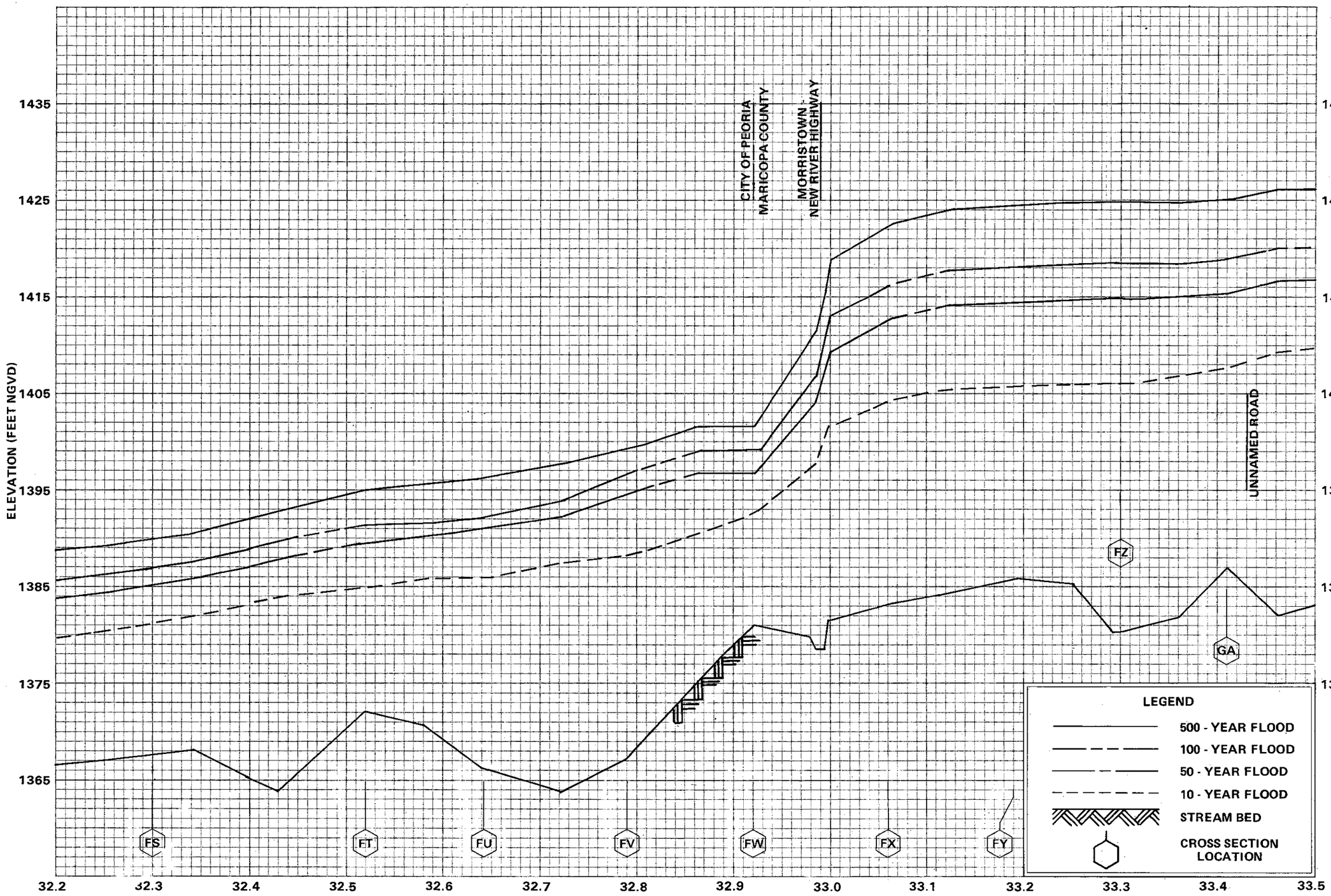


FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS



FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

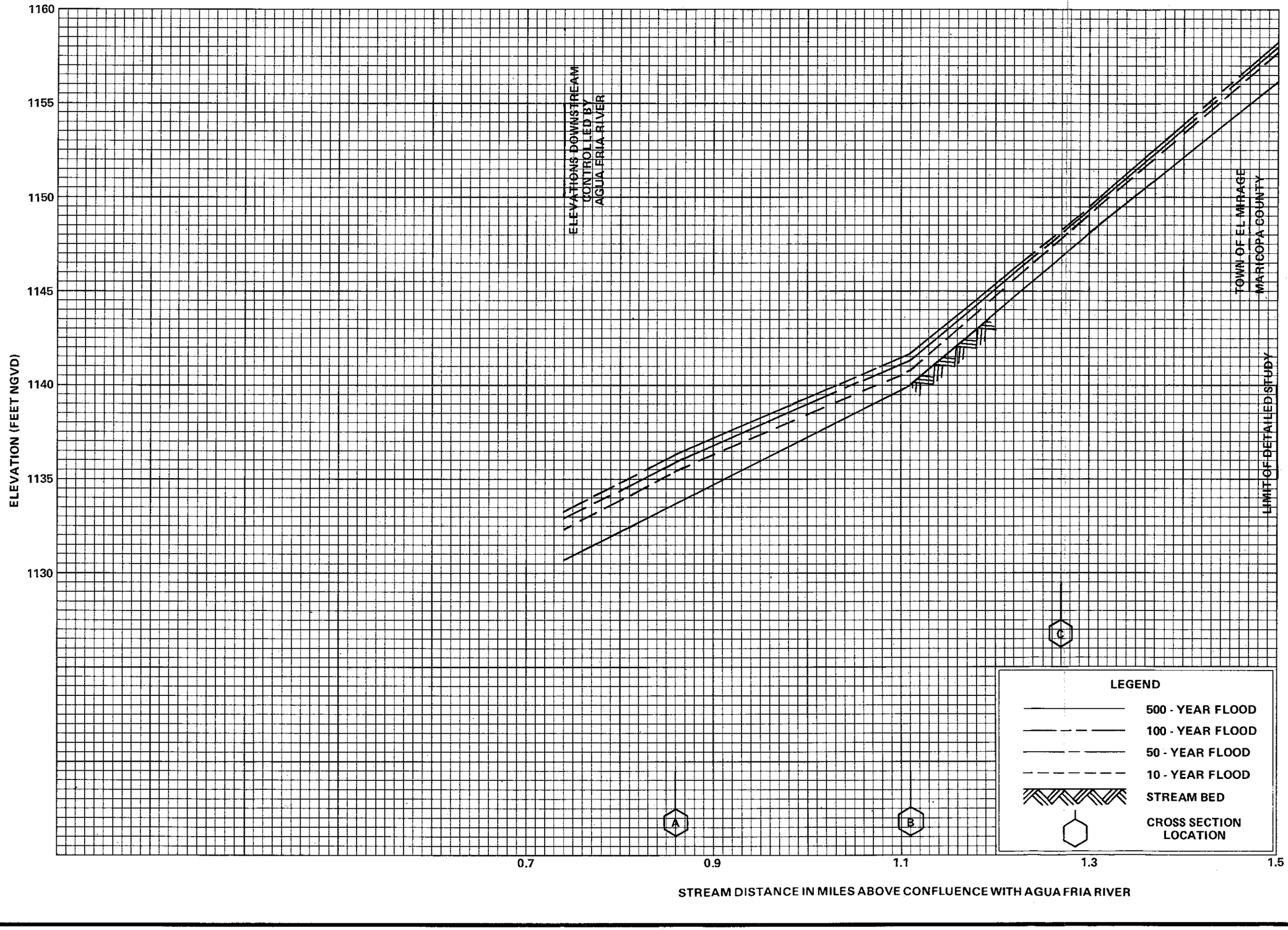
140153

FLOOD PROFILES

AGUA FRIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

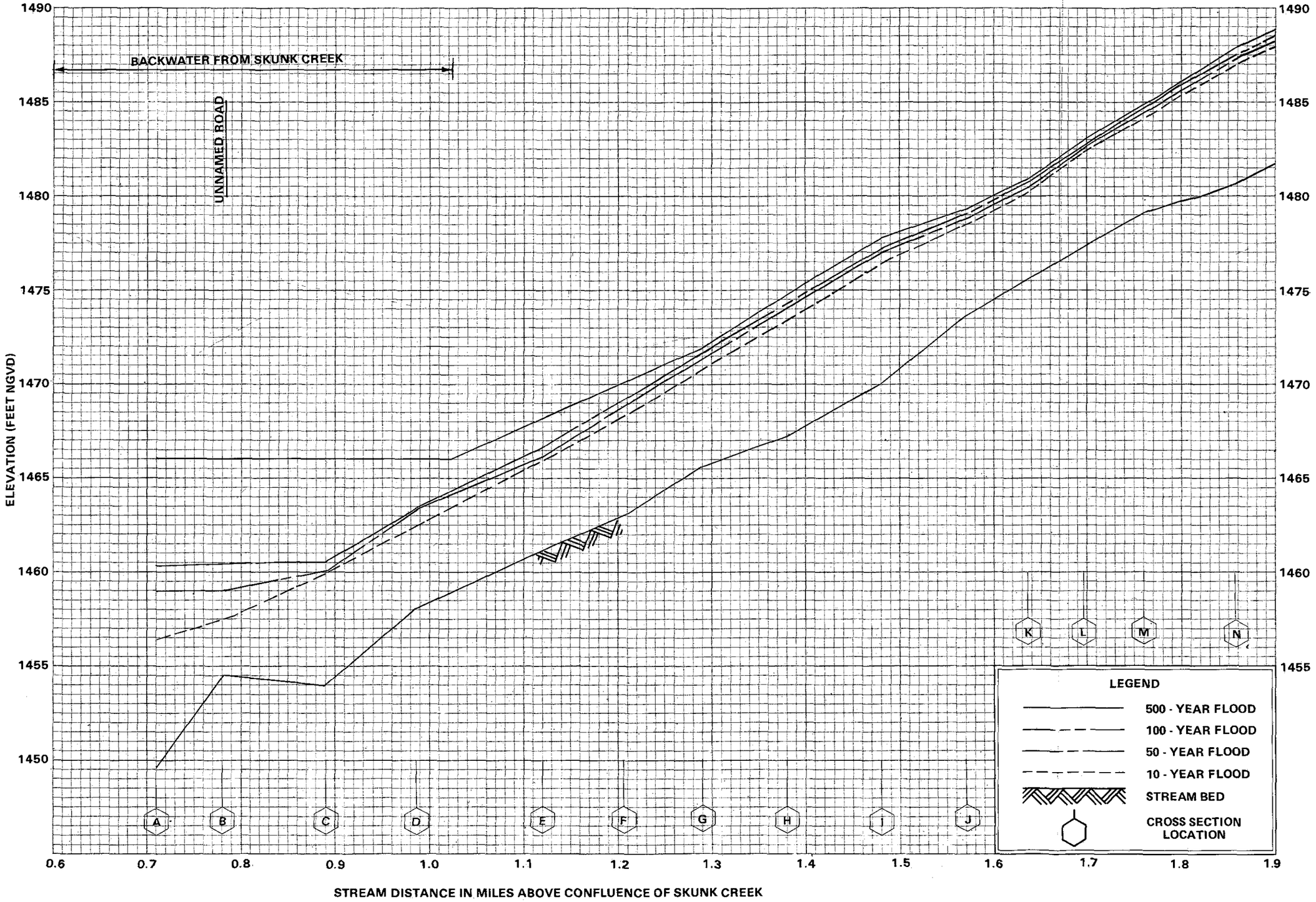


FLOOD PROFILES

ATCHISON TOPEKA & SANTA FE RAILWAY CHANNEL
(AT EL MIRAGE)

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

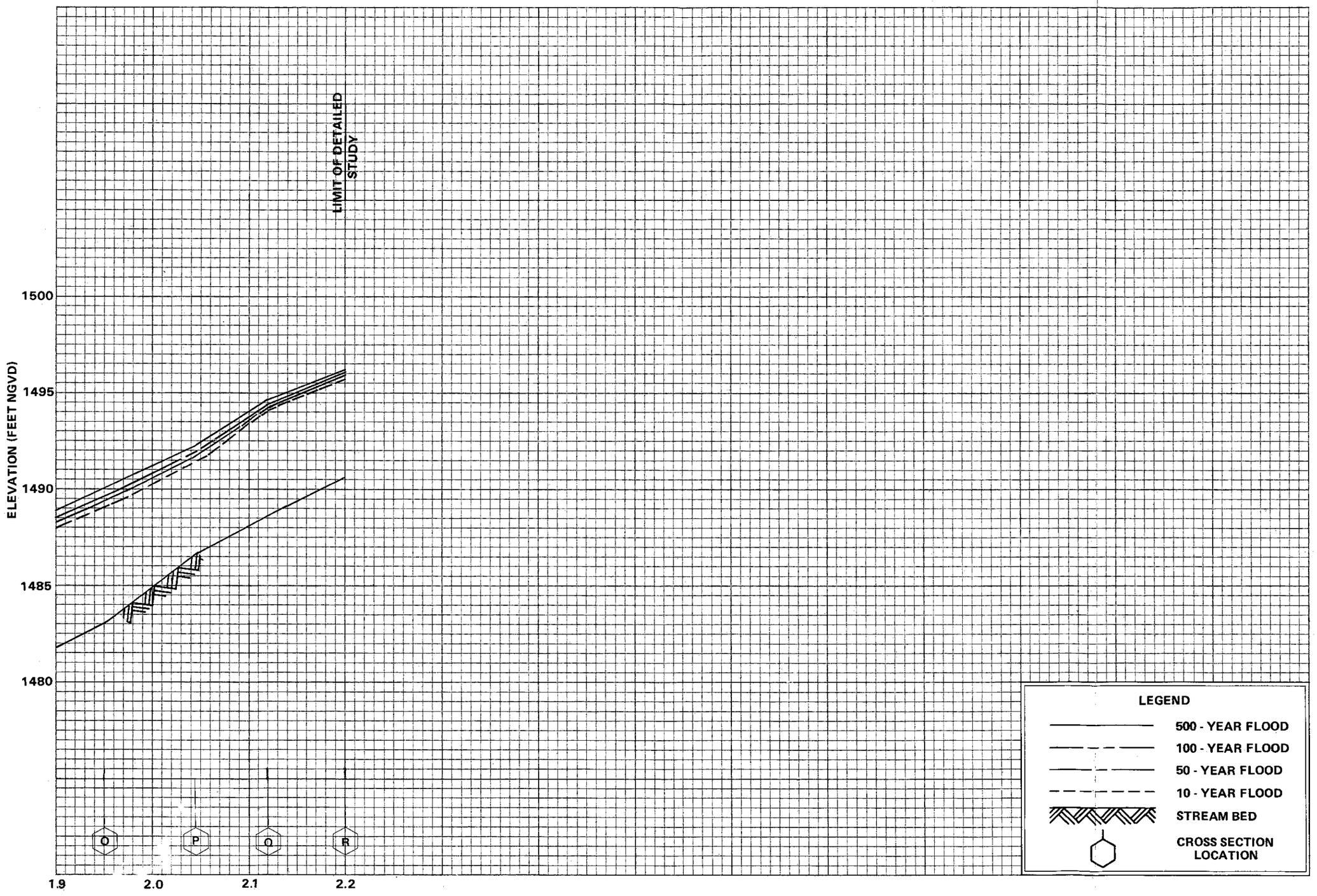


FLOOD PROFILES

BUCHANAN WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

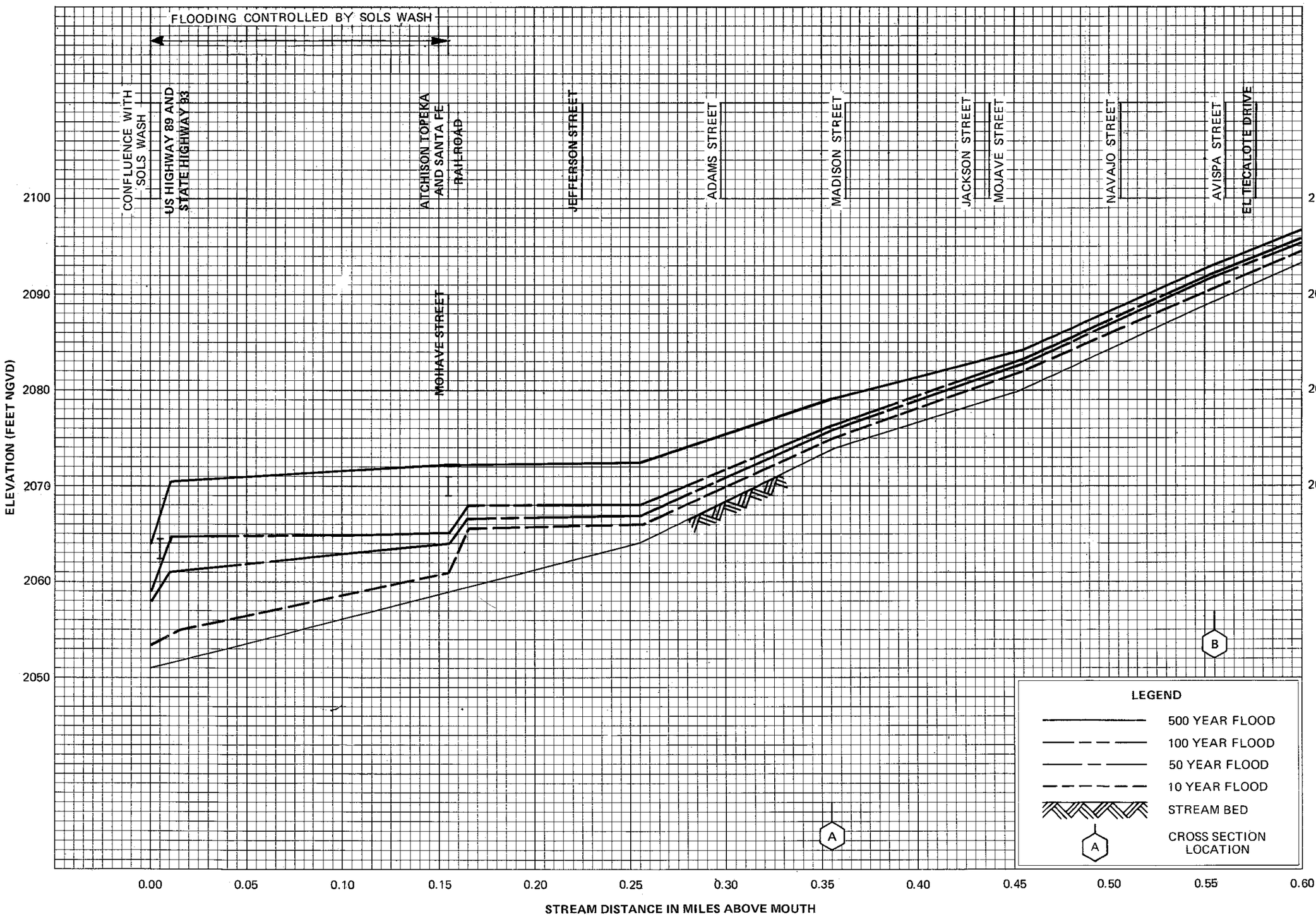


FLOOD PROFILES

BUCHANAN WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS



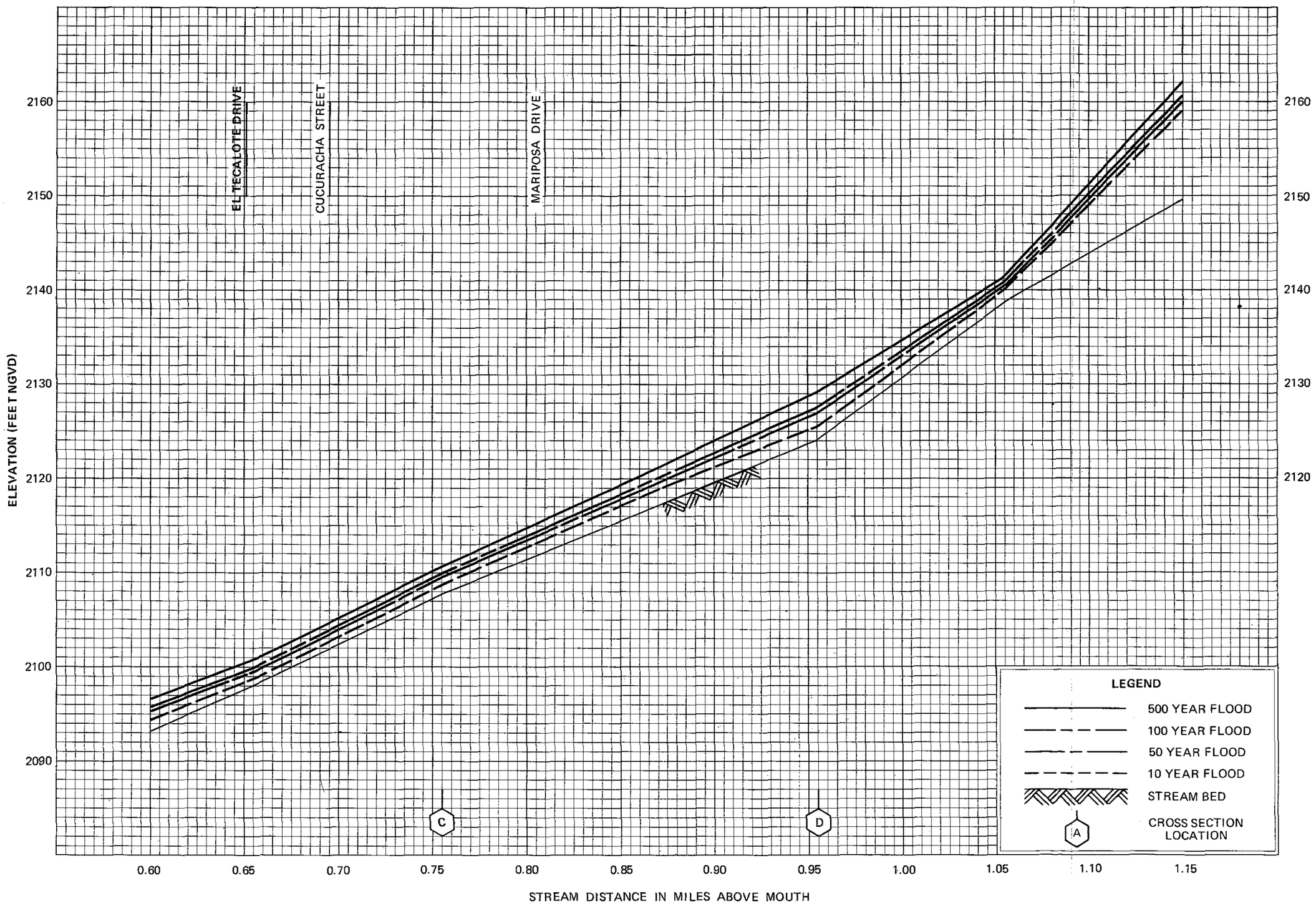
FLOOD PROFILES

CASANDRO WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

37P

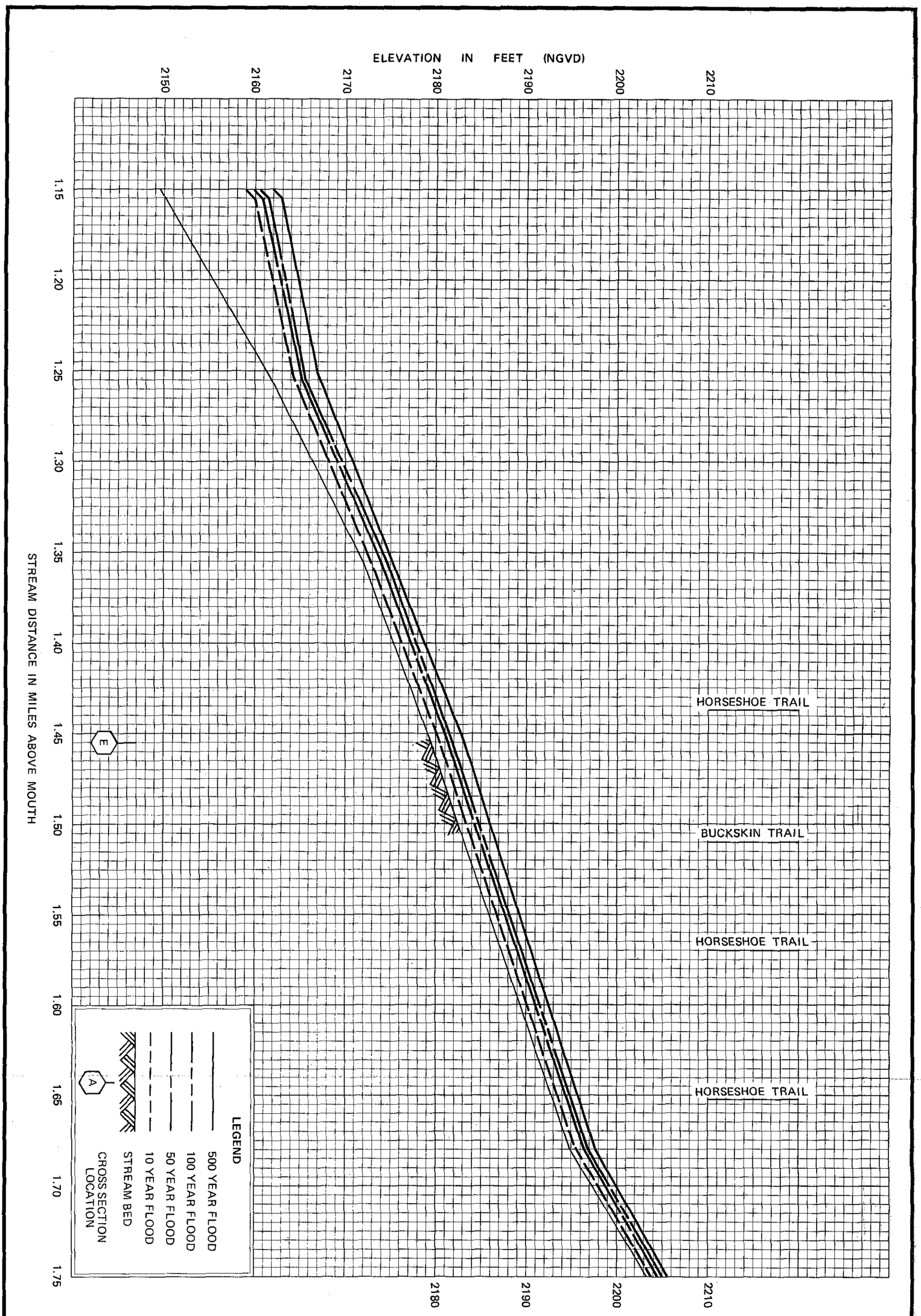


FLOOD PROFILES

CASANDRO WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS



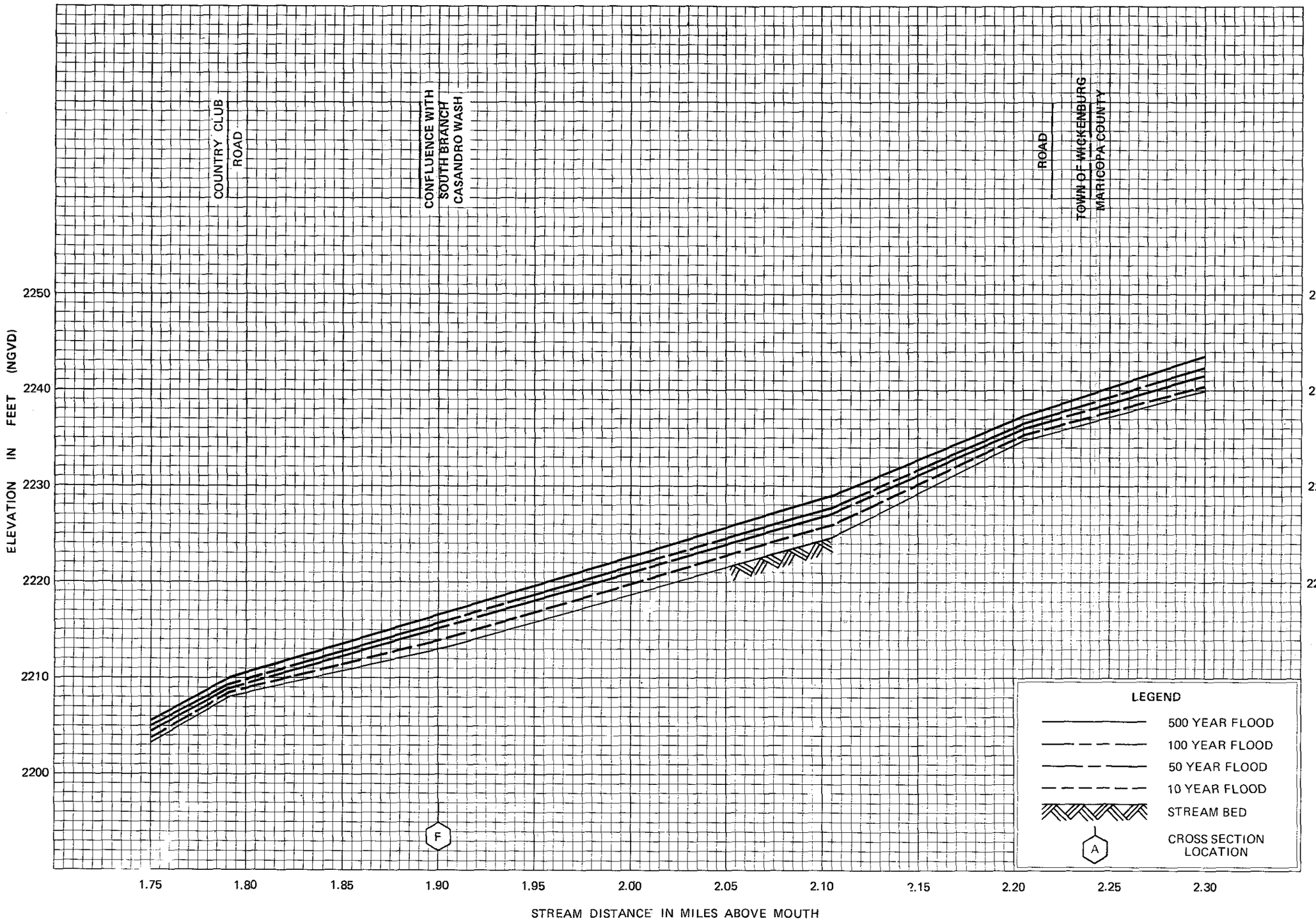
39P

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOOD PROFILES

CASANDRO WASH



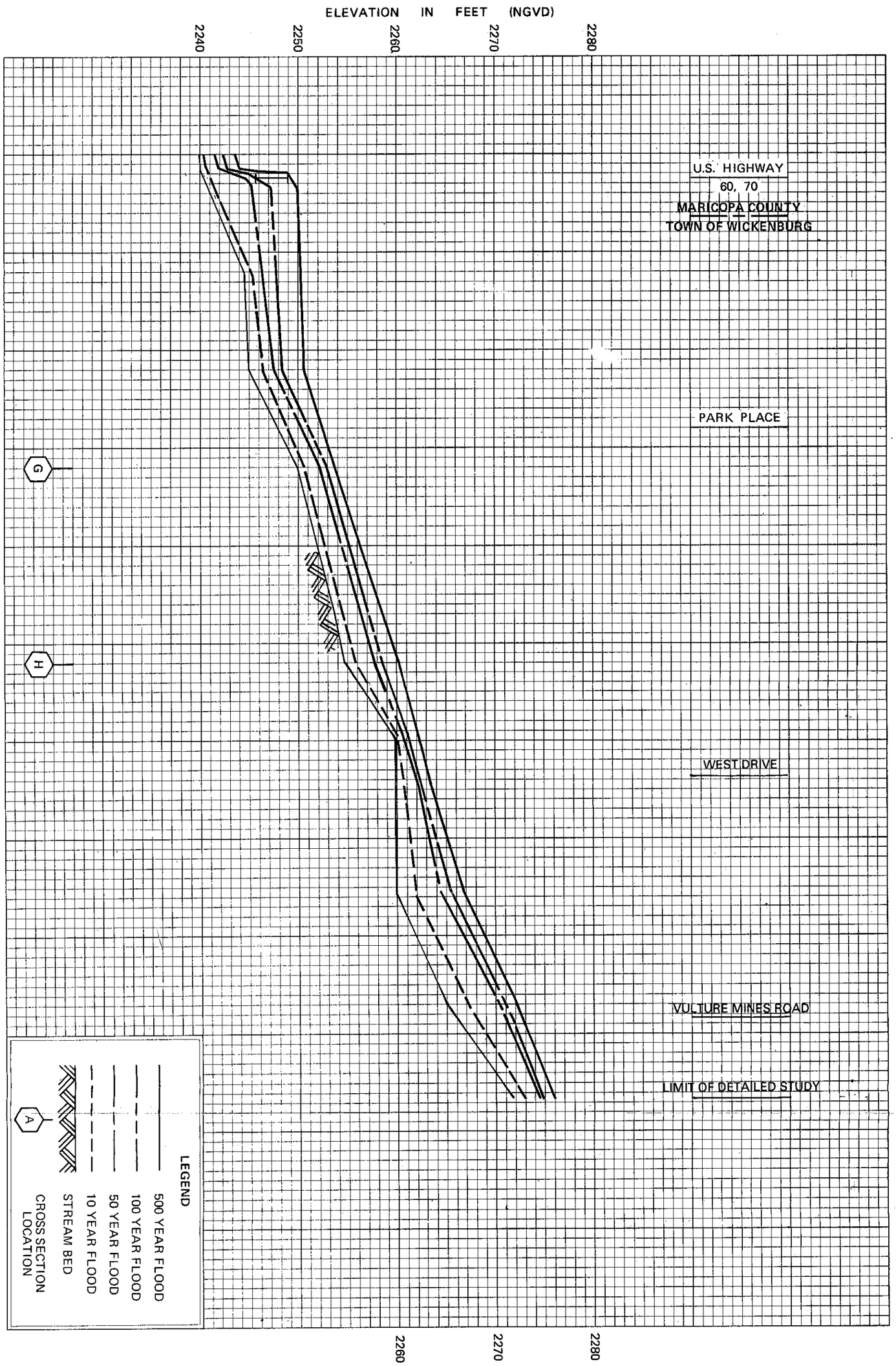
FLOOD PROFILES

CASANDRO WASH

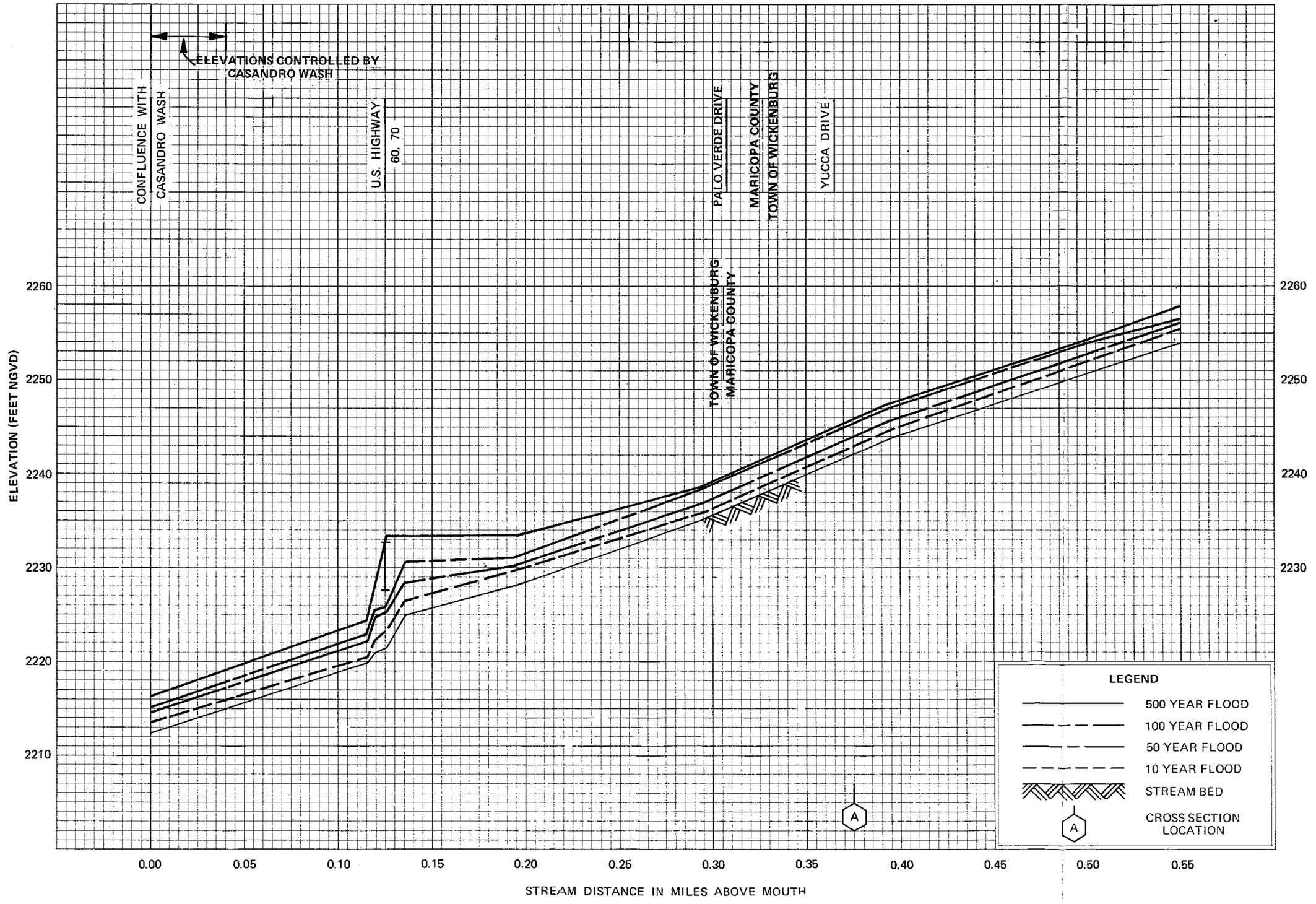
FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

40P



41P	FEDERAL EMERGENCY MANAGEMENT AGENCY MARICOPA COUNTY, AZ AND INCORPORATED AREAS	FLOOD PROFILES CASANDRO WASH

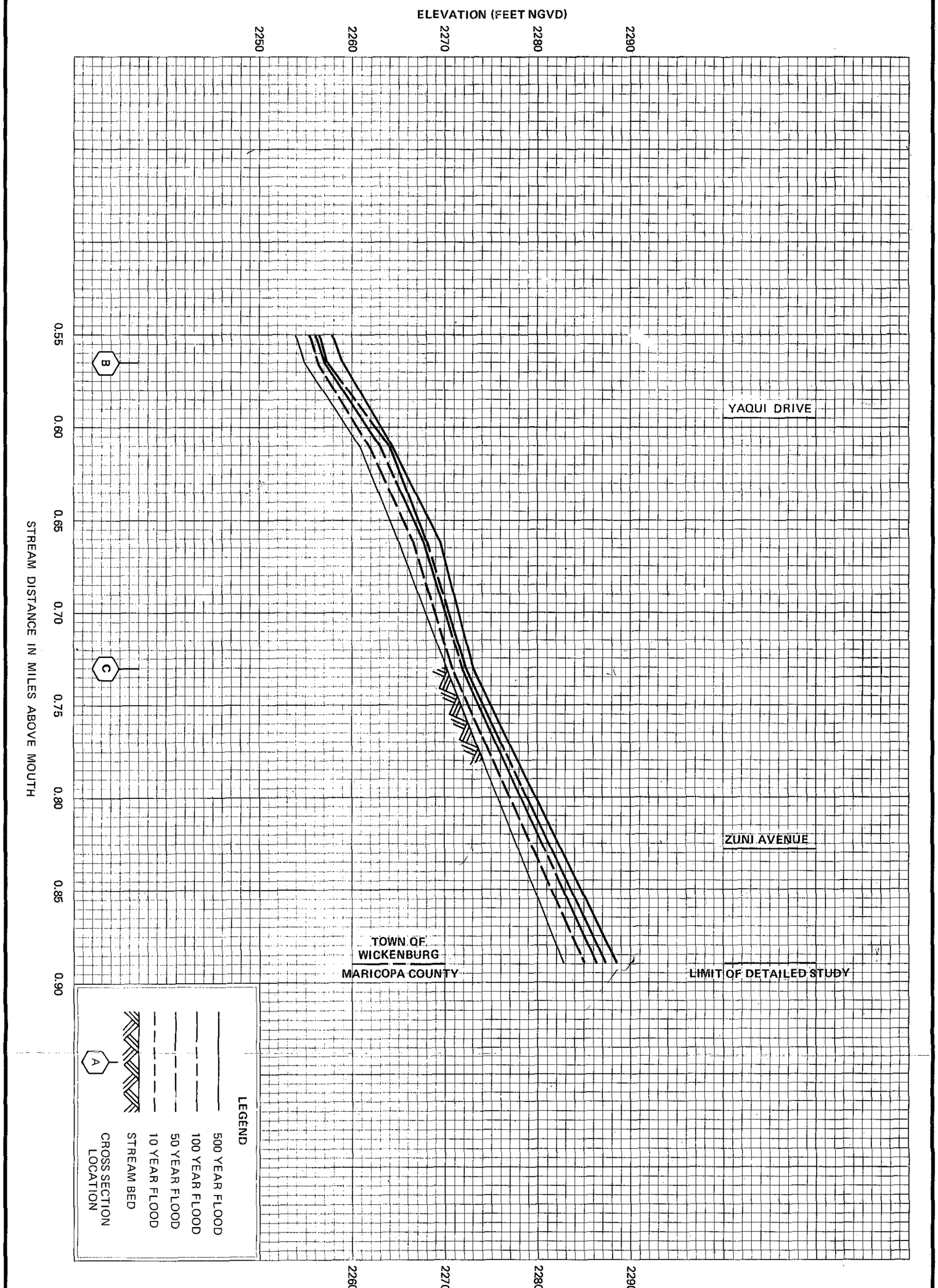


FLOOD PROFILES

SOUTH BRANCH CASANDRO WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS



FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOOD PROFILES

SOUTH BRANCH CASANDRO WASH