FLOOD INSURANCE STUDY

SISKIYOU COUNTY, CALIFORNIA
AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
DORRIS, CITY OF*	060442
DUNSMUIR, CITY OF	060363
ETNA, CITY OF	060364
FORT JONES, TOWN OF	060365
MONTAGUE, CITY OF	060451
MT. SHASTA, CITY OF*	060452
SISKIYOU COUNTY (UNINCORPORATED AREAS)	060362
TULELAKE, CITY OF*	060087
WEED, CITY OF	060649
YREKA, CITY OF	060367

*NON-FLOODPRONE

EFFECTIVE:
JANUARY 19, 2011

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
06093CV000A

NOTICE TO
FLOOD INSURANCE STUDY USERS

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

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

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

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

Initial Countywide FIS Effective Date: January 19, 2011

Revised Countywide FIS Dates:

TABLE OF CONTENTS

TABLE OF CONTENTS – continued

FLOOD INSURANCE STUDY
SISKIYOU COUNTY, CALIFORNIA AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This countywide Flood Insurance Study (FIS) investigates the existence and severity of flood hazards in, or revises and updates previous FISs/Flood Insurance Rate Maps (FIRMs) for the geographic area of Siskiyou County, California, including: the Cities of Dunsmuir, Etna, Montague, Weed, and Yreka; the Town of Fort Jones; and the unincorporated areas of Siskiyou County (hereinafter referred to collectively as Siskiyou County). The Cities of Dorris, Mt. Shasta, and Tule Lake are non-floodprone communities.

This FIS aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This FIS has developed flood risk data for various areas of the county that will be used to establish actuarial flood insurance rates. This information will also be used by Siskiyou County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and will also be used by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

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

1.2 Authority and Acknowledgments

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

This FIS was prepared to include the unincorporated areas of, and incorporated communities within, Siskiyou County in a countywide format. Information on the authority and acknowledgments for each jurisdiction included in this countywide FIS, as compiled from their previously printed FIS reports, is shown below.

Dunsmuir, City of:	the hydrologic and hydraulic analyses from the FIS report dated June 1979 were performed by the U.S. Geological Survey (USGS) for the Federal Insurance Administration (FIA) under Inter-Agency Agreement No. IAA-H-8-76, Project Order No. 7. The work was completed in August 1978.

Etna, City of:	the hydrologic and hydraulic analyses from the FIS report dated September 1979 were performed by the USGS for the FIA under Inter-Agency Agreement No. IAA-H-8-76, Project Order No. 14. The work was completed in August 1978.
Fort Jones, Town of:	the hydrologic and hydraulic analyses from the FIS report dated September 1979 were performed by the USGS for the FIA under Inter-Agency Agreement No. IAA-H-8-76, Project Order No. 14. The work was completed in August 1978.
Montague, City of:	the hydrologic and hydraulic analyses from the FIS dated March 1980 were performed by the USGS for the FIA under Inter-Agency Agreement No. IAA-H-8-76, Project Order No. 14. The work was completed in February 1979.
Siskiyou County (Unincorporated Areas):	the hydrologic and hydraulic analyses for the original study were performed by the USGS, for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. IAA-H-9-77, Project Order No. 7. The work was completed in April 1979. The revised hydrologic and hydraulic analyses for the Klamath River (near the Town of Klamath River), Scott River, and Moffett Creek (near the Town of Fort Jones), and Whitney Creek (near the City of Weed) were performed by CH2M HILL, Inc., for FEMA, under Contract No. EMW-83, C-1172. The work was completed in February 1985. The revised hydrologic and hydraulic analyses was revised to provide detailed mapping along Panther and Squaw Valley Creeks near McCloud. The study area extended from the northern limits of the unincorporated area of McCloud south to Cemetary Road. This work was performed by Northwest Hydraulics Consultants, Inc., for FEMA under Contract No. EMF-2001-CO-0015. The work was completed in October 2004.
Weed, City of:	the hydrologic and hydraulic analyses from the FIS dated July 20, 1981, were performed by the USGS for the FIA under Inter-Agency Agreement No. IAA-H-8-76, Project Order No. 14. The work was completed in February 1979.

Yreka, City of:	the hydrologic and hydraulic analyses from the FIS dated May 18, 1981, were performed by the USGS for the FIA under Inter-Agency Agreement No. IAA-H-8-76, Project Order No. 14. The work was completed in September 1979.

Countywide Analysis

There were no revised hydrologic and hydraulic analyses prepared for this countywide FIS.

Road centerline information shown on this FIRM was provided in digital format by the Siskiyou County Department of Public Works. These data were developed in 2001 using vehicle-mounted sub-meter GPS equipment. Railroad centerlines were derived from 2006 Second Edition TIGER/Line files published by the U.S. Census Bureau.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 10. The horizontal datum was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

1.3 Coordination

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

The dates of the initial and final CCO meetings held for Siskiyou County and the incorporated communities within its boundaries are shown in Table 1, "Initial and Final CCO Meetings."

TABLE 1 - INITIAL AND FINAL CCO MEETINGS

Community	For FIS Dated	Intermediate CCO Date	Initial CCO Date	Final CCO Date
Dunsmuir, City of	June 1979	July 26, 1978	April 1975	November 20, 1978
Etna, City of	September 1979	July 26, 1978	April 1975	November 21, 1978

TABLE 1 - INITIAL AND FINAL CCO MEETINGS - continued

Community	For FIS Dated	Intermediate CCO Date	Initial CCO Date	Final CCO Date
Fort Jones, Town of	October 1979	July 26, 1978	April 1975	November 21, 1978
Montague, City of	March 1980	January 18, 1979	April 1975	August 22, 1979
Siskiyou County (Unincorporated Areas)	May 17, 1982	April 24, 1975 August 21, 1979	March 17, 1975	November 12, 1980
	May 19, 1987	*	April 18, 1983	May 29, 1986
Weed, City of	July 20, 1981	January 1979	April 1975	December 13, 1979
Yreka, City of	May 18, 1981	August 22, 1979	April 1975	November 13, 1980

*Data not available

For this countywide FIS, final CCO meetings were held July 5, 2009. These meetings were attended by representatives of the study contractors, the communities, the California Department of Water Resources, and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Siskiyou County, California.

All or portions of the following flooding sources were studied by detailed methods. Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2).

Boles Creek	Moffett Creek
Cottonwood Creek	Oregon Slough
Greenhorn Creek	Sacramento River
Humbug Gulch	Scott River
Indian Creek	Shasta River
Johnson Creek	Squaw Valley Creek
Klamath River	Yreka Creek

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

Etna Creek, Panther Creek, Panther Creek Overflow, and Whitney Creek are either areas of ponding (Zone AH) or sheet flow on sloping terrain (Zone AO).

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

2.2 Community Description

Siskiyou County, one of the three northernmost counties in California, borders Oregon for approximately 110 miles. The westernmost county limits are approximately 25 miles from the Pacific coast. The county is approximately 70 miles across in the north-south direction, and its area is 6,281 square miles. According to the U.S. Census Bureau, Siskiyou County has a July, 2008 population of 44,542. The City of Yreka is the largest city and the county seat.

The economy of Siskiyou County is based principally on livestock and crops, timber and mineral production, and associated industries. In addition, various historical and recreational attractions are significant to the economy of the county.

In the rugged western portion of Siskiyou County, mountains rise to elevations of 7,000 feet or more and canyons descend to elevations of less than 1,000 feet. The eastern portion of the county is essentially a 3,000- to 4,500-foot plateau, out of which rise several mountain ranges having peaks of 8,000 feet or more. Among these is Mt. Shasta, whose peak is at an elevation of 14,162 feet (U.S. Department of Commerce, 1965).

The climate of the county varies according to elevation and location. Valley areas have hot summers (over 100°F) and relatively mild winters, while the summers become cooler and winters colder at higher elevations. Generally, precipitation in the county decreases from west to east and also from higher to lower elevations. The total seasonal precipitation received within the county varies from approximately 10 inches in the northeastern corner to 100 inches or more along the northern part of the western border. The western one-quarter of the county normally receives from 40 to 60 inches of precipitation per year annually at higher elevations. The central one-half of the county receives from 12 to 20 inches of precipitation below 4,000 feet, and up to 60 inches in the mountains and along the extreme southern border. The southeastern one-quarter of the county receives 40 to 50 inches of precipitation over some of the mountains, and even more on Mt. Shasta, while stations on the 4,500-foot plateau receive only 10 to 20 inches of precipitation per year (U.S. Department of Commerce, 1965).

The Sacramento River flow southerly through the City of Dunsmuir in southern Siskiyou County. Development in the floodplain is residential, with trailer parks bordering the city. Development decreases south of the incorporated area. Small areas in the southern part of the county drain into the Sacramento River, one of the major watercourses in the county.

Soils in the upland regions of the Dunsmuir area have high runoff potential. The lowlands consist of alluvial soils associated with pastureland. The majority of forested areas are in the upland regions.

The Shasta River flows northerly through the Edgewood area in the south-central portion of the county. The floodplain is undeveloped. Soils in this area of the Shasta River valley consist of two major series, Settlemeyer and Gazelle. Settlemeyer soils are poorly drained with profiles of stratified loam, silt loam, and sandy clay loam. The surface layer is calcareous and moderately alkaline. Gazelle soils are moderately deep, nearly level, saline-alkali, and very poorly drained silt soils. These soils are formed in medium-textured alluvium from mixed rock sources. Gazelle soils have a strongly and moderately alkaline, saline-alkali silt loam profile underlain by a calcium and silica-cemented hardpan. Slopes in this vicinity range from 0 to 5 percent (U.S. Department of Agriculture, 1978).

The Edgewood area is a grassland plant community. The indicator plant species are wild oats, foxtail brome, Italian ryegrass, creeping bentgrass, grass-nut brodiceae, six-weeks fescue, yellow mustard, redstem filigree, California-poppy, and buttercup. Riparian vegetation includes digger pine, live oak, poison oak, and a variety of sparse brushes (V. Brown and D. Hoover, 1967).

Cottonwood Creek flows southerly through the community of Hornbrook in northern Siskiyou County. There is limited residential development in the floodplain, with several sawmills in the area. Soils here are, in general, very similar to those in the foothills of the Cascade Range, which include three major series: Lassen, Kuck, and Mary. These soils are moderately deep, gently sloping, well-drained clay, cobbly clay, stoney clay, clay loam, stoney clay loam, and stoney loam soils formed on foothills located in the lower elevations of the southern Siskiyou Mountains. The indicator plant species in this community includes a variety of oaks, digger pine, poison oak, bracken fern, and natural pasture grasses. Some of the lesser sloping areas are used as cultivated and non-cultivated croplands (V. Brown and D. Hoover, 1967).

Indian Creek flows southerly through the Happy Camp area in northwestern Siskiyou County to its confluence with the Klamath River. The central and western portions of the county drain into the Klamath River, a major watercourse in the county that flows westerly and southerly. Floodplain development consists of residential structures and several small business establishments. The Klamath River flows westerly into the Seiad Valley area, where there are scattered homes along the river and alone Seiad Creek, a tributary that flows southerly into the Klamath River.

Oregon Slough flows westward along the northern limit of Montague. Boles Creek, North Fork Boles Creek, and Beaughton Creek flow northwestward through Week to their confluence with the Shasta River near Edgewood.

In general, soils in this area include three major series: Marpa, Kinkel, and Boomer. Marpa soils are moderately deep with gravelly loam surface layers and subsoils that are gravelly, sandy clay loam underlain by fractured shale parent materials. Kinkel soils are very deep with gravelly loam and very gravelly loam surface layers and subsoils. Boomer soils are deep with loam surface layers and clay loam subsoils underlain by metamorphic rock parent materials (U.S. Department of Agriculture, 1978).

The Happy Camp area lies in the Pacific Coast Coniferous Forest plant community. The indicator plant species in this community are coastal redwood, Douglas fir, tan oak, madrone, black huckleberry, sword fern, redwood sorrel, and star flower. The lower valley portions of this area support some pasture grasses and associated bushier vegetation (V. Brown and D. Hoover, 1967).

Yreka Creek flows northeasterly through the City of Yreka to its confluence with the Shasta River, in central Siskiyou County. Humbug Gulch and Greenhorn Creek join Yreka Creek from the west. Johnson Creek and Etna Creek flow northeasterly and border the City of Etna, in the central portion of the county, and border the City of Etna, in the central portion of the county, is bordered by Johnson Creek to the north, and Etna Creek to the south, which flow northeasterly. Moffett Creek flows southwesterly along the northwestern corporate limits of the Town of Fort Jones, in central Siskiyou County. The Scott River flows northwesterly in the vicinity of For Jones. County land is affected by flooding in these areas. There is sparse floodplain development on county land surrounding the cities. However, residential and commercial development can be found in the floodplain as the incorporated areas are approached.

The unincorporated area of McCloud is located in a small valley on the southern margin of Mt. Shasta, a Cascade Range volcano, at an elevation of about 3,300 feet. Panther and Squaw Valley Creeks flow into the McCloud area. Panther Creek enters the valley from the northwest side, and has formed a small alluvial fan as it exits from a confined channel. The Panther Creek channel decreases in size to a small drainage ditch through the urbanized portion of McCloud. Squaw Valley Creek enters the valley from the northeast side, and is perched along the eastern boundary of the study area.

There are no major streams in eastern Siskiyou County. Most of the streams in this area are temporal, flowing only during the winter and spring.

2.3 Principal Flood Problems

Frontal-type storms with freezing levels generally above 7,000 feet cause heavy rainfall over large areas of the county. These flood producing storms occur between October and March.

According to newspaper articles in the Siskiyou Daily News and the Yreka Journal, flooding in Siskiyou County occurred in 1852, 1861, 1862, 1864, 1867, 1875, 1881, 1890 (several times), 1904, 1926, 1927, 1955, 1964, 1970, and 1974

(U.S. Department of the Interior, 1939). Frequencies cannot be determined for most of these events, although the floods of 1861 and 1890 were probably the highest known for the period from 1861 to 1927. The flooding in 1964 was the most serious since 1861 and 1890 in many areas of the county. Along the Klamath River, the flood of 1964 caused considerable damage by washing away bridges and flooding structures in the communities of Happy Camp and Seiad Valley. In 1974, flooding in south-central Siskiyou County along the Sacramento River near Dunsmuir, the East Fork Scott River near Callahan, and Moffett Creek near Fort Jones, also caused damage to roads, bridges, and structures. Historical flooding and subsequent damage in Edgewood and Seiad Valley and the Cities of Dunsmuir, Etna, Edgewood, Fort Jones, Yreka, and the surrounding county land has largely been due to shallow-flooding events. Table 2 gives approximate frequencies for the floods of 1964 and 1974 on selected streams.

TABLE 2 – APPROXIMATE FREQUENCIES FOR FLOODS OF 1964 AND 1974 ON SELECTED STREAMS IN SISKIYOU COUNTY

		Flood Frequency	
Stream	Location	1964	1974
Cottonwood Creek	Hornbrook	25-Year	*
East Fork Scott River	Callahan	25-Year	75-Year
Etna Creek	City of Etna	50-Year	30-Year
Indian Creek	Happy Camp	100-Year	20-Year
Klamath River	Seiad Valley	100-Year	25-Year
Moffett Creek	Town of Fort Jones	*	50-Year
Sacramento River	City of Dunsmuir	15-Year	50-Year
Salmon River	Somes Bar	100-Year	20-Year
Scott River	Town of Fort Jones	75-Year	25-Year
Shasta River	Edgewood	50-Year	*

*Data not available

Whitney Creek flooding is due to an anomalous event where a high-intensity thunderstorm occurs on the northwestern side of Mt. Shasta in the Bolam and Whitney Glacier area. The extremely steep slopes and limited perviousness of the glaciers cause the runoff to be rapidly translated into a flash flood (debris flow), which carries debris onto the alluvial fan below U.S. Highway 97. Historically, flows have covered the highway and completely plugged the undercrossing. Because of the limited data available, flood frequencies have not been established for these events. The capacity of the U.S. Highway 97 culvert crossing has been estimated by the California Department of Transportation at 3,000 cubic feet per second (cfs) for the 100-year event. This flow can be approximately generated by applying the 100-year thunderstorm event to the glacial area, assuming a minimal infiltration rate and a 25-percent attenuation factor from an elevation of 8,000 feet to the Highway 97 crossing at an elevation of 3,700 feet.

A significant flood event occurred in the unincorporated areas of the McCloud study area between December 29, 1996, and January 1, 1997. Over 11 inches of precipitation fell on a deep existing snow pack triggering flooding of Panther and Squaw Valley Creeks. Anecdotal evidence suggests that flooding in town was the worst to occur in over 50 years and was mainly due to the rain-on-snow effects that caused substantial snow pack runoff. The hydraulic response of the two streams to this event was distinctly different: Panther Creek experienced flows heavily laden with sediment, while Squaw Valley Creek experienced relatively clear flows and transport of woody debris.

In the City of Dunsmuir, the six largest floods on the upper Sacramento River since 1911, in decreasing order of magnitude, occurred in January 1974, February 1940, January 1914, December 1964, March 1916, and December 1955. The flood of January 16, 1974, was estimated to have a peak discharge of 21,000 cfs at Dunsmuir. The estimated discharge, based on high-water marks surveyed in 1977, was determined to have a recurrence interval of approximately 50 years. The flood of December 1964 was estimated to have a peak discharge of 14,000 cfs and a recurrence interval of approximately 15 years. Damages in the City of Dunsmuir area from the flood of 1974 were estimated to be $4.2 million, with 25 homes destroyed ("Dunsmuir Flood Damages," 1974), or approximately 25 cfs per square mile of drainage area.

In 1974, the bridge connecting Scherrer Avenue and South First Street constricted the flow from the Sacramento River, causing an increase in water-surface elevation of approximately 3 feet immediately upstream of the bridge. The backwater effect only extended a short distance upstream because of the steep channel slope.

An unnamed creek that enters the City of Dunsmuir near the corner of Oak Street and Elinore Way has overflowed and caused widespread shallow flooding of streets and street-level homes. The drainage area of this creek is small, but the floodwaters have high velocities (approximately 15 to 20 feet per second) due to the steep slopes (a 50-foot drop along 400 feet of Oak Street). The flow paths are unpredictable due to the street pattern and topography.

In the City of Etna, substantial flooding occurred along Etna Creek in 1955, 1964, and 1974. The largest of these floods occurred in December 1964 and has a recurrence interval of 50 years (USACE, 1966). The flood of January 1974 has an estimated recurrence interval of 30 years, based on flow records for the Scott River near Fort Jones.

The principal flood problem on Etna Creek has been that, although the main channel capacity is large, it has been blocked by natural dams, shifting most of the flow out onto the floodplain. The damming is caused by debris lodging in the channel, followed by buildup of cobbles and gravel. The main channel of Etna Creek has been cleared of debris, gravel and rockfill, and vegetation after each of the three recent major floods. The main channel area that is available is adequate to carry floodflows with little damage, but local residents feel that the problem of the past is likely to occur again.

The overbank flow is principally on the left-bank floodplain between Etna Creek and the low bluff where the majority of the city is located. The overflow follows a variable course, dependent on the location of vegetation and obstructions. During the past floods, efforts have been made to direct Etna Creek overflow back into its main channel by using heavy earthmoving equipment to build levees of river rock and gravel (U.S. Department of Agriculture, 1971). These efforts have not been successful in the past, so it is unlikely that work during a 1-percent annual chance (100-year) flood would be of much benefit.

In the Town of Fort Jones, substantial flooding occurred along Moffett Creek in 1953, 1955, 1958, 1964, and 1974. The largest of the floods occurred on January 16, 1974, with an estimated peak discharge of approximately 7,000 cfs and a recurrence interval of approximately 50 years. During large flood events, the channel capacity of Moffett Creek is exceeded in the vicinity of the upstream end of Marble View Avenue, and the overflow spreads out onto the very flat floodplain. This overflow continues flowing southwest, without re-entering the channel, as broad, shallow, and fairly slow-moving sheet flow. Much of the residential area of Fort Jones is subject to shallow flooding from the overflow of Moffett Creek. The sheet flow ponds behind the Scott River Road embankment where some overflows the road and some returns to the channel.

The absence of streamflow data and lack of historic flood information has complicated the study of past floods in the City of Montague.

Siskiyou County Public Works Department records show that the old Montague-Ager Road bridge over Oregon Slough was built in 1965 (Siskiyou County Public Works Department, 1978). Local residents indicated that a combination of culverts was in place prior to 1965 which were inadequate to pass the floodwaters. Water had been observed ponding upstream until it ran over the road, causing some road and embankment erosion. The present bridge is now adequate to pass the 1-percent annual chance flood.

Trees and debris collected behind the Yreka Western Railroad bridge upstream and downstream of the sewage treatment ponds during the flood of December 1964. The culverts through the railroad embankments did not carry all the flow, and the overflow caused erosion of the embankment. The damage was repaired and larger, wooden beam bridges which presently exist, were constructed (Yreka Western Railroad, 1978). Two of the old culverts are still in place east of the upstream bridge and will pass some of the flow during future floods.

The flood of January 1974 reached the levee of the old sewage treatment pond at approximately station 80+00, but the low velocities did not create bank erosion (Piemme and Bryan, Inc., 1978).

Some minor ponding occurred upstream of the Southern Pacific Railroad at the unnamed drainage, but no damage resulted.

The largest flood in the City of Weed, according to local residents and city officials, occurred in January 1974. Flooding also occurred in December 1964. No data prior to 1978 have been collected on flood magnitudes or duration; therefore, no frequencies can be determined for these floods. A flood occurring in January 1978 was determined to have approximately a 10-percent annual chance (10-year) frequency.

Overflow in 1974 from Boles Creek and North Fork Boles Creek caused shallow flooding of Main and Grove Streets, Lake Avenue, and Eureka Way as flows exceeded the capacities of the culverts under Lake and Main Streets. Flow also ponded upstream from the embankment of U.S. Highway 97.

Local runoff within the City of Weed has caused shallow flooding in the vicinity of the Weed Convalescent Hospital (near Park Street between Alamo Avenue and Clark Lane) and south of Columbus Way, between U.S. Highway 97 and the Southern Pacific Railroad.

No major flooding from Beaughton Creek has occurred.

The flooding in the City of Yreka in 1974 was probably less than that in 1861 and 1890, but greater than that in 1964. Both Scott River and Shasta River flooded in 1852, 1864, 1867, 1881, and 1904 (U.S. Department of the Interior, 1939). These rivers are to the west and east of the City of Yreka, respectively, which suggests that flooding probably occurred in the City of Yreka during these years as well.

Flood problems on Yreka Creek have historically consisted of damage to bridges and erosion of streambanks. The erosion has in turn caused problems with structures along the banks. Yreka Creek caused some flooding of buildings along Main Street in 1861, according to the Yreka Journal. In 1927, flooding from Yreka Creek damaged water mains, barns, garages, outbuildings, and a newly constructed sewer line according to the Siskiyou Daily News.

Flooding along Humbug Gulch caused property damage along Gold Street, Pine Street, Lane Street, West Miner Street, North Street, Yama Street, and West Lennox Street in 1890, according to accounts in the Yreka Journal. In 1964, Humbug Gulch flooded several houses in the vicinity of Yama and North Streets at their intersection with Gold Street, according to the Siskiyou Daily News.

2.4 Flood Protection Measures

The numerous marshes, broad valleys, and volcanic geology near the State line, together with Upper Klamath Lake, Lost River diversion canal, Tule Lake, and Lower Klamath Lake, afford a high degree of natural and manmade storage in the Klamath River drainage basin, which is approximately 4,630 square miles upstream from Iron Gate Reservoir, near the northern Siskiyou County boundary. During the

December 1964 flood, the peak flow downstream from Iron Gate Reservoir was 29,400 cfs (U.S. Department of the Interior, 1965), or only approximately 6 cfs per square mile of drainage area. Effects on the 1-percent (100-year) and 0.2-percent annual chance (500-year) events from these storage lakes cannot be determined, although they do reduce discharge volumes downstream.

Lake Dwinnell provides some flood storage for runoff from the upper 139 square miles of the Shasta River basin. The volcanic soils together with the flat plain of the Shasta River valley also serve to reduce flood peaks as they traverse the valley, yet do not provide adequate 1-percent annual chance flood protection. Near then City of Yreka, at its confluence with the Klamath River, the drainage area of Shasta River is approximately 800 square miles; here, the December 1964 flood peak was 21,500 cfs (U.S. Department of the Interior, 1965), or approximately 25 cfs per square mile of drainage area.

Lake Siskiyou, formed when Box Canyon Dam on the Sacramento River, approximately 6 miles northwest of the City of Dunsmuir, was completed in 1968, has a storage capacity of 26,000 acre-feet, of which 2,000 acre-feet are designated for flood control. During the 1974 flood, the peak flow reduction due to Lake Siskiyou was approximately 1,000 cfs (State of California, 1974) in relation to a peak outflow of 11,500 cfs.

The levee along the Sacramento River south of the City of Dunsmuir provides some flood protection by reducing velocities; however, the 1-percent annual chance flood overtops the structure and results in shallow flooding.

In the City of Etna, there are no reservoirs on Etna or Johnson Creeks. Flood protection in the past has consisted of emergency channel work to keep Etna Creek in its channel (U.S. Department of Agriculture, 1971).

In the Town of Fort Jones, there are small manmade levees along the Moffett Creek channel (1-3 feet high), but the additional channel capacity is not sufficient to contain discharges larger than the 10-percent annual chance flood.

In the City of Montague, no flood protection structures have been constructed on Oregon Slough. Bridges have been enlarged after historic flooding periods. A few small stock ponds exist (U.S. Department of Agriculture, May 1971) on the minor tributaries feeding Oregon Slough, but their effect on flood control is expected to be negligible. In addition, no floodplain management measures exist within the city.

In the City of Yreka, there are no reservoirs on Yreka Creek or Humbug Gulch. On Greenhorn Creek, there is a small reservoir for domestic supply. It provides no protection from the 1-percent annual chance flood.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the floodplain, as set forth in the Code of Federal Regulations at 24 CFR,1910.1(d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

3.0 ENGINEERING METHODS

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

3.1 Hydrologic Analyses

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

Peak discharge-frequency relations for the Shasta River near the unincorporated areas of Edgewood were based on a regional analysis (U.S. Department of the Interior, 1977). The peak flows downstream from Beaughton Creek (also called Beaughan Creek), which enters from the east just downstream from the Southern Pacific Railroad bridge, were reduced on the basis of the estimated peak flow in Beaughton Creek during the flood in January 1978. The January 1978 flow was estimated to be approximately a 10-percent annual chance flood. Peak flows for the various frequency floods were also reduced upstream from the confluence with the Parks Creek Diversion. The diversion enters the Shasta River from the west just upstream from the railroad bridge. The reductions in flows were based on an estimate of the 1978 peak flow in the diversion. Because the diversion carries only a portion of the flow in Parks Creek, engineering judgment was used to estimate floodflows.

A log-Pearson Type III analysis of 7 years of record collected (1965-1971) on Cottonwood Creek near the unincorporated areas of Hornbrook was compared to peak flows determined from regional analysis (U.S. Department of the Interior, 1977). No discrepancies were found, so the log-Pearson Type III results were used for the detailed study in the Hornbrook area. No change in flow was necessary through the detailed-study reach as tributary inflow within the reach would have a negligible effect on water-surface elevations.

In the unincorporated areas of Seiad Valley and the Happy Camp area, peak discharge-frequency relations for the Klamath River at Seiad Valley were determined from a log-Pearson Type III analysis of streamflow records collected at Seiad Valley and/or at Somes Bar since 1913. The flood of December 1964 on the Klamath River was found to have a 1-percent annual chance frequency. The frequency relations developed at Seiad Valley were transferred to the Happy Camp detailed-study area based on drainage-area comparisons.

Peak discharge-frequency relationships for Indian Creek were determined from a log-Pearson Type III analysis of streamflow record collected on Indian Creek near Happy Camp. Records have been collected at the Happy Camp location since 1956. Records were extended back to 1913 based on the relation to peak flows of Klamath River at Seiad Valley.

The hydrologic analysis of the Klamath River study area was based on the reconstruction of the Klamath River discharge hydrographs for the 1964 and 1974 floods at several locations from Iron Gate Reservoir to the USGS streamflow gage at Seiad Valley (No. 11520500). A log-Pearson Type III frequency analysis (Water Resources Council, 1981) was performed on the Seiad Valley gage, which had records since 1913. The 1964 and 1974 flood peaks recorded at the Seiad Valley gage are about 95 percent of the peak flow determined by the frequency analysis for the 1- and 2-percent annual chance floods, respectively.

The travel times and phasing of various tributary flows and local inflows were found to be critical in reconstructing hydrographs along the Klamath River. The various flows of the hydrograph developed for the Seiad Valley site were found to reproduce the observed discharges well. The flood peaks of the study area hydrographs for 1964 and 1974 floods were used to develop the frequency curve, assuming the 100- and 50-year recurrence intervals, respectively.

The frequency curve developed for the Whitney Creek site was taken from a California Department of Transportation (Caltrans) Preliminary Report, dated February 1980, for the replacement of the Whitney Creek bridge over Highway 97. The 1-percent annual chance flood discharge was also computed by applying the SCS rainfall-runoff methodology to the glacial area of Whitney and Bolam Glaciers. The 1-percent annual chance thunderstorm event on the glaciers was assumed to produce the 1-percent annual chance runoff event. The resultant peak discharge at U.S. Highway 97 was found to compare closely with the 1-percent annual chance flood discharge noted in the Caltrans report. The site is an alluvial fan, and only the 1-percent annual chance flood discharge is required for the hydraulics methodology.

The USACE determined discharge-frequency relations for the streams in the City of Yreka area for a Flood Plain Information report prepared in 1976 (USACE, 1976). The study contractor reviewed the results of this report and found them to be acceptable. The data from the Flood Plain Information report was therefore used in this study. The hydrologic analyses were developed using the HEC-1 hydrologic model (HEC, 1998) because no gage data were available for either Panther Creek or Squaw Valley Creek. Therefore, peak discharges for Panther and Squaw Valley Creek and four additional local tributaries were established using the following data sources and assumptions:

1. Watershed subbasins were delineated from USGS 1:24,000 scale topographic maps.
2. Land use values were defined from site investigations and USGS maps.
3. Soils information was obtained from National Resource Conservation Service and United States Forest Service soils maps (NRCS, no date; USFS, no date).
4. Curve numbers were developed from available soils maps and defined land use values (SCS, 1985; McCuen, 1989).
5. Initial losses and times of concentration were based on values and equations presented in the Sacramento and San Joaquin River Basins Comprehensive Study (HEC, 2001).
6. Peak rainfall totals were determined from isohyetals presented in NOAA Atlas 2 (NWS, 1973); the 0.2-percent annual chance rainfall total was extrapolated from the 10- through 1-percent annual chance return period totals.
7. The SCS unit hydrograph method was applied to generate the 1- and 0.2-percent annual chance discharge hydrographs at study area inflow points.

Flow routing was not included in the hydrologic model because flows were routed hydraulically across the study area. Flow hydrographs were developed for each basin draining to the study area for the 10-, 2-, 1-, and 0.2-percent annual chance return interval floods. Peak discharges associated with each basin's computed hydrograph are presented in the Summary of Discharges table.

In the City of Dunsmuir, peak discharge-frequency relations were computed for four USGS gaging stations along the Sacramento River by the log-Pearson Type III method as outlined by the Water Resources Council (Water Resources Council, 1976). The drainage areas and periods of record for the four gaging stations are summarized in Table 3. A regional skew of 0.42 was used, based on the average of skews from 13 stations with hydrologic conditions similar to those in the study area. The peak discharges of the floods of January 16, 1974, and December 22, 1964, at the City of Dunsmuir were computed from high-water marks to determine drainage area-peak discharge relations. The peak discharge per square mile of drainage area was found to be consistent at the four gaging stations, so the discharge-frequency relations at the City of Dunsmuir were computed using a direct drainage area ratio to the flows determined at the Delta gaging station approximately 25 miles downstream.

TABLE 3 – STREAMFLOW RECORDS

USGS Gaging Station	Drainage Area (Square Miles)	Period of Record
Sacramento River Near Mt. Shasta		
(Below Box Canyon Dam)	135	1960-Present
At Castella	256	1911-23
At Delta	425	1945-Present
At Antler	451	1911, 1920-41

The peak discharges of the floods of January 16, 1974, and December 22, 1964, at Dunsmuir were computed from high-water marks to determine drainage area-peak discharge relations. The peak discharge per square mile of drainage area was found to be consistent at the four gaging stations, so the discharge-frequency relations at Dunsmuir were computed using a direct drainage-area ratio to the flows determined at the Delta gaging station, approximately 25 miles downstream.

Flood discharges for areas of approximate study were based on the USGS report, Magnitude and Frequency of Floods in California (U.S. Department of the Interior, 1977), which is a regional method based on regression analysis. The method relates drainage area, elevation, and average annual precipitation to the peak discharge by empirical equations.

In the City of Etna, the USACE (USACE, 1966) found 8,000 cfs to be the 1-percent annual chance peak discharge of Etna Creek. A 13-year record of peaks obtained by the USGS at an upstream station with a very small drainage area (0.8 square mile compared to 24.8 square miles) was analyzed by the method recommended by the Water Resources Council (Water Resources Council, 1976), and, when adjusted for the differences in drainage area, was found to be in reasonable agreement. The USACE figure, therefore, has been used in this study. The 1-percent annual chance peak discharge was also computed by the index flood method (Vail, Lounsbury, and Associates, 1974) and by using a regional flood frequency regression analysis (U.S. Department of the Interior, 1977). These results were not used, based on the study contractor's judgment.

Peak discharge-frequency relations for Johnson Creek were determined from regional flood-frequency relations (Vail, Lounsbury, and Associates, 1974).

In the Town of Fort Jones, the hydrologic analyses of Moffett Creek were based on a regional analysis by the index flood method done by Vail, Lounsbury, and Associates for Siskiyou County (Vail, Lounsbury, and Associates, 1974). The results were substantiated by estimating the peak discharge of the flood of 1974 from high-water marks, and estimating the recurrence interval of this event to be approximately 50 years at several gaging stations in the area. The U.S. Soil Conservation Service had calculated the 4-percent annual chance peak discharge of Moffett Creek at Fort Jones to be 5,850 cfs, which agrees with the results of this study. Flood frequency relations were developed, based on 12 years of recorded flows at the California Department of Water Resources gage, Moffett Creek near Fort Jones (drainage area of 70 square miles). These relations were not used because the remainder of the basin (51 square miles) downstream from the gage contributes much more runoff than any proportional relation would indicate.

Peak flows for the Scott River were developed using an area-transfer method of the USGS Scott River gage near Fort Jones (No. 11519500). Approximately 81 percent of the contributing drainage area at the gage site is also contributing to the study site.

No gaging stations exist on Oregon Slough for defining discharge-frequency relationships; however, regional estimates for the area around the City of Montague made by the U.S. Soil Conservation Service (U.S. Department of Agriculture, 1973) and by Vail, Lounsbury, and Associates (Vail, Lounsbury, and Associates, 1974) are in reasonable agreement. The Siskiyou County Public Works Department has determined 2- and 1-percent annual chance discharges in planning construction of a new bridge over Oregon Slough at the Montague-Ager Road crossing. These values are somewhat lower than those determined by the U.S. Soil Conservation Service and by Vail, Lounsbury, and Associates. The Siskiyou County Public Works Department estimated an effective drainage area which was significantly smaller, 5.2 square miles, than the total drainage area, 28 square miles, measured from the USGS topographic maps (U.S. Department of the Interior, 1954, et cetera). The USGS regional flood-frequency analyses described by Waananen and Crippen (U.S. Department of the Interior, 1977) were used for both the Northeast and North Coast Regions because Montague is located near the boundary of those two regions. The discharge values for the Northeast region appear low, while the North Coast Region values appear high. This difference may be explained by the fact that Montague lies in the transition zone between the two areas and, therefore, is not well defined by the regional coefficients for either region.

The U.S. Soil Conservation Service discharge-frequency relationships used in the City of Montague study area were determined with background information from field surveys and were used because they best fit the middle of the range determined by the USGS methods. The 0.2-percent annual chance discharge estimate was determined through the use of a direct ratio of the U.S. Soil Conservation Service 1-percent annual chance discharge.

In the City of Weed, discharges for the peak flood of January 16, 1978, on Boles and North Fork Boles Creeks were determined to have approximately a 10-percent annual chance frequency from comparison with frequency-discharge relationships developed at Dunsmuir (Sacramento River) and at Edgewood (Shasta River). The ratio of the 1-percent annual chance flood to the 10-percent annual chance flood was determined at both Dunsmuir and Edgewood. These ratios were averaged to obtain a ratio for the 1-percent annual chance flood to the 10-percent annual chance flood for Boles and North Fork Boles Creeks at Weed. This procedure was also used for the 2- and 0.2-percent annual chance floods.

The 1-percent annual chance discharge for the approximate study of Beaughton Creek was estimated to be 150 cfs, based on study contractor's judgment, information from city officials, and field reconnaissance.

Drainage areas for the streams studied were not determined as relations between drainage area and runoff are unreliable because of the effects of highways, railroads, and the volcanic geology of the area.

A summary of the drainage area-peak discharge relationships for all the streams studied by detailed methods is shown in Table 4, "Summary of Discharges."

TABLE 4 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT ANNUAL CHANCE	2-PERCENT ANNUAL CHANCE	1-PERCENT ANNUAL CHANCE	0.2-PERCENT ANNUAL CHANCE
AREA TRIBUTARY TO SQUAW VALLEY CREEK					
East of McCloud	2.1	210	360	570	790
South of McCloud	1.7	230	420	650	910
BOLES CREEK					
Southern Pacific Railroad culvert to Grove Street	—[1]	200	375	460	720
Grove Street to Main Street	—[1]	190	360	440	690
Main Street to Interstate Highway 5	—[1]	160	300	370	580
Upstream of Interstate Highway 5	—[1]	140	265	325	510
COTTONWOOD CREEK					
At Henley Horn Brook Road	90	4,300	8,000	10,100	16,200
GREENHORN CREEK					
At the City of Yreka corporate limits	12.0	900	1,800	2,200	3,700
HUMBUG GULCH					
At the City of Yreka corporate limits	3.8	400	750	900	1,500

[1]Drainage Area Not Applicable Due To Volcanic Geology

TABLE 4 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT ANNUAL CHANCE	2-PERCENT ANNUAL CHANCE	1-PERCENT ANNUAL CHANCE	0.2-PERCENT ANNUAL CHANCE
INDIAN CREEK					
From mouth to the confluence of Doolittle Creek	133	15,000	27,500	34,500	55,500
Upstream of the confluence of Doolittle Creek	121	13,500	25,000	31,000	50,000
JOHNSON CREEK					
At the City of Etna corporate limits	2.3	200	400	500	990
KLAMATH RIVER					
Downstream of confluence of Elk Creek	7,330	73,000	164,000	220,000	405,000
Elk Creek to Indian Creek	7,230	67,000	150,000	202,000	372,000
Upstream of confluence of Indian Creek	7,090	58,000	130,000	174,000	320,000
Downstream of Grider and Seiad Creeks confluence	6,980	55,000	123,000	165,000	300,000
Grider and Seiad Creeks to Walker Creek	6,890	60,000	115,000	155,000	280,000
Upstream of Walker Creek	6,870	49,000	114,000	153,000	277,000
At the Town of Klamath	5,875	17,000	59,000	92,000	230,000
LOCAL DRAINAGE OF McCLOUD COMMUNITY	0.8	220	330	450	570
LOCAL DRAINAGE SOUTH OF McCLOUD COMMUNITY	0.3	50	90	140	190
MOFFETT CREEK					
At Town of Fort Jones corporate limits/At Scott River Road	121.0	3,400	7,000	8,000	12,000
OREGON SLOUGH					
At City of Montague corporate limits	28.0	840	1,620	1,900	2,700

TABLE 4 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT ANNUAL CHANCE	2-PERCENT ANNUAL CHANCE	1-PERCENT ANNUAL CHANCE	0.2-PERCENT ANNUAL CHANCE
SACRAMENTO RIVER					
At Interstate Highway 5 near the City of Dunsmuir	163	13,000	22,000	27,000	40,000
SCOTT RIVER					
Downstream from the confluence of Moffett Creek	538.0	19,400	39,000	49,000	81,000
Upstream from the confluence of Moffett Creek	416.0	16,000	32,000	41,000	69,000
SHASTA RIVER					
At downstream Edgewood Road Bridge	70	4,800	9,400	11,700	20,000
At Central Oregon and Pacific Railroad Bridge	*	4,600	9,150	11,200	19,200
Upstream from confluence of Parks Creek Diversion	*	3,700	8,000	9,700	17,000
SQUAW VALLEY CREEK					
At logging road above McCloud River Railroad	10.5	700	1,220	2,010	2,910
UNNAMED TRIBUTARY TO PANTHER CREEK					
At confluence with Panther Creek above Hill Street	1.0	110	200	30	460
At McCloud River Railroad	5.5	490	880	1,380	1,950
At confluence with Panther Creek at West Colombero Drive	1.0	120	220	340	480
At Modoc Avenue	6.8	780	1,340	2,050	2,820

*Data not available

TABLE 4 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT ANNUAL CHANCE	2-PERCENT ANNUAL CHANCE	1-PERCENT ANNUAL CHANCE	0.2-PERCENT ANNUAL CHANCE
YREKA CREEK					
At Yreka Municipal Sewage Treatment Plant	42.5	3,000	6,000	8,000	14,000
At confluence of Humbug Gulch	*	2,550	5,150	7,000	12,300
At confluence of Greenhorn Creek	*	1,650	3,300	4,400	7,600
At confluence of Juniper Creek	12.6	950	1,900	2,600	4,600

*Data not available

3.2 Hydraulic Analyses

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

Starting water-surface elevations for the step-backwater computer program were determined by the slope-conveyance method.

For the Sacramento River north of the City of Dunsmuir, studied by approximate methods, the hydraulic analyses consisted of examining photographs (D. A. Van Heest, 1974) and reports of flooding in January 1974, along with topographic maps (State of California, 1952; U.S. Department of the Interior, 1955) and aerial photographs (U.S. Department of Agriculture, 1955). The hydraulic analyses for the overbank portion of the Sacramento River studied by approximate methods south of the City of Dunsmuir consisted of examining topographic maps (U.S. Department of the Interior, 1955) and using engineering judgment.

Cross sections for the backwater analyses of Shasta River near Edgewood were surveyed in November 1977. High-water marks along the Shasta River from the peak of January 1978 (approximately a 10-percent annual chance peak flow) were surveyed to aid in the profile analyses. USGS step-backwater computer program J-635 (U.S. Department of the Interior, May 1977) was used to compute water-surface elevations at the surveyed cross sections. Starting water-surface elevations were based on slope-conveyance computations at the most downstream cross sections. Data from the gaging station on the Shasta River at Edgewood, operated by the State of California, at the most downstream cross section were not used because it is a low-flow data site and flood data are not available.

Flooding from Beaughton Creek south of the Southern Pacific Railroad at Edgewood, at its confluence with the Shasta River, was estimated from field inspection and descriptions of flooding by local residents. The main channel of Beaughton Creek is narrow, and most high flows will exceed its capacity. Flow will spread out rapidly and will average less than 1 foot deep.

Cross sections for the backwater analyses of Cottonwood Creek near Hornbrook were surveyed in November 1977. USGS step-backwater computer program J-635 (U.S. Department of the Interior, May 1977) was used to compute water-surface elevations at the surveyed cross sections on Cottonwood Creek. Starting water-surface elevations were based on slope-conveyance computations at the most downstream cross section and on high-water marks from the flood of December 1964 (USACE, 1965).

Rancheria Gulch, with a drainage area of approximately 4.6 square miles and a tributary to Cottonwood Creek from the west, flows through Hornbrook in a narrow, steep channel subject to overflow. In past floods, high-velocity flow has caused debris and gravel to fill the main channel of the creek and has caused flows to back up at unobstructed bridges. Based on photographs of 1964 flooding (M. Spearine, 1964), field observations, and discussion with local residents, overflow from the main channel will generally be less than 2 feet deep.

Cross sections for the backwater analyses of the Klamath River and Indian Creek near Happy Camp were surveyed in September 1977. USGS step-backwater computer program J-635 (U.S. Department of the Interior, May 1977) was used to compute water-surface elevations at the surveyed cross sections on the Klamath River and Indian Creek. Starting water-surface elevations for both the Klamath River and Indian Creek backwater computations were based on slope-conveyance relations at the most downstream cross sections and high-water marks for the flood of December 1964. The lower portion of Indian Creek in the community of Happy Camp was flooded by backwater from the Klamath River. Water-surface profiles for the area of Indian Creek, for which cross sections were not surveyed, were based on profiles determined by using high-water marks from the 1964 flood (USACE, 1965), topographic maps, and comparisons to profiles developed in surveyed stretches. The channel of Indian Creek is steeply entrenched in much of the study area not surveyed for cross sections, and residential or commercial development in such a channel is very unlikely.

Cross sections for the backwater analyses of the Klamath River and Seiad Creek in the vicinity of the community of Seiad Valley were surveyed in September 1977. Profiles for Seiad Creek were not determined because of the unstable channel and extensive area of shallow overflow. USGS computer program E-431 (U.S. Department of the Interior, 1976) was used to compute water-surface elevations at the surveyed cross sections. Starting water-surface elevations were based on slope-conveyance relations at the most downstream cross section, together with discharge and high-water marks for the 1964 flood. The water-surface profile for the 500-year flood was determined by slope-conveyance computations at each surveyed cross section and by comparison to the computed 1-percent annual chance flood profile.

Most of the community of Seiad Valley is inundated by water from the Klamath River during the 1-percent annual chance flood. Most of the remainder of the community is flooded by shallow overflow from Seiad Creek. The average depth of this flooding was estimated from surveyed cross sections, historical photographs (M. Malloy, 1964), topographic maps (State of California, 1975; U.S. Department of the Interior, 1957), and high-water marks from the 1964 flood (USACE, 1965).

Cross sections for the Scott River were determined photogrammetrically (CH2M Hill, Inc., 1983). Additional data were taken from field surveys performed in October 1983. Data were correlated with known high-water marks from the 1964 and 1974 floods. Water-surface elevations were computed using the HEC-2 computer program (USACE, 1977). Starting water-surface elevations for the Scott River were determined using the slope/area method.

Cross section data for Klamath River were taken from field surveys performed in October 1983. Data were correlated with known high-water marks from the 1964 and 1974 floods. Water-surface elevations were computed using the HEC-2 computer program (USACE, 1977). The 1964 and 1974 flood peaks were used to calibrate roughness factors. Starting water-surface elevations were determined using the slope/area method.

The Whitney Creek area is an alluvial fan that extends for approximately 4.5 miles from U.S. Highway 97 out onto the valley floor. The 1-percent annual chance flood discharge was used to compute the associated flow depths and velocities on the alluvial fan by the methodology adopted by FEMA. The approach is documented in a paper by Dawdy (David Dawdy, 1979). No field-surveyed cross sections are required in the estimation of the hydraulic characteristics of flow on the fan. Aerial photographs and a topographic map for Lake Shastina were used to delineate the extent of the fan width at various elevations.

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

Approximate-study areas of the Klamath, Shasta, and Scott Rivers and Indian Creek and their associated tributaries had elevations determined by field survey, topographic maps, and historical data (State of California, 1952; U.S. Department of the Interior, 1955; M. Spearine, 1964; State of California, 1975; U.S. Department of the Interior, 1957; Clair A. Hill and Associates, 1966).

Due to significant overland flooding in the study area of Panther and Squaw Valley Creek, hydrodynamic modeling was performed using MIKE21 (DHI, 2000), an averaged-depth two-dimensional model. Significant culverts in the system were modeled using the one-dimensional MIKE11 model (DHI, 2000), which was hydraulically linked to MIKE21 in MIKE Flood (DHI, 2000), which allows flow to pass from one model domain to the other. A uniform roughness value of 0.06 was selected for the model based on available literature and two-dimensional modeling experience. Although no technical calibration data were available, final results were compared to anecdotal evidence from the damaging January 1, 1997, flood. The primary flow paths modeled in MIKE21 were found to correlate well with the primary flow paths observed during the 1997 flood.

In the City of Dunsmuir, cross sections for the backwater analyses and high-water marks from the floods of 1974 and 1964 on the Sacramento River were surveyed in May 1977. High-water marks from the flood of January 14, 1978, were surveyed on January 26, 1978, because they were more accurate and plentiful than marks from the earlier, larger floods.

Step-backwater calculations for streams in the City of Dunsmuir were made using the USGS step-backwater computer program J-635 (U.S. Department of the Interior, 1977) in both the upstream and the downstream directions due to the flow conditions bordering on critical flow. In many reaches, normal depth was not achieved because the flow changed from supercritical to subcritical every few cross sections. In these reaches, the 1974 high-water profile with a computed discharge (by slope/area computations) of 21,000 cfs, was used as the 2-percent annual chance profile with FIA consultation. Average water-surface elevation differences computed by stage-conveyance relationships were used to determine the 10-, 1-, and 0.2-percent annual chance water-surface profiles.

For the stream segments studied by approximate methods in the City of Dunsmuir, the hydraulic analyses consisted of examining photographs (D. A. Van Heest, 1974) and reports of flooding in January 1974, along with topographic maps (California Department of Transportation, 1952; U.S. Department of the Interior, 1955) and aerial photographs (U.S. Department of the Interior, 1975).

The 1-percent annual chance floodplains of Bear Creek and an unnamed tributary at the southern corporate limits of the City of Dunsmuir have widths of less than 200 feet. As a result, in accordance with FIA guidelines, these areas were determined to be of minimal flood hazard.

In the City of Etna, cross sections for Etna Creek and Johnson Creek were field surveyed by the USGS in May 1977.

Because of the unstable channel and unpredictable flow pattern, profiles are not shown for Etna Creek. Only the extent of 1-percent annual chance flooding was determined. Slope-conveyance methods were used to check boundaries of the flow for the main channel as defined during the field surveys. Overbank flooding depths were computed by slope conveyance methods assuming complete channel obstruction and an even spreading of flow across the floodplain. Localized depths may be substantially larger due to the variation of flow pattern during a flood.

Step-backwater calculations for determining water-surface elevations on Johnson Creek were made using the USGS step-backwater computer program J-635 (U.S. Department of the Interior, May 1977) in both the upstream and downstream directions because of the flow conditions bordering on critical flow. Upstream computations were found to be acceptable. Starting water-surface elevations for Johnson Creek were computed by the slope-conveyance method.

Little flooding from Johnson Creek will occur within the City of Etna. The main channel of Johnson Creek will carry flows in excess of the capacity (400 cfs) of the State Highway 3 culvert. Flows that exceed the culvert capacity will cause ponding upstream of State Highway 3, shallow overflow of the highway north of the culvert, and shallow flow northeastward.

Flow downstream from State Highway 3 in the main channel will not exceed approximately 400 cfs because the shallow flow that leaves the channel upstream from the culvert does not reenter the main channel in the detailed study reach. Therefore, the profiles for the 2-, 1-, and 0.2-percent annual chance floods downstream from the culvert will be identical.

Starting water-surface elevations for Johnson Creek were computed by slope conveyance method.

For Etna Creek, the 1-percent annual chance flood was determined from normal depth calculations at surveyed cross sections, accounts of 1964 flooding from local residents, reports describing the 1964 flood (USACE, 1966; U.S. Department of Agriculture, 1971; U.S. Department of Agriculture, 1965; USACE, 1965), and a 1971 aerial photograph at a scale of 1:7,900 (U.S. Department of Agriculture, 1971).

In the Town of Fort Jones, cross sections along Moffett Creek and high-water marks of the 1974 flood were field surveyed by the study contractor in May 1977. Cross sections for the 1985 study were field surveyed in October 1983. Additional cross sections were determined photogrammetrically (CH2M Hill, Inc., 1983).

Water-surface elevations for the 10-percent annual chance flood along Moffett Creek were computed up the main channel only. This flow is bankfull in the main channel for most of the length of Moffett Creek. Larger discharges overflow the channel on both banks onto the very wide, flat floodplain, so increased discharge causes very little increase in the water-surface elevation in the channel. Because overflow is separated from the channel flow along much of the channel, water-surface elevations for discharges larger than bankfull cannot be computed by normal step-backwater methods. Therefore, water-surface elevations in the channel for the 2-, 1-, and 0.2-percent annual chance floods were derived by estimating stage differences using the slope-conveyance method.

Starting water-surface elevations for Moffett Creek were determined by the slope/area method at the Scott River Road crossing.

Overflow from Moffett Creek is shallow and unconfined, and the water-surface elevations inside and outside the main channel are not necessarily the same. Therefore, the overflow was analyzed by shallow flooding methods which dictate calculations for the 1-percent annual chance flood only. Average depths of flow across the width of the floodplain were computed by the slope-conveyance method. The 1974 flood produced a pattern and extent of inundation very similar to that of the 1-percent annual chance flood. Therefore, computer water-surface elevations and depths were checked by the 1974 high-water marks obtained in the field survey.

Both the channel flow and the overflow build up along Moffett Creek behind the Scott River Road embankment will eventually flow through the bridge and over the road. Therefore, the ponded water-surface elevation was computed and is shown on the map.

Several small areas adjacent to State Highway 3 are subject to shallow overflow from Moffett Creek and local rainfall runoff with 1-percent annual chance depths of less than 1.0 foot. The approximate analyses for these areas were based on field inspection.

Water-surface elevations were determined in part through use of the U.S. Geological Survey program J635 (Vail, Lounsbury and Associates, et cetera). Program J635 computed hydraulic variables and water-surface elevations for the 10-, 2-, and 1-percent annual chance discharges. Water-surface elevations for the 0.2-percent annual chance flood were determined by the slope-conveyance method because data obtained were inadequate for use as computer input.

In the City of Montague, cross sections of the slough channel were surveyed by the U.S. Soil Conservation Service (U.S. Department of Agriculture, 1973) from a point approximately 3,000 feet downstream of the corporate limits to approximately 3,030 feet upstream of the corporate limits. Additional cross sections were determined by use of 1:24,000 scale, 5-foot contour interval topographic maps (U.S. Department of the Interior, 1922, et cetera).

In the City of Weed, cross sections for Boles Creek were surveyed in January and May 1978. The geometry of all the culverts within the study reach from the Southern Pacific Railroad culvert (downstream from U.S. Highway 97) to the Interstate Highway 5 culvert near South Weed Boulevard was measured using standard surveying methods.

Water-surface elevations for Boles Creek were determined from the USGS step-backwater computer program E-431 (Open-File Report 76-499, et cetera) and from flow-through-culvert computations (Computer Program A-526, et cetera).

The starting water-surface elevation for Boles Creek was determined using the slope/conveyance method. Flooding from North Fork Boles Creek is generally shallow sheet flow; therefore, no profiles are shown. The depth of the shallow sheet flow was estimated from descriptions of the 1974 flooding, field inspection of the Lake Avenue and East Lake Avenue area, and pictures of the 1974 flooding at the intersection of Lake Avenue and Main Street.

In the City of Yreka, water-surface elevations for floods of the selected recurrence intervals on Yreka Creek, Humbug Gulch, and Greenhorn Creek were determined using the USACE HEC-2 step-backwater computer program (USACE, 1973).

Water-surface elevations for the 1- and 0.2-percent annual chance floods on Yreka Creek, Humbug Gulch, and Greenhorn Creek were compared with those determined by the USACE (USACE, 1976). The USACE profiles were used, with some slight modifications made by the study contractor. These modifications were based on additional cross-section data and engineering judgment.

Cross sections for Yreka Creek, Humbug Gulch, and Greenhorn Creek were determined from available topographic maps (Clair A. Hill and Associates, 1964) and from field surveys performed by the USACE in 1976 (USACE, 1976).

The deposition in the box culvert under Interstate Highway 5 on Greenhorn Creek was assumed to remain in place during flooding.

The USACE found that the maximum channel capacity for Humbug Gulch was approximately 300 cfs from the Lane Street bridge to Yreka Creek (USACE, 1976). Overflow from the main channel during the 1-percent annual chance flood will cause sheetflow through Yreka in the area north of South Street between Humbug Gulch and Yreka Creek and north of Humbug Gulch between North Oregon Street and Yreka Creek.

On Greenhorn Creek downstream from Greenhorn Reservoir, shallow flow will occur north of the main channel of the creek, approximately 900 feet west of South Main Street. Flows in excess of 1,800 cfs (the 2-percent annual chance flood) will exceed the capacity of the Interstate Highway 5 culvert. For the 1-percent annual chance flood, approximately 400 cfs will flow northerly along South Main Street to join Yreka Creek at Oberlin Road and north of Oberlin Road near Rose Lane. The area southeast of the confluence of Greenhorn Creek and Yreka Creek is an area of general shallow flooding.

Approximately 1 mile of Juniper Creek, upstream from the corporate limits of Yreka and just south of the county fairgrounds, was studied using available topographic maps (USACE, 1977) and field inspections.

Roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and were based on field observations of the streams and floodplain areas. Roughness factors for all streams studied by detailed methods are shown in Table 5, "Manning's "n" Values."

TABLE 5 - MANNING'S "n" VALUES

Stream	Channel "n"	Overbank "n"
Boles Creek	0.024 – 0.050	0.050 – 0.070
Cottonwood Creek	0.034 – 0.050	0.030 – 0.070
Greenhorn Creek	0.040	0.080
Humbug Gulch	0.024 – 0.050	0.080 – 0.100
Indian Creek	0.030 – 0.040	0.040 – 0.075
Johnson Creek	0.040 – 0.060	0.030
Klamath River (near Happy Camp)	0.030 – 0.035	0.040 – 0.075
Klamath River (near the Town of Klamath River)	0.030 – 0.056	0.035 – 0.075
Klamath River (near Seiad Valley)	0.030 – 0.035	0.040 – 0.060
Moffett Creek	0.030	0.030 – 0.070
North Fork Boles Creek	0.024 – 0.050	0.050 – 0.070
Oregon Slough	0.035 – 0.040	0.040 – 0.050
Sacramento River	0.035 – 0.045	0.030 – 0.070
Scott River	0.030	0.040
Shasta River	0.030 – 0.040	0.030 – 0.080
Yreka Creek	0.030 – 0.040	0.060 – 0.080

3.3 Vertical Datum

All FISs and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FISs and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD 29). With the finalization of the North American Vertical Datum of 1988 (NAVD 88), many FIS reports and FIRMs are being prepared using NAVD 88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD 88. Structure and ground elevations in the community must, therefore, be referenced to NAVD 88. It is important to note that adjacent communities may be referenced to NGVD 29. This may result in differences in base flood elevations across the corporate limits between the communities.

Prior versions of the FIS report and FIRM were referenced to NGVD 29. When a datum conversion is effected for an FIS report and FIRM, the Flood Profiles, base flood elevations (BFEs) and ERMs reflect the new datum values. To compare structure and ground elevations to 1-percent annual chance flood elevations shown in the FIS and on the FIRM, the subject structure and ground elevations must be referenced to the new datum values.

As noted above, the elevations shown in the FIS report and on the FIRM for Siskiyou County are referenced to NAVD 88. Ground, structure, and flood elevations may be compared and/or referenced to NGVD 29 by applying a standard conversion factor. The conversion factor to NAVD 88 for all the streams in the county, with the exceptions of Boles Creek, Shasta River, and Squaw Valley Creek, is 3.42 feet. The datum conversion for Boles Creek is 3.63 feet, Shasta River is 3.52 feet, and Squaw Valley Creek is 3.44 feet.

The BFEs shown on the FIRM represent whole-foot rounded values. For example, a BFE of 102.4 will appear as 102 on the FIRM and 102.6 will appear as 103. Therefore, users that wish to convert the elevations in this FIS to NGVD 29 should apply the stated conversion factor(s) to elevations shown on the Flood Profiles and supporting data tables in the FIS report, which are shown at a minimum to the nearest 0.1 foot.

For more information on NAVD 88, see the publication entitled Converting the National Flood Insurance Program to the North American Vertical Datum of 1988, FEMA Publication FIA-20/June 1992, or contact the Spatial Reference System Division, National Geodetic Survey, NOAA, Silver Spring Metro Center, 1315 East-West Highway, Silver Spring, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

Qualifying bench marks within a given jurisdiction that are cataloged by the NGS and entered into the National Spatial Reference System (NSRS) as First or Second Order Vertical and have a vertical stability classification of A, B, or C are shown and labeled on the FIRM with their 6-character NSRS Permanent Identifier. Bench marks cataloged by the NGS and entered into the NSRS vary widely in vertical stability classification. NSRS vertical stability classifications are as follows:

- Stability A: Monuments of the most reliable nature, expected to hold position/elevation well (e.g., mounted in bedrock)
- Stability B: Monuments which generally hold their position/elevation well (e.g., concrete bridge abutment)
- Stability C: Monuments which may be affected by surface ground movements (e.g., concrete monument below frost line)
- Stability D: Mark of questionable or unknown vertical stability (e.g., concrete monument above frost line, or steel witness post)

In addition to NSRS bench marks, the FIRM may also show vertical control monuments established by a local jurisdiction; these monuments will be shown on the FIRM with the appropriate designations. Local monuments will only be placed on the FIRM if the community has requested that they be included, and if the monuments meet the aforementioned NSRS inclusion criteria.

To obtain current elevation, description, and/or location information for bench marks shown on the FIRM for this jurisdiction, please contact the Information

Services Branch of the NGS at (301) 713-3242, or visit their Web site at www.ngs.noaa.gov.

It is important to note that temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with this FIS and FIRM. Interested individuals may contact FEMA to access this data.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS provides 1-percent annual chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent annual chance flood elevations; delineations of the 1- and 0.2-percent annual chance floodplains; and 1-percent annual chance floodway. This information is presented on the FIRM and in many components of the FIS, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the county. For each stream studied by detailed methods, the 1- and 0.2-percent annual chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. For Sacramento River near Dunsmuir, the boundaries of the 1- and 0.2-percent annual chance floods were delineated by interpolating between the flood elevations determined at each cross section using topographic maps at scales of 1:1,200 and 1:62,500, with contour intervals of 5 feet and 80 feet, respectively (State of California, 1952; U.S. Department of the Interior, 1955, respectively), and 1975 aerial photographs at a scale of 1:9,400 (U.S. Department of Agriculture, 1955). North of Dunsmuir, the Sacramento River was studied by approximate methods. The 1-percent annual chance floodplain boundary was developed from 1974 flood photographs (D. A. Van Heest, 1974), normal-depth calculations, and topographic maps (State of California, 1952; U.S. Department of the Interior, 1955). The 1-percent annual chance floodplain boundary for the overbank portion of Sacramento River studied by approximate methods south of Dunsmuir was developed from topographic maps (U.S. Department of the Interior, 1955) and engineering judgment.

The 1- and 0.2-percent annual chance floodplain boundaries for the Shasta River near Edgewood were based on water-surface elevations determined at each cross section, an aerial photograph at a scale of 1:10,100 (U.S. Department of Agriculture, 1975), and field observations.

The 1- and 0.2-percent annual chance floodplain boundaries on Cottonwood Creek near Hornbrook were determined at each surveyed cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000, with a contour interval of 20 feet (U.S. Department of the Interior, 1957); an aerial photograph at a scale of 1:7,900 (U.S. Department of Agriculture, 1971); and field observations. The 1-percent annual chance floodplain boundary in Rancheria Gulch was determined from field observations, discussion with local residents, photographs of flooding in 1964 (M. Spearine, 1964), and topographic maps (State of California, 1964).

The 1- and 0.2-percent annual chance floodplain boundaries on the Klamath River and on Indian Creek near Happy Camp were determined at the surveyed cross sections. The boundaries were interpolated between cross sections based on topographic maps at scales of 1:24,000 and 1:1,200, with contour intervals of 20 feet and 2 feet, respectively (U.S. Department of the Interior, 1957; Happy Camp Sanitary District, 1977, respectively); accounts of 1964 flooding (USACE, 1965; Happy Camp Sanitary District, 1977); and aerial photographs at a scale of 1:8,500 (U.S. Department of Agriculture, 1974).

Near Montague, the 1- and 0.2-percent annual chance floodplain boundaries were delineated for Oregon Slough using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000, enlarged to 1:3600 with a contour interval of 5 feet, (U.S. Department of the Interior, Geological Survey, 1922), and developed photogrammetrically, using aerial photographs at a scale of 1:7920 (U.S. Department of Agriculture, May 11, 1971). Near Seiad Valley, the 1- and 0.2-percent annual chance floodplain boundaries were located using the flood elevations determined at each cross section surveyed on the Klamath River. Between cross sections, topographic maps at scales of 1:1,200 and 1:24,000, with contour intervals of 2 feet and 20 feet, respectively (State of California, 1975; U.S. Department of the Interior, 1957, respectively); aerial photographs at a scale of 1:10,300 (U.S. Department of Agriculture, 1975); and field observations were used to determine the extent of flooding. On Seiad Creek, only 1-percent annual chance flooding was delineated based on surveyed cross sections together with topographic maps (State of California, 1975; U.S. Department of the Interior, 1957).

Floodplain boundaries along the Klamath River near the Town of Klamath River were delineated using the flood elevations determined at each cross section; between cross sections, boundaries were interpolated using topographic maps at a scale of 1:4,800, with a contour interval of 5 feet (CH2M Hill, Inc., 1983).

Near Weed, the 1- and 0.2-percent annual chance floodplain boundaries were delineated for Boles Creek and North Fork Boles Creek using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:6000, with a contour interval of

2 feet, in conjunction with flow-through culvert computations, step-backwater calculations, and accounts of 1974 flooding from the city officials and local residents.

Floodplain boundaries along the Scott River were delineated using the flood elevations determined at each cross section; between cross sections, boundaries were interpolated using topographic maps at a scale of 1:4,800, with a contour interval of 5 feet (CH2M Hill, Inc., 1983).

For the Yreka Creek, Humbug Creek, and Greenhorn Creek near Yreka, the 1- and 0.2-percent annual chance floodplain boundaries were determined by step-backwater calculations, field inspection in areas of overland flow, and photographs of 1974 flooding (Piemme and Bryan, Inc., 1974), and were delineated using a 1976 USACE flood map (USACE, 1976).

Near the Town of Fort Jones, the 1- and 0.2-percent annual chance floodplain boundaries were delineated for Moffett Creek using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at scales of 1:4,800 and 1:62,500, with contour intervals of 5 and 20 feet, respectively (CH2M Hill, Inc., 1983; U.S. Department of the Interior, 1975, respectively), and aerial photographs at a scale of 1:9,400 (U.S. Department of Agriculture, 1975).

Near the City of Etna, the 1-percent and 0.2 percent annual chance floodplain boundary on Etna Creek were determined from field observations and cross-section surveys, accounts of 1964 flooding from local residents, and reports describing the 1964 flood (USACE, 1966; U.S. Department of Agriculture, 1971; U.S. Department of Agriculture, 1971), and was delineated using 1971 aerial photographs at a scale of 1:7,900 (U.S. Department of Agriculture, 1971), and a topographic map at a scale of 1:24,000, with a contour interval of 10 feet (U.S. Department of the Interior, 1955). For Johnson Creek, the 1- and 0.2-percent annual chance floodplain boundaries were delineated using the flood elevations determined at each cross section, field observations, a topographic map (U.S. Department of the Interior, 1955), and 1971 aerial photographs (U.S. Department of Agriculture, 1971).

Floodplain boundaries for the Whitney Creek alluvial fan were delineated using USGS topographic maps at a scale of 1:62,500, with a contour interval of 40 feet (U.S. Department of the Interior, 1954).

Floodplain boundaries for the approximate-study areas along the Klamath, Scott, and Shasta Rivers and Indian Creek were determined by review of published reports, field inspections, and review of aerial photographs. They were delineated using topographic maps and Flood Hazard Boundary Maps (USACE, 1966; M. Spearine, 1964; M. Malloy, 1964; Clair A. Hill and Associates, 1966; S. Lindgreen, 1974; U.S. Department of the Interior, 1922; U.S. Department of the Interior, 1974, et cetera; U.S. Department of the Interior, 1955, et cetera; U.S. Department of Housing and Urban Development, 1977).

Detailed topographic mapping for Panther and Squaw Valley Creek was collected using LiDAR technology at a scale that supported 2-foot contours. Additional ground surveys were performed to collect channel cross section and culvert information. The vertical datum was NGVD 1929, the horizontal datum was NAD 1983, and the projection was California State Plane Zone I feet.

Flood hazard zones were developed for Panther and Squaw Valley Creeks by breaking down the study area into subareas that reflected average flooding conditions in each particular location based on average flow depths and overland flow patterns. Most subareas were aggregated into fairly large regions, but several smaller subareas of higher flood hazards were defined where the surrounding region was designated Zone X. Average depths were determined using zonal statistics generated by GIS analysis for each subarea. The flood hazard maps developed in this study replace previous flood maps that were developed by approximate methods and that predicted shallow flooding of less than 1 foot deep.

Approximate floodplain boundaries in other portions of the study area were taken directly from the Flood Hazard Boundary Map (U.S. Department of Housing and Urban Development, 1977).

Approximate Zone A analysis and floodplain mapping was performed by Nolte Engineering in 2008 along the Lost River, near East West Road.

The 1- and 0.2-percent annual chance floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 1-percent annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 0.2-percent annual chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent annual chance floodplain boundaries are close together, only the 1-percent annual chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent annual chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent annual chance flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this FIS are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

Average velocities of flow for the 1-percent annual chance flood in the main channel of the Sacramento River, from the City of Dunsmuir south to the County limits, vary from 10 to 20 feet per second. Because of these hazardous velocities, the floodplain north of the levee is considered included in the floodway. From the Siskiyou County limits upstream to the northern end of the present levee along the east bank of the Sacramento River, for approximately 2,450 feet, a floodway was delineated by equal-conveyance reduction. Within the City of Dunsmuir, due to the hazardous velocities, the entire 1-percent annual chance floodplain is considered included in the floodway and no Floodway Data Table was produced.

The floodways on the Klamath River near Seiad Valley and near Happy Camp were computed using the USGS step-backwater computer program J-635 (U.S. Department of the Interior, May 1977). The floodway includes the main channel and does not increase velocities appreciably. The surcharges generally are less than the 1.0 foot limit because areas included in the floodway fringe are either ponded or shallow-flow areas.

A floodway is generally not appropriate in areas where the stream channel is unstable and stream velocities would be increased by the floodway. Thus, no floodways were prepared for Cottonwood Creek near Hornbrook, Humbug Gulch near the City of Yreka, and Shasta River near Edgewood. A floodway computation was not made for Yreka Creek due to the shallow flooding, the many bridges and culverts already in place, and the extensive development along the channel. Overflow from Humbug Gulch and Greenhorn Creek is shallow and not subject to a floodway determination. No floodway was determined for Johnson Creek near the City of Etna due to the average velocity of flow varying from 5 to 9 feet per second, Moffett Creek upstream of Scott River Road near the Town of Fort Jones, due to broad, shallow flooding, or Seiad Creek near Seiad Valley, because flooding from these sources is shallow sheet flow. Floodway analysis was not applicable on Indian Creek near Happy Camp because of the steep banks and entrenched channel that allow only minimal development potential. No floodways were determined for Boles Creek and North Fork Boles Creek near Weed because the hydraulics of the many culverts generally determine the distribution and extent of flooding, and a floodway would not be practical.

A floodway computation was not made for Etna Creek near the City of Etna because of the unstable channel; however, the main channel of Etna Creek should be kept free of development because of the hazardous average velocity of 8 to 12 feet per second.

Floodways are not applicable for alluvial fan flooding; therefore, a floodway was not determined for Whitney Creek.

The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (Table 6).

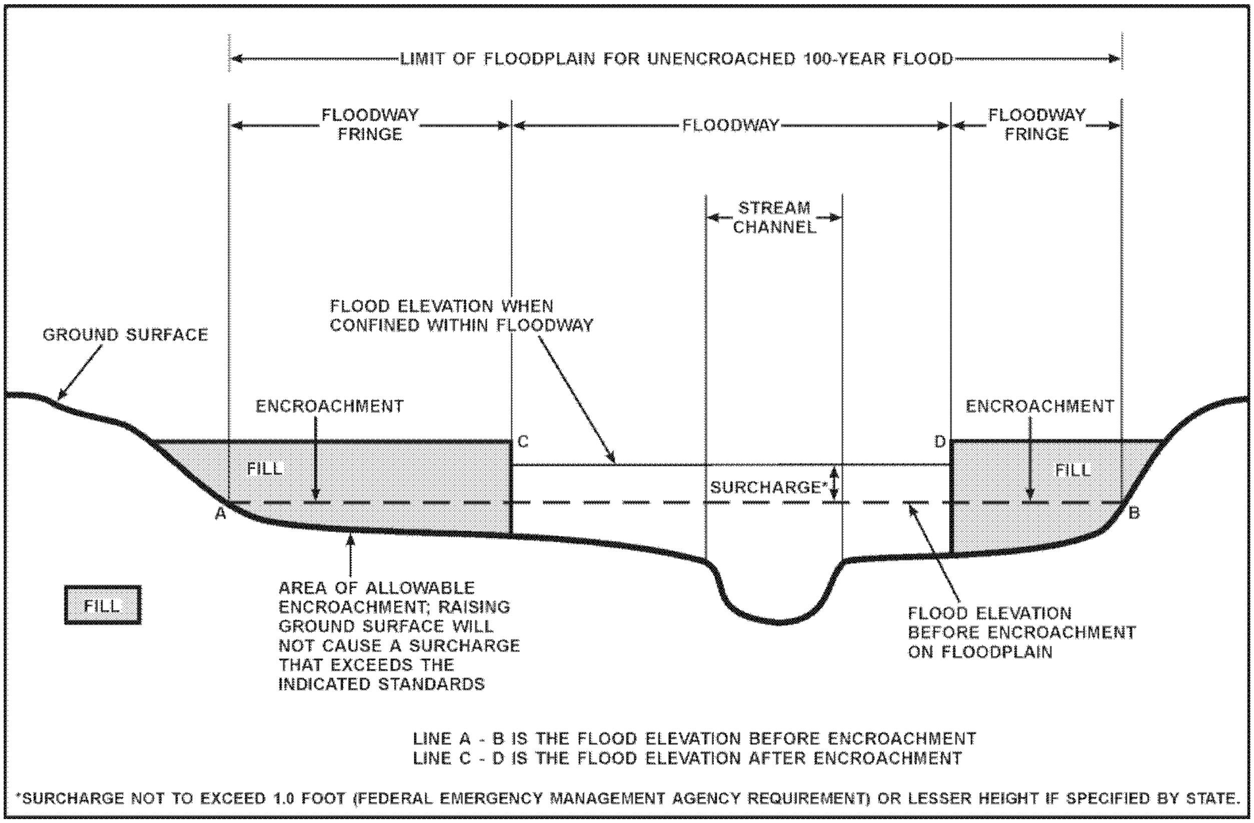
No floodways were determined for Panther Creek and Squaw Valley Creek because of the shallow overland flooding characteristics. However, the 1- and 0.2-percent annual chance flood profiles were developed for Squaw Valley Creek and are presented as flood profiles in this study. Profiles were not developed for Panther Creek and the other small tributaries because of their classification as shallow overland flooding systems during the modeled flood events and because of their relatively low channel conveyance.

Floodway analysis is not appropriate to the floodplains in the City of Montague because only shallow flooding is expected to reach any of the developed portions of the city. The main channel of Oregon Slough should be kept free from encroachment and can be designated as the floodway.

No floodways were determined for the City of Weed because the hydraulics of the many culverts generally determine the distribution and extent of flooding and a floodway would not be practical.

The floodways presented in this FIS were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain.

The area between the floodway and 1-percent annual chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 1-percent-annual-chance flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1, "Floodway Schematic."



FLOODWAY SCHEMATIC Figure 1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Klamath River								
A	198,800	830	20,610	10.67	1,075.4	1,075.4	1,075.4	0.0
B	201,100	770	21,280	10.34	1,077.5	1,077.5	1,077.5	0.0
C	202,800	840	17,330	12.69	1,078.0	1,078.0	1,078.0	0.0
D	204,700	494	11,790	17.13	1,079.9	1,079.9	1,079.9	0.0
E	206,400	564	13,570	14.88	1,084.4	1,084.4	1,084.4	0.0
F	207,400	646	14,270	14.15	1,085.4	1,085.4	1,085.7	0.3
G	208,100	434	9,230	20.01	1,086.4	1,086.4	1,086.5	0.1
H	209,400	678	16,360	24.70	1,092.7	1,092.7	1,092.7	0.0
I	210,500	557	12,020	21.88	1,094.9	1,094.9	1,094.9	0.0
J	211,500	699	13,600	12.79	1,097.6	1,097.6	1,097.6	0.0
K	212,800	798	16,610	10.47	1,099.7	1,099.7	1,099.7	0.0
L	214,800	550	12,630	13.78	1,101.1	1,101.1	1,101.1	0.0
M	216,300	703	14,020	12.41	1,103.1	1,103.1	1,103.1	0.0
N	217,300	812	15,820	11.00	1,104.1	1,104.1	1,104.1	0.0
O	219,400	646	16,230	10.72	1,107.0	1,107.0	1,107.0	0.0
P	221,800	829	12,200	14.27	1,108.3	1,108.3	1,108.3	0.0
Q	223,050	635	13,160	13.22	1,110.7	1,110.7	1,110.7	0.0
R	224,550	858	15,000	11.60	1,112.6	1,112.6	1,112.6	0.0
S	227,000	623	12,780	13.62	1,115.3	1,115.3	1,115.3	0.0
T	334,900	382	8,620	19.1	1,363.4	1,363.4	1,363.4	0.0
U	336,700	541	10,590	14.6	1,369.5	1,369.5	1,369.5	0.0
V	338,500	494	9,140	17.0	1,372.7	1,372.7	1,372.7	0.0
W	341,100	457	8,820	17.6	1,378.1	1,378.1	1,379.0	0.9
X	343,600	451	9,680	16.0	1,386.2	1,386.2	1,386.2	0.0
Y	345,100	580	11,660	13.3	1,390.1	1,390.1	1,390.1	0.0
Z	346,800	560	9,950	15.6	1,393.7	1,393.7	1,394.1	0.4

[1]Feet above county boundary

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

KLAMATH RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Klamath River (continued)								
AA	348,750	354	7,810	19.9	1,400.1	1,400.1	1,400.1	0.0
AB	349,150	583	11,940	13.0	1,405.4	1,405.4	1,405.4	0.0
AC	350,950	473	9,780	15.8	1,408.1	1,408.1	1,408.1	0.0
AD	353,550	469	10,290	14.9	1,413.7	1,413.7	1,413.7	0.0
AE	355,600	489	9,520	16.1	1,416.6	1,416.6	1,416.7	0.1
AF	357,200	483	9,740	15.7	1,420.2	1,420.2	1,420.2	0.0
AG	463,376	316	6,080	15.1	1,677.5	1,677.5	1,678.0	0.5
AH	464,101	418	6,610	13.9	1,680.1	1,680.1	1,680.1	0.0
AI	464,801	638	12,260	7.5	1,684.3	1,684.3	1,684.9	0.6
AJ	465,526	296	6,050	15.2	1,684.4	1,684.4	1,685.0	0.6
AK	466,326	642	12,320	7.5	1,689.7	1,689.7	1,690.6	0.9
AL	467,201	662	11,110	8.3	1,690.1	1,690.1	1,690.9	0.8
AM	468,201	891	12,210	7.5	1,690.9	1,690.9	1,691.8	0.9
AN	468,901	717	10,670	8.6	1,691.3	1,691.3	1,692.1	0.8
AO	469,551	693	7,630	12.1	1,691.3	1,691.3	1,692.1	0.8
AP	470,406	690	11,290	8.1	1,695.0	1,695.0	1,695.7	0.7
AQ	471,201	490	8,640	10.7	1,695.4	1,695.4	1,696.1	0.7
AR	472,046	412	6,710	13.7	1,695.8	1,695.8	1,696.1	0.3
AS	472,726	296	5,390	17.1	1,696.6	1,696.6	1,697.1	0.5
AT	473,566	697	10,780	8.5	1,701.3	1,701.3	1,702.2	0.9
AU	474,366	567	8,990	10.2	1,701.7	1,701.7	1,702.5	0.8
AV	475,951	675	8,910	10.3	1,706.8	1,706.8	1,706.9	0.1
AW	476,926	516	7,020	13.1	1,707.5	1,707.5	1,707.6	0.1
AX	477,826	598	9,270	9.9	1,710.2	1,710.2	1,710.7	0.5
AY	478,701	501	8,820	10.4	1,711.0	1,711.0	1,711.0	0.0
AZ	479,351	430	4,770	19.3	1,711.0	1,711.0	1,711.0	0.0

[1]Feet above county boundary

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

KLAMATH RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Klamath River (continued)								
BA	480,051	1,261	12,710	7.2	1,716.2	1,716.2	1,716.2	0.0
BB	480,806	1,348	14,530	6.3	1,717.0	1,717.0	1,717.5	0.5
BC	481,446	1,105	14,430	6.4	1,717.6	1,717.6	1,718.1	0.5
BD	482,096	368	6,490	14.2	1,717.6	1,717.6	1,718.1	0.5
BE	482,751	407	6,110	15.1	1,719.9	1,719.9	1,719.9	0.0
BF	483,376	353	5,984	15.6	1,722.3	1,722.3	1,722.6	0.3
BG	484,036	783	14,270	6.4	1,728.5	1,728.5	1,729.5	1.0
BH	484,636	651	10,720	8.6	1,728.7	1,728.7	1,729.6	0.9
BI	485,236	677	10,460	8.8	1,729.3	1,729.3	1,730.2	0.9
BJ	485,796	474	9,150	10.0	1,729.6	1,729.6	1,730.4	0.8
BK	486,296	384	6,840	13.4	1,729.6	1,729.6	1,730.4	0.8

[1]Feet above county boundary

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

KLAMATH RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Moffett Creek								
A	1,820[1]	950	1,640	4.9	2,723.3	2,723.3	2,724.2	0.9
B	2,560[1]	1,200	1,720	4.7	2,726.7	2,726.7	2,727.7	1.0
C	2,690[1]	1,500	5,070	1.6	2,728.8	2,728.8	2,729.8	1.0
D	2,920[1]	1,190	2,680	3.1	2,728.8	2,728.8	2,729.8	1.0
E-K**								
Sacramento River								
A	0[2]	200/50[3]	1,450	18.62	2,170.8	2,170.8	2,170.8	0.0
B	130[2]	200	2,170	12.44	2,173.9	2,173.9	2,173.9	0.0
C	990[2]	160	1,540	17.53	2,181.1	2,181.1	2,181.1	0.0
D	2,030[2]	280	2,110	12.80	2,191.2	2,191.2	2,191.2	0.0
E-AF**								
Scott River								
A	0[4]	1,380	10,780	4.5	2,713.3	2,713.3	2,714.1	0.8
B	820[4]	820	9,080	5.4	2,713.8	2,713.8	2,714.6	0.8
C	1,480[4]	340	3,740	13.1	2,713.8	2,713.8	2,714.6	0.8
D	2,480[4]	640	5,160	9.5	2,717.8	2,717.8	2,718.7	0.9
E	5,005[4]	860	7,550	5.4	2,724.2	2,724.2	2,725.2	1.0
F	5,625[4]	1,020	11,420	3.6	2,725.0	2,725.0	2,726.0	1.0
G	6,325[4]	1,510	17,460	2.3	2,725.3	2,725.3	2,726.3	1.0
H	7,405[4]	3,950	37,400	1.1	2,726.2	2,726.2	2,727.2	1.0
I	8,205[4]	4,560	41,700	1.0	2,726.2	2,726.2	2,727.2	1.0

[1]Feet above confluence with Scott River
[2]Feet above county boundary
[3]Width/width within Siskiyou County Limits
[4]Feet above Limit of Detailed Study*
*Limit of Detailed Study is approximately 7,360 feet downstream of State Highway 3
**Data not available

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

MOFFETT CREEK – SACRAMENTO RIVER – SCOTT RIVER

5.0 INSURANCE APPLICATIONS

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

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS 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 1-percent-annual-chance floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 1-percent-annual-chance 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.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone AR

Area of special flood hazard formerly protected from the 1-percent-annual-chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1-percent-annual-chance or greater flood event.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 1-percent-annual-chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, and to areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent annual chance floodplains that were studied by detailed methods, shows selected whole-foot 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 1- and 0.2-percent annual chance floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

The current FIRM presents flooding information for the entire geographic area of Siskiyou County. Previously, separate Flood Hazard Boundary Maps and/or FIRMs were prepared for each identified flood-prone incorporated community of the county. This countywide FIRM also includes flood hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community, up to and including this countywide FIS, are presented in Table 7, "Community Map History."

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Dorris, City of[1]	None	None	None	
Dunsmuir, City of	May 24, 1974	October 10, 1975	December 4, 1979	
Etna, City of	February 22, 1974	February 6, 1976	March 4, 1980	
Fort Jones, Town of	April 5, 1974	April 16, 1976	April 15, 1980	
Montague, City of	March 26, 1976	None	September 17, 1980	
Mt. Shasta, City of[1]	None	None	None	
Siskiyou County (Unincorporated Areas)	November 15, 1977	None	May 17, 1982	May 19, 1987
Tulelake, City of[1]	None	None	None	
Weed, City of	January 20, 1981	None	January 20, 1982	
Yreka, City of	March 22, 1974	February 27, 1976	November 18, 1981	

[1]Non-floodprone community

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

Because it is based on more up-to-date analyses, this FIS supersedes the previously printed FISs for the communities within Siskiyou County.

Information pertaining to revised and unrevised flood hazards for each jurisdiction within Siskiyou County has been compiled into this FIS. Therefore, this FIS supersedes all previously printed FIS Reports, FHBMs, FBFMs, and FIRMs for all of the incorporated areas within Siskiyou County and should be considered authoritative for purposes of the NFIP.

This countywide FIS has been compiled from information taken from the following previously printed FIS Reports: The Cities of Etna (FEMA, 1979), Dunsmuir (FEMA, 1979), Montague (FEMA, 1980), Weed (FEMA, 1981), and Yreka (FEMA, 1981), the Town of Fort Jones (FEMA, 1979), and the County of Siskiyou (FEMA, 1987).

The results of this study generally agree with the approximate delineation of flooded areas shown on the Flood Hazard Boundary Map for Siskiyou County (Ref 48), on the Scott Valley zoning plan map (Ref 49), and on the maps of the Klamath and Scott rivers in a USACE report on the flood of December 1964 (Ref 30).

Results of this study in the vicinity of Etna do not conflict with those in a reconnaissance-level study done by the USACE (Ref 12) or with an approximate delineation of flooding done by the SCS (Ref 27).

Flooding shown on Humbug Gulch, Greenhorn Creek, and on Yreka Creek in the vicinity of Yreka agrees with that shown on a flood plain information map (Ref 10) prepared by USACE.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this FIS can be obtained by contacting FEMA, Federal Insurance and Mitigation Division, 1111 Broadway, Suite 1200, Oakland, California 94607-4052.

9.0 BIBLIOGRAPHY AND REFERENCES

California Department of Transportation. (November 1947, Revised 1952). Topographic Maps, Road II-SIS-3-A, Scale 1:1,200, Contour Interval 5 feet.

CH2M Hill, Inc. (November 1983). Topographic Maps, Klamath River, Scott River, and Moffett Creek, Scale 1:4,800, Contour Interval 5 feet.

Clair A. Hill and Associates, Consulting Engineers. (McCloud, California, 1966). Topographic Maps, Scale 1:2,400, Contour Interval 5 feet.

Clair A. Hill and Associates, Consulting Engineers. (January 1964). Topographic Maps 11-SIS-5 for Interstate Highway 5, Scale 1:600, Contour Interval 2 feet.

Computer Program A-526, Preparation of Input Data for Automatic Computation of Stage-Discharge Relations at Culverts, 1969.

D. A. Van Heest. (January 15-16, 1974). Flood Photos of Dunsmuir.

David Dawdy. (November 1979). "Flood Frequency Estimates on Alluvial Fans," Journal of the Hydraulics Division, American Society of Civil Engineers, Volume 105.

"Dunsmuir Flood Damages." (January 23, 1974). Dunsmuir News.

Federal Emergency Management Agency. (November 18, 1981). Flood Insurance Study, City of Yreka, Siskiyou County, California.

Happy Camp Sanitary District. (March 1977). Sewerage System Map, Sheets 7 through 11, Scale 1:1,200, Contour Interval 2 feet. Siskiyou County, California.

M. Malloy. (December 1694). Flood Photos of Seiad Valley, California.

M. Spearine. (December 1964). Flood Photos of Hornbrook, California.

Open-File Report 76-499, User's Manual for Computer Program E-431: Computer Applications for Step-Backwater and Floodway Analysis, 1976.

Piemme and Bryan, Inc., Montague City Engineer. (August 15, 1978). Telephone conversation with Jim Bray.

Piemme and Bryan, Inc. (January 1974). Flood Photos of Yreka, California.

S. Lindgreen. (January 1974). Flood Photos of Siskiyou County, California.

Siskiyou County Public Works Department. (August 30, 1978). Telephone conversation with Len Alexander.

State of California, Department of Transportation. (April 1975). Site of Proposed Seiad Valley Airport, Topographic Maps, Scale 1:1,200, Contour Interval 2 feet.

State of California, Department of Water Resources. (March 15, 1974). Personal Correspondence, "Effect of Box Canyon Dam and Lake Siskiyou on Flood Peak in Dunsmuir." Gene Serr (author). Red Bluff, California.

State of California, Department of Transportation. (1964). Topographic Maps, Road II-SIS-5, Scale 1:600, Contour Interval 2 feet.

State of California, Department of Transportation. (November 1947, Additional Topography, 1952). Topographic Maps, Road II SIS-3-A, Scale 1:1,200, Contour Interval 5 feet.

U.S. Army Corps of Engineers, Hydrologic Engineering Center. (March 1977). HEC-2 Water-Surface Profiles, Generalized Computer Program.

U.S. Army Corps of Engineers. (November 1976). Floodplain Information, City of Yreka, Flooded Areas Map, Scale 1:6,000, Water-Surface Profiles, Siskiyou County, California.

U.S. Army Corps of Engineers. (1966). Reconnaissance Investigation, Etna Creek, Siskiyou County, California.

U.S. Army Corps of Engineers. (December 1965). Report on Floods of December 1964 in Northern California Coastal Streams, Volume 2. San Francisco, California.

U.S. Army Corps of Engineers. (July 1965). High Water Marks Data for Klamath River, Upper Portion, Flood of December 1964. San Francisco, California.

U.S. Department of Agriculture, Soil Conservation Service. (October 1978). Preliminary Manuscript of Siskiyou County Soils Survey. Joseph G. Gahnke (author). Yreka, California.

U.S. Department of Agriculture, Forest Service. (Fort Jones, California, 1975). Aerial Photographs, Scale 1:9,400.

U.S. Department of Agriculture, Forest Service. (Edgewood, California, 1975). Aerial Photograph, Scale 1:10,100.

U.S. Department of Agriculture, Forest Service. (Seiad Valley, California, 1975). Aerial Photographs, Scale 1:10,300.

U.S. Department of Agriculture, Forest Service. (Happy Camp, California, 1974). Aerial Photographs, Scale 1:8,500.

U.S. Department of Agriculture, Soil Conservation Service. (1973). Inventory and Evaluation, Sewage Utilization Proposal, City of Montague and Meamber Ranch Project.

U.S. Department of Agriculture, Soil Conservation Service. (City of Etna, California, 1971; Hornbrook, California, 1971). Aerial Photographs, Scale 1:7,900.

U.S. Department of Agriculture. (September 1971). Watershed Investigation Report for Etna Creek, Siskiyou County, California.

U.S. Department of Agriculture, Soil Conservation Service. (May 11, 1971). Aerial Photograph of Montague, California, Scale 1:7,920.

U.S. Department of Agriculture, Soil Conservation Service. (July 1965). Flood Damage Report for Storms of December 21, 1964, to January 4, 1965. San Francisco, California.

U.S. Department of Agriculture, Forest Service. (Dunsmuir, California, 1955). Aerial Photographs, Scale 1:9,400.

U.S. Department of Commerce, Weather Bureau. (January 1965). Climate of Siskiyou County.

U.S. Department of Housing and Urban Development, Federal Insurance Administration. (November 15, 1977). Flood Hazard Boundary Map, Siskiyou County, California (Unincorporated Areas), Scale 1:24,000.

U.S. Department of the Interior, Geological Survey. (June 1977). Water-Resources Investigations 77-21, Magnitude and Frequency of Floods in California. A. O. Waananen and J. R. Crippen (authors).

U.S. Department of the Interior, Geological Survey. (May 1977). Computer Program J-635, Users Manual: Step Backwater and Floodway Analysis. J. O. Sherman (author).

U.S. Department of the Interior, Geological Survey. (1976). Open-File Report 76-499, Users Manual for Computer Program E-431: Computer Applications for Step-Backwater and Floodway Analysis.

U.S. Department of the Interior, Forest Service. (1975). Aerial Photographs, Dunsmuir, California, Scale 1:9,400.

U.S. Department of the Interior, Geological Survey. (Fort Jones, California, 1975). 15-Minute Series Topographic Maps, Scale 1:62,500, Contour Interval 20 feet.

U.S. Department of the Interior, Geological Survey. (Happy Camp NW, California, 1974; Happy Camp SW, California, 1974; Happy Camp SE, California, 1974; Seiad Valley SW, California, 1974; Seiad Valley SE, California, 1974; Ukonom Lake NW, California, 1974; Ukonom Valley SW, California, 1974; Scott Bar NE, California, 1974; Bark Shanty Gulch, California, 1974; Forks of Salmon NW, California, 1974). 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Intervals 40 or 80 feet.

U.S. Department of the Interior, Geological Survey. (1965). Water-Resources Data for California, Part I, Surface-Water Records, Vol. 2.

U.S. Department of the Interior, Geological Survey. (1957). Plan and Profile of the Klamath River, Scale 1:24,000, Contour Interval 20 feet.

U.S. Department of the Interior, Geological Survey. (Contour Interval 80 feet: Dunsmuir, California, 1955; Hornbrook, California, 1955; Condrey Mountain, California, 1955; Fort Jones, California,1955; Yreka, California, 1954; Dillon Mountain, 1955; Etna, California, 1955; Weed, California, 1954; Contour Interval 40 feet: Copco, California, 1954; Macdoel, California, 1954). 15-Minute Series Topographic Maps, Scale 1:62,500, Contour Interval 80 feet.

U.S. Department of the Interior, Geological Survey. (Etna, California, 1955). 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 10 feet.

U.S. Department of the Interior, Geological Survey. (Lake Shastina, California, 1954). 15-Minute Series Topographic Maps, Scale 1:62,500, Contour Interval 40 feet.

U.S. Department of the Interior, Geological Survey. (Yreka, California, 1954; Hornbrook, California, 1955; Lake Shastina, California, 1954; and Copco, California, 1954). 15-Minute Series Topographic Maps, Scale 1:48,000, Contour Interval 40 feet.

U.S. Department of the Interior, Geological Survey. (1939). Water-Supply Paper 843, The Floods of December 1937 in Northern California.

U.S. Department of the Interior, Geological Survey. (Yreka, California, 1922; Lake Shastina, California, 1922; Shasta Valley, California, 1922). 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 5 feet.

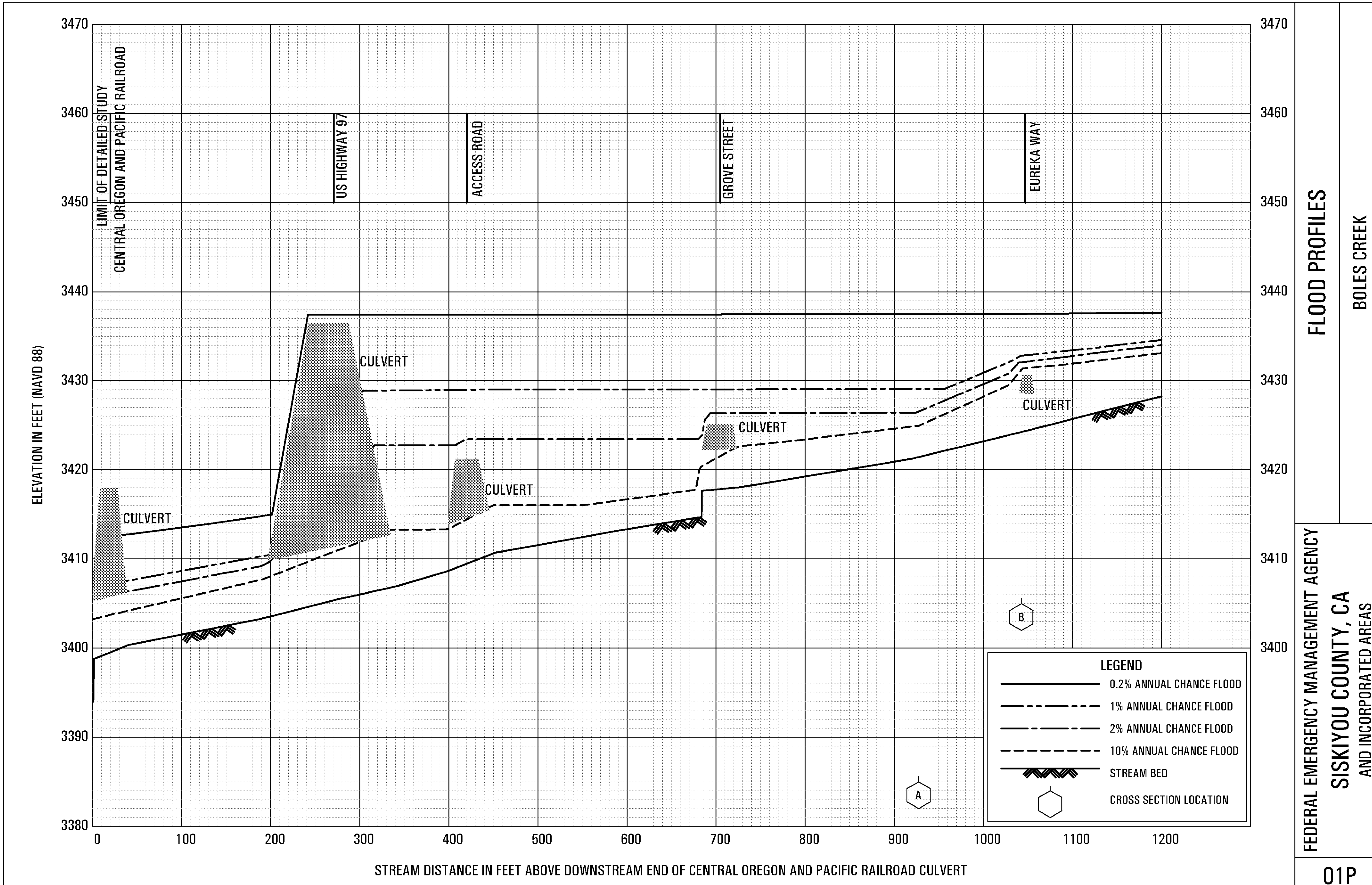
V. Brown and D. Hoover. (1967). The California Wildlife Map Book. Healdsburg, California.

Vail, Lounsbury, and Associates. (September 1974). Siskiyou County Drainage Manual, Appendix A, "Peak Flood Flows for Selected Watersheds and Concentration Points." Fair Oaks, California.

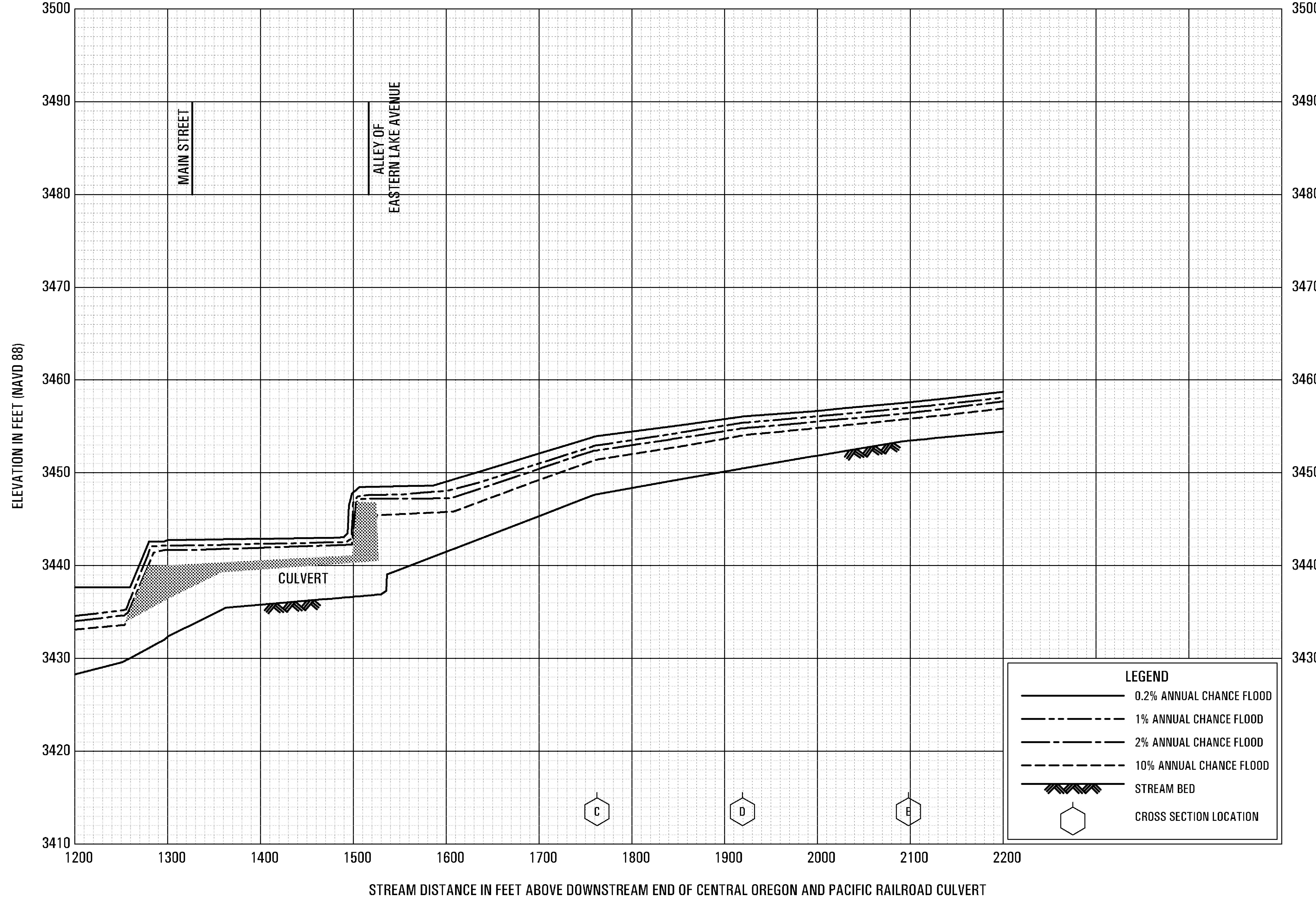
Water Resources Council. (September 1981). "Guidelines for Determining Flood Flow Frequency," Bulletin 17B.

Water Resources Council. (March 1976). "Guidelines for Determining Flood Flow Frequency," Bulletin 17.

Yreka Western Railroad. (September 7, 1978). Telephone conversation with Bud Sargent, General Manager.



FLOOD PROFILES
BOLES CREEK
FEDERAL EMERGENCY MANAGEMENT AGENCY
SISKIYOU COUNTY, CA
AND INCORPORATED AREAS
01P
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE DOWNSTREAM END OF CENTRAL OREGON AND PACIFIC RAILROAD CULVERT
LIMIT OF DETAILED STUDY
CENTRAL OREGON AND PACIFIC RAILROAD
US HIGHWAY 97
ACCESS ROAD
GROVE STREET
EUREKA WAY
CULVERT
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
A
B
3380
3390
3400
3410
3420
3430
3440
3450
3460
3470
0
100
200
300
400
500
600
700
800
900
1000
1100
1200



FLOOD PROFILES

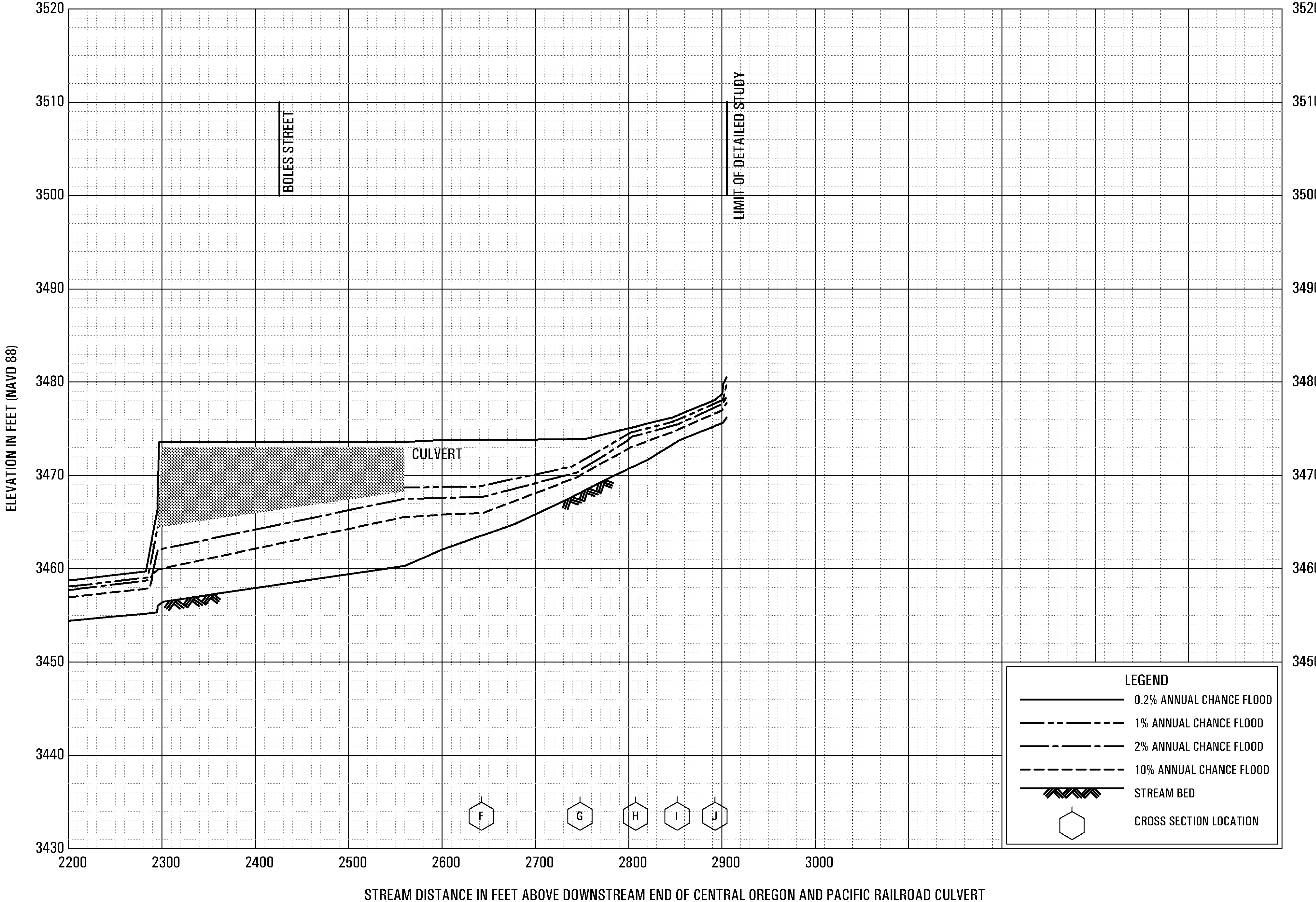
BOLES CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS

02P



FLOOD PROFILES

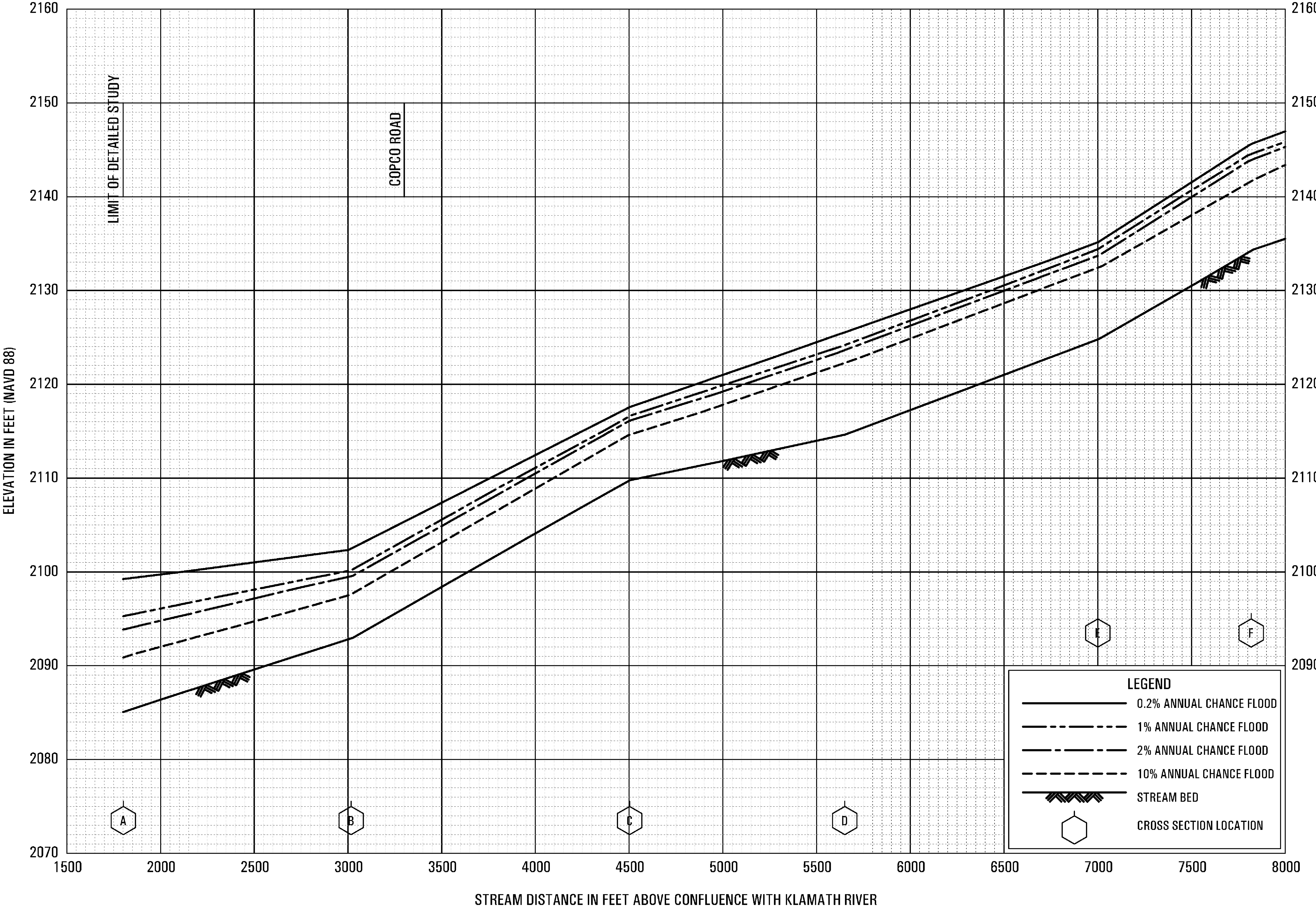
BOLES CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS

03P



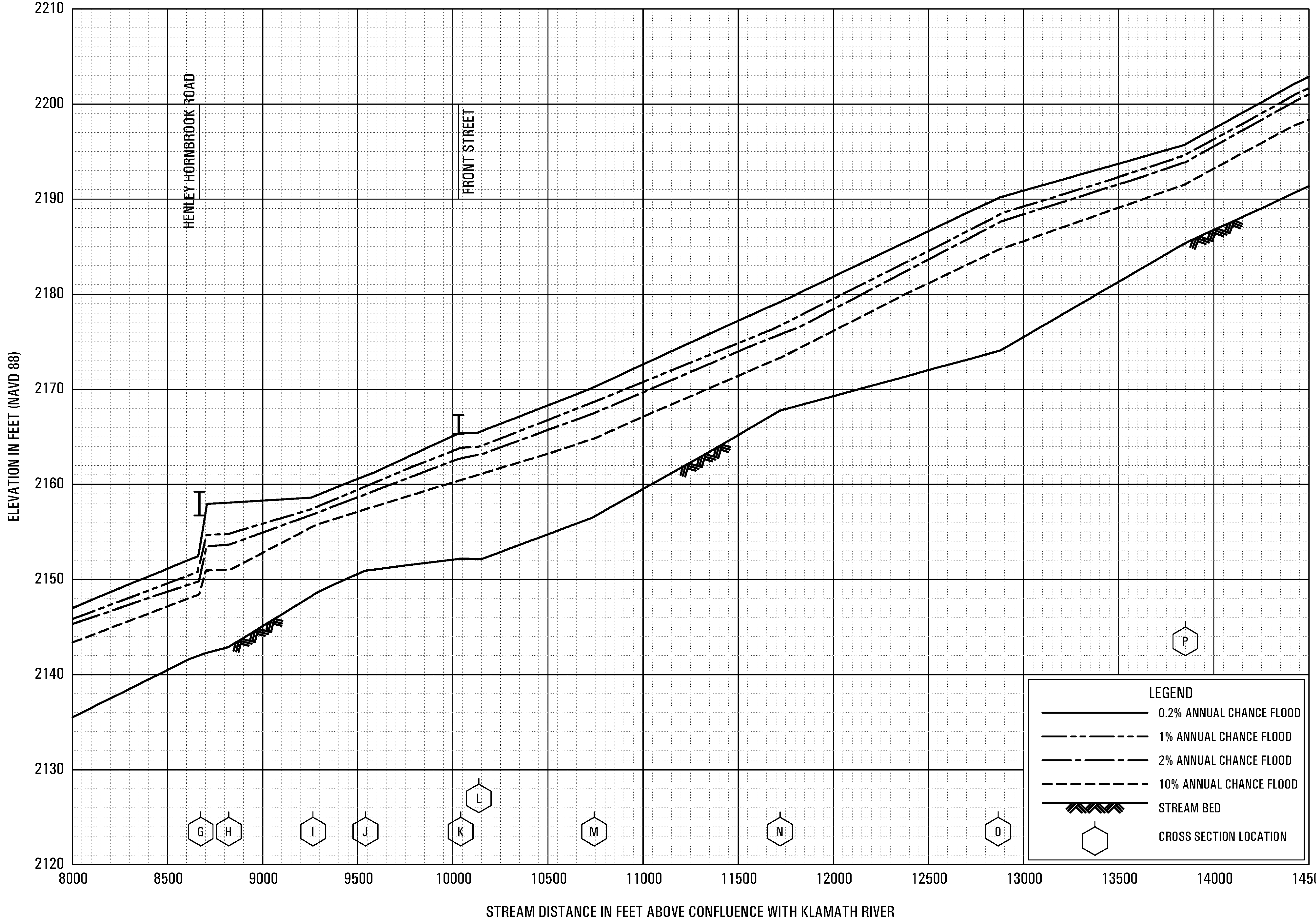
FLOOD PROFILES

COTTONWOOD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



FLOOD PROFILES

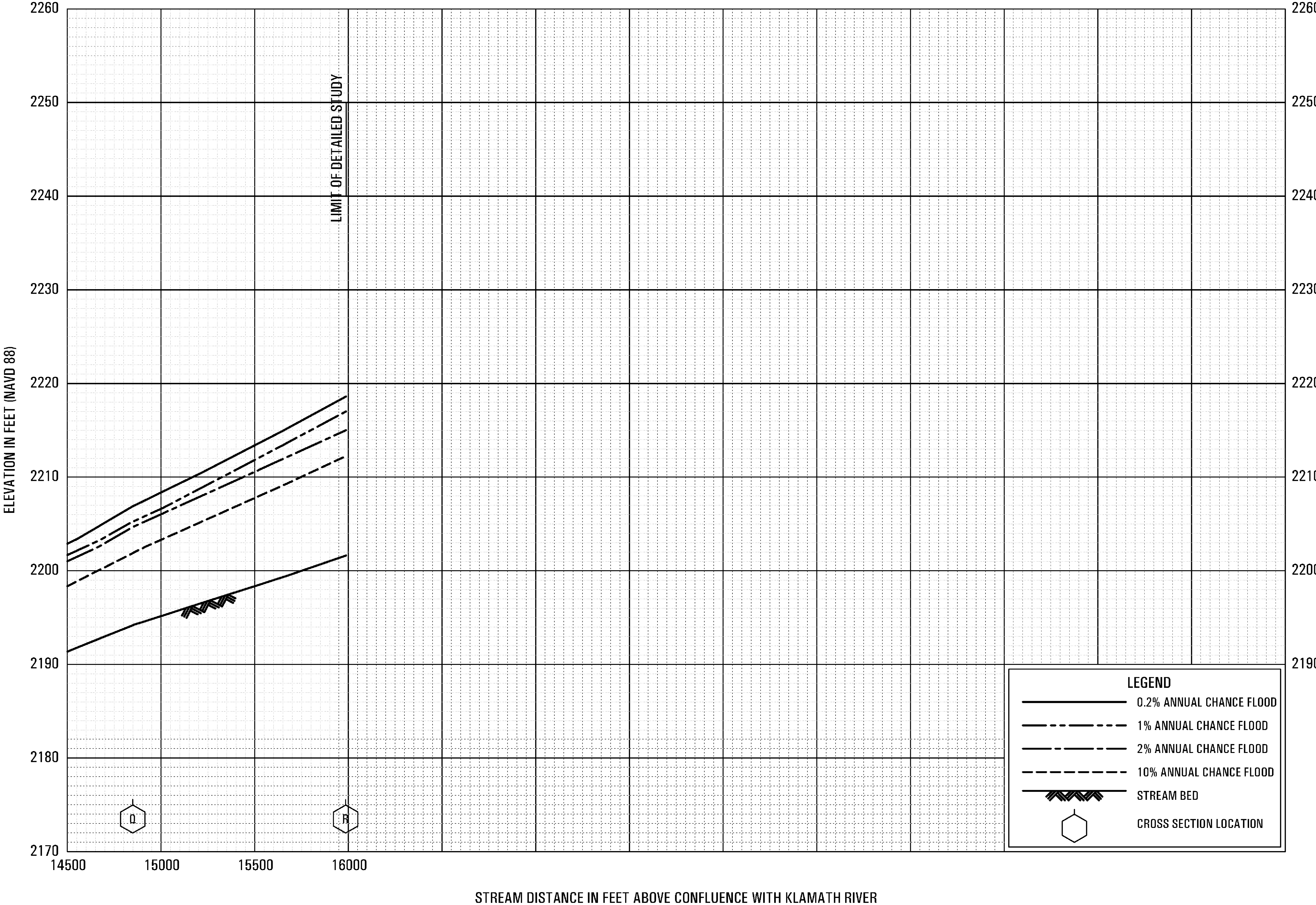
COTTONWOOD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS

05P



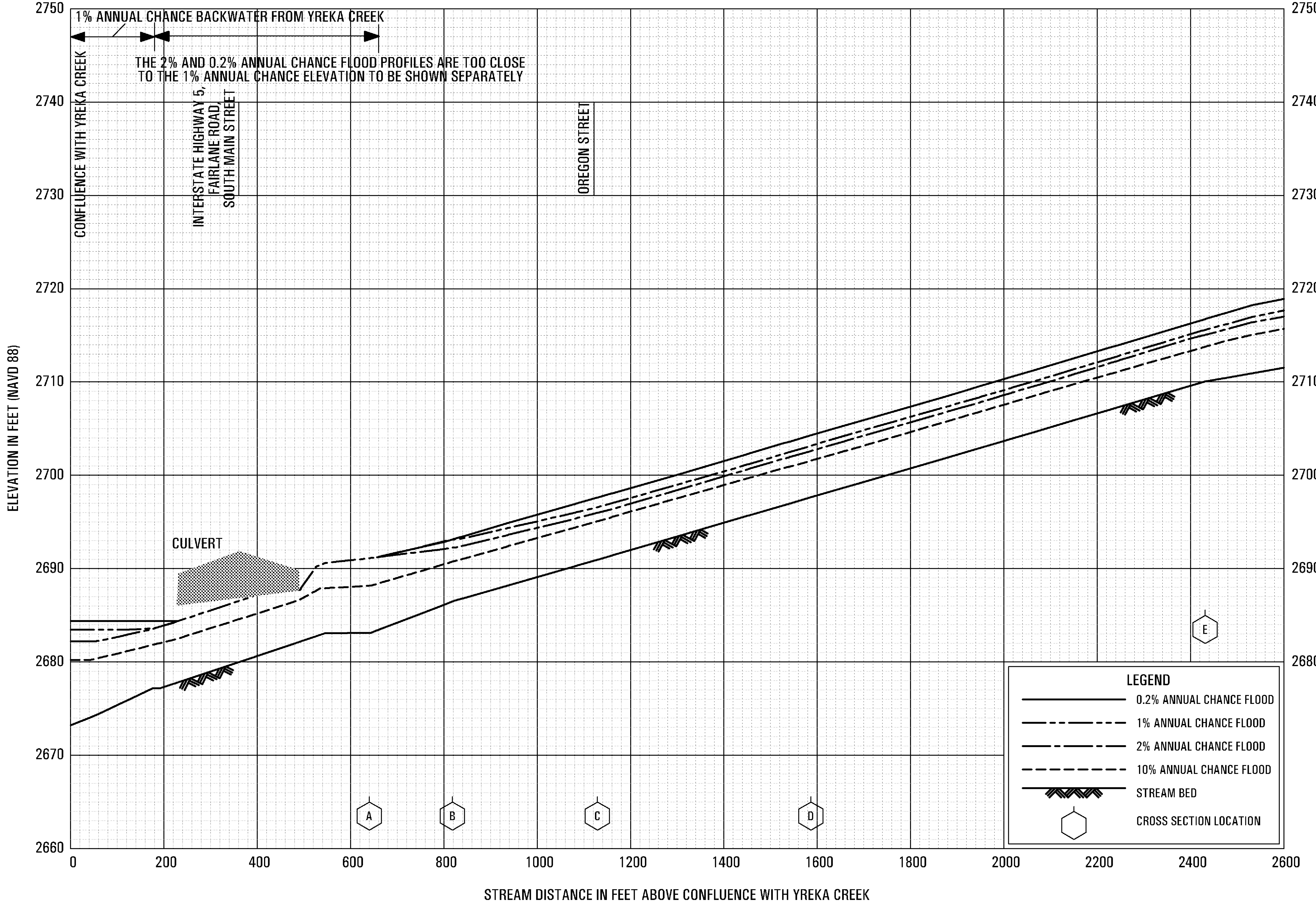
FLOOD PROFILES

COTTONWOOD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



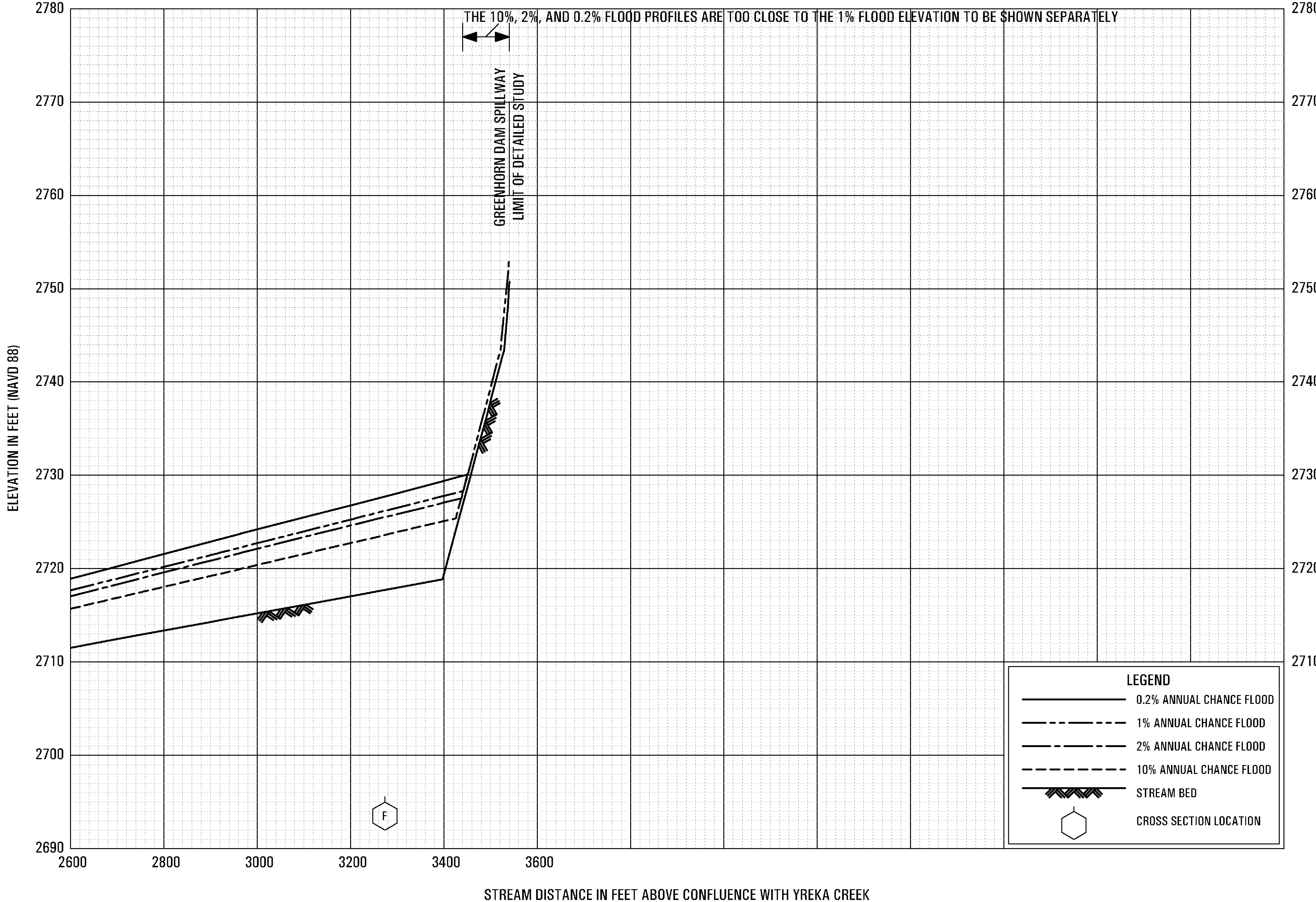
FLOOD PROFILES

GREENHORN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



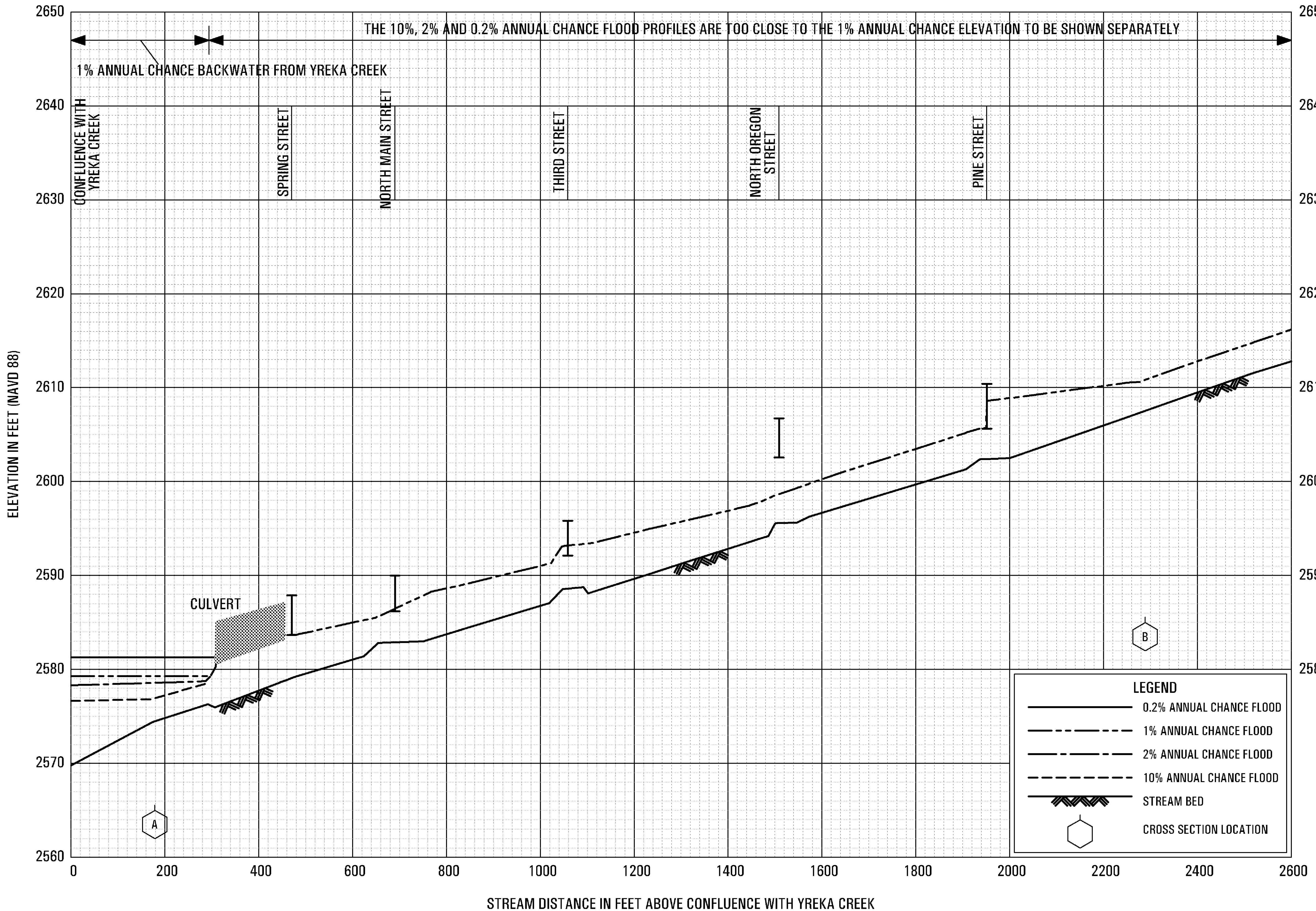
FLOOD PROFILES

GREENHORN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



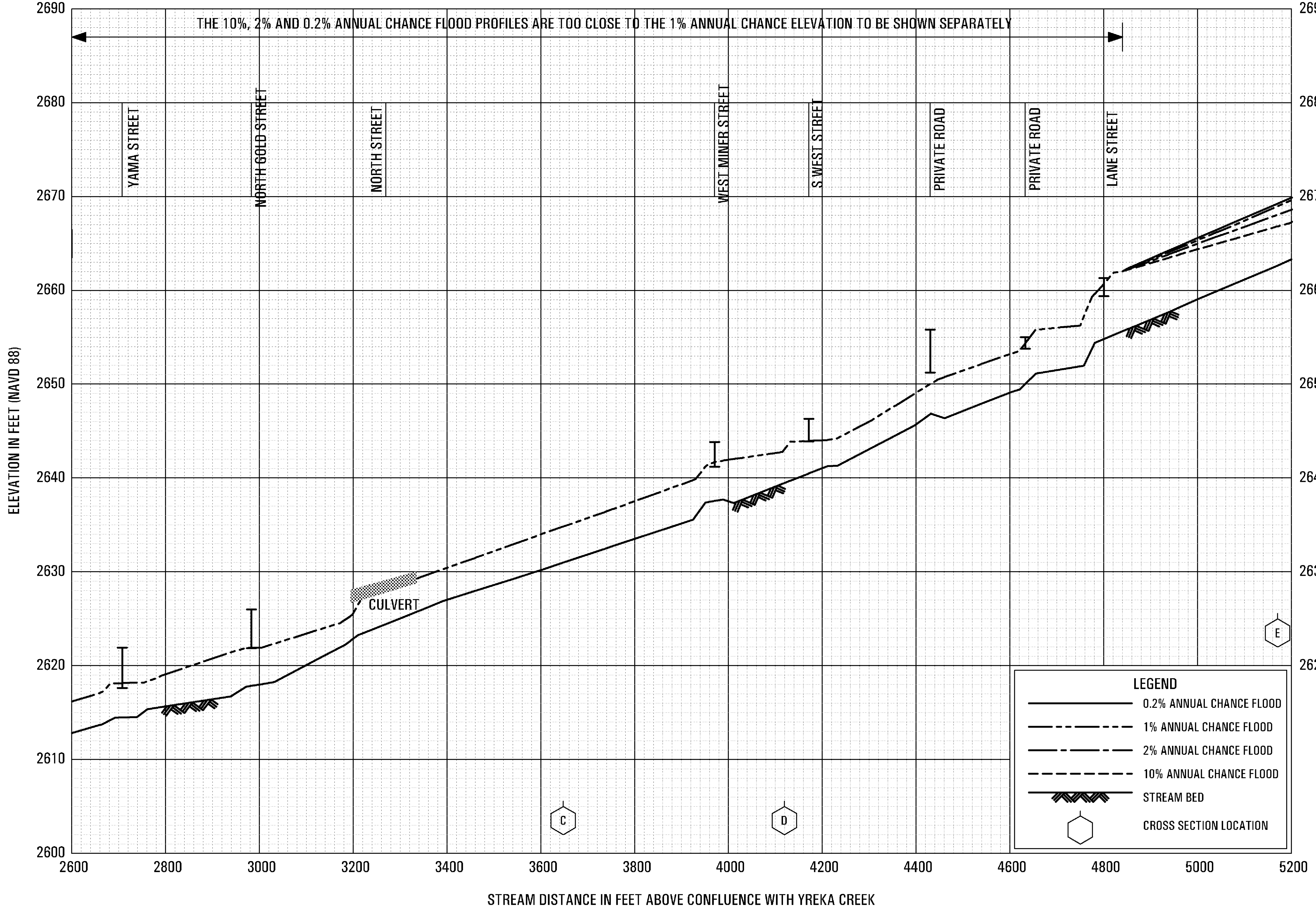
FLOOD PROFILES

HUMBUG GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA
AND INCORPORATED AREAS

09P



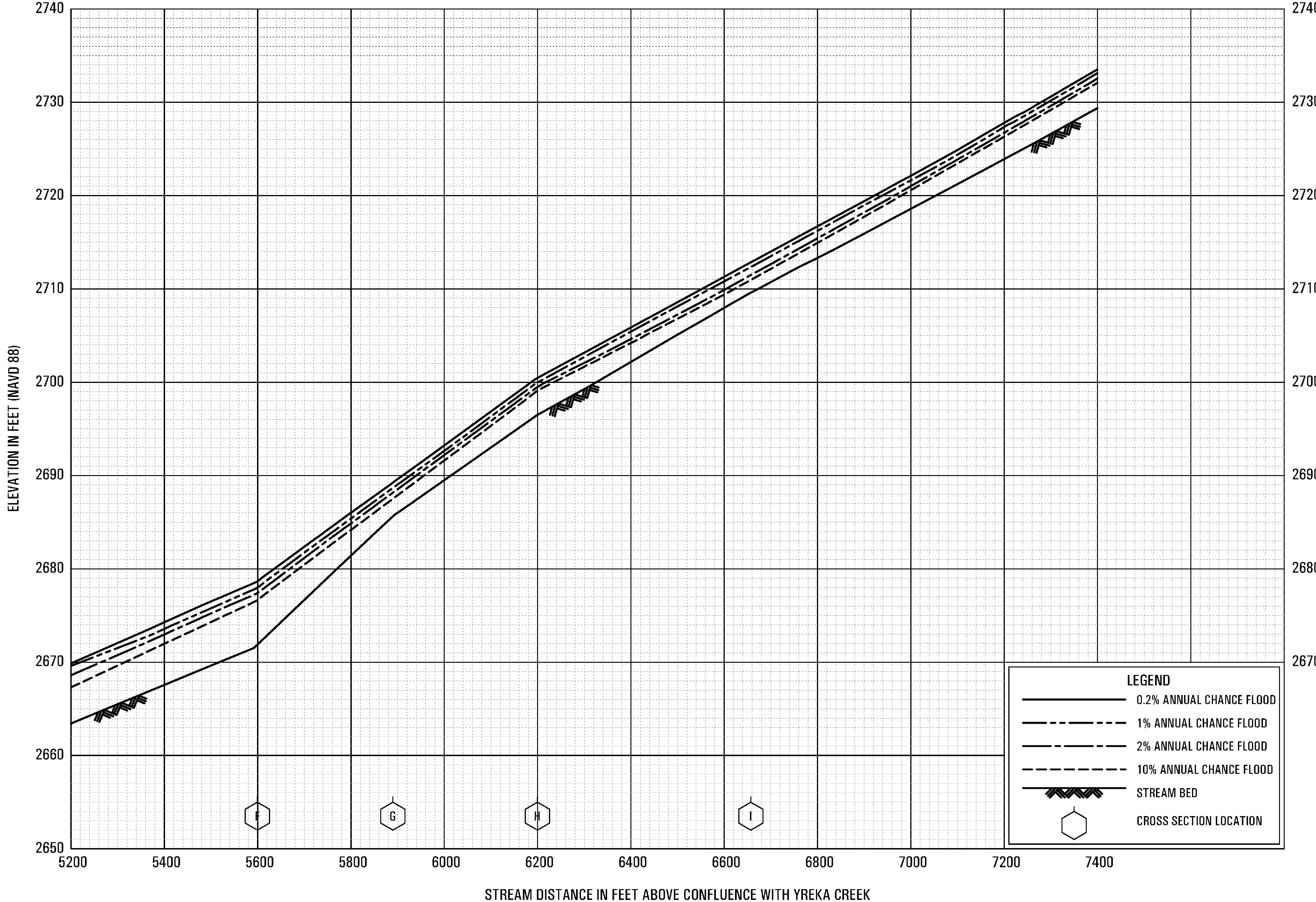
FLOOD PROFILES

HUMBUG GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



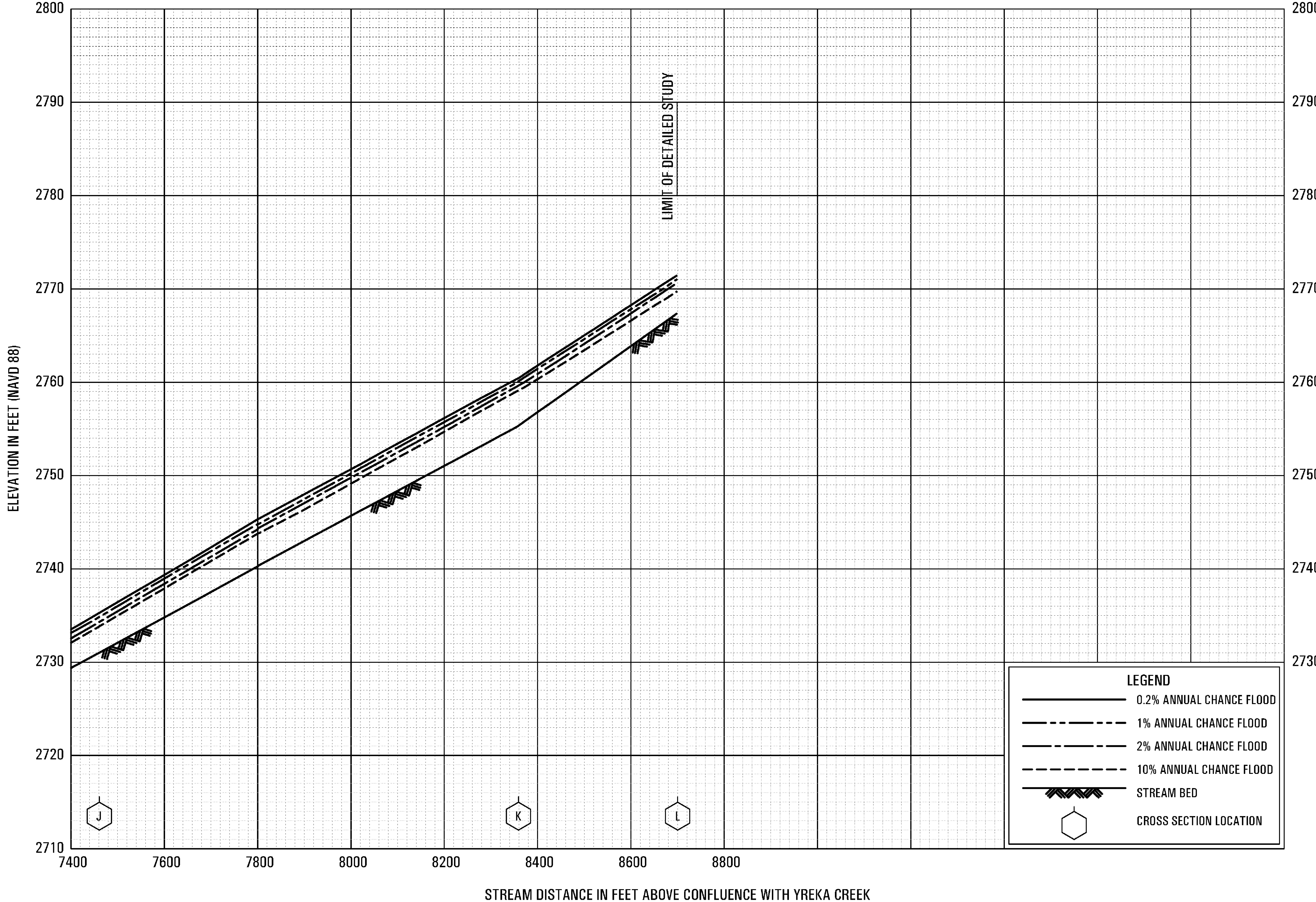
FLOOD PROFILES

HUMBUG GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



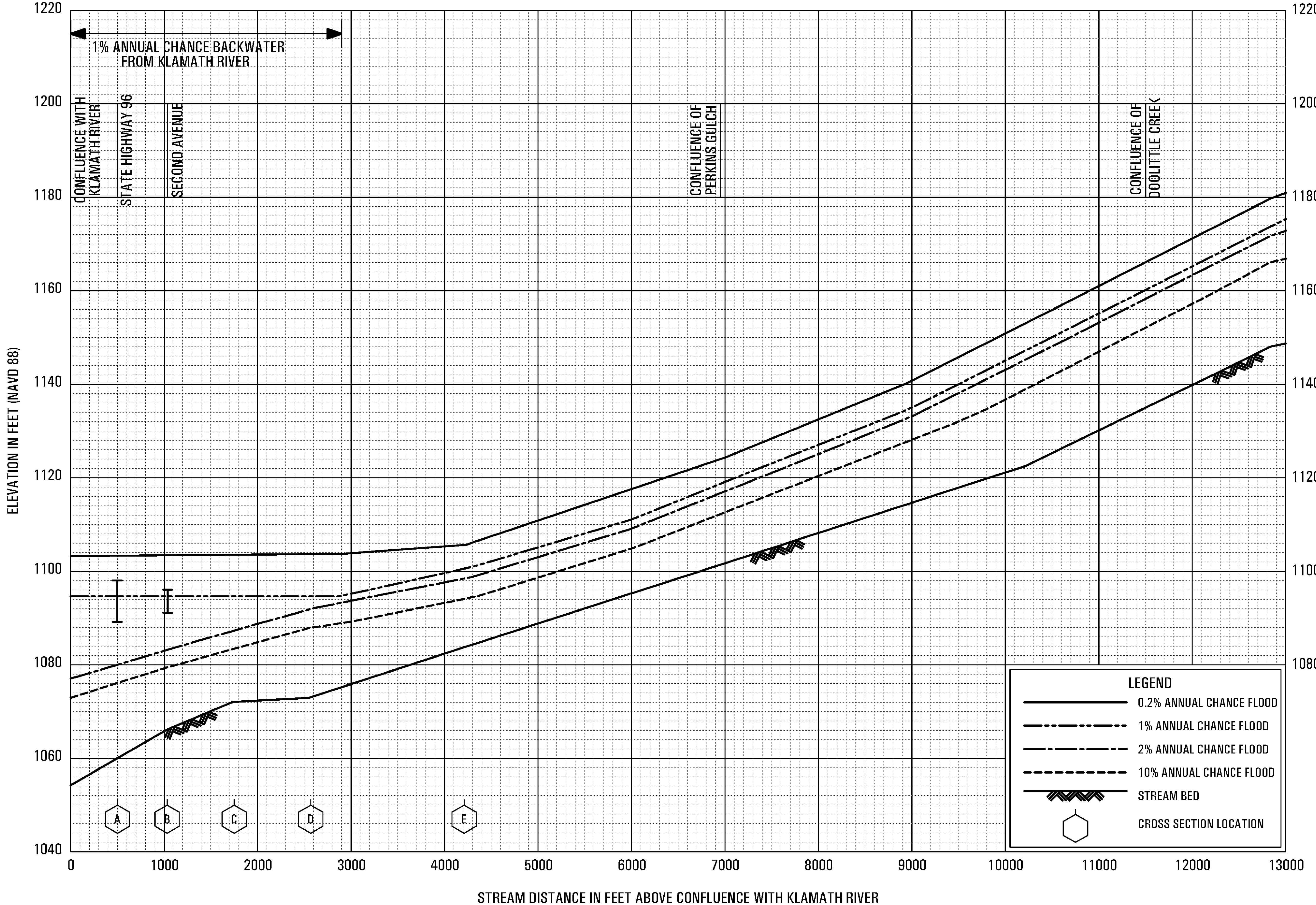
FLOOD PROFILES

HUMBUG GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



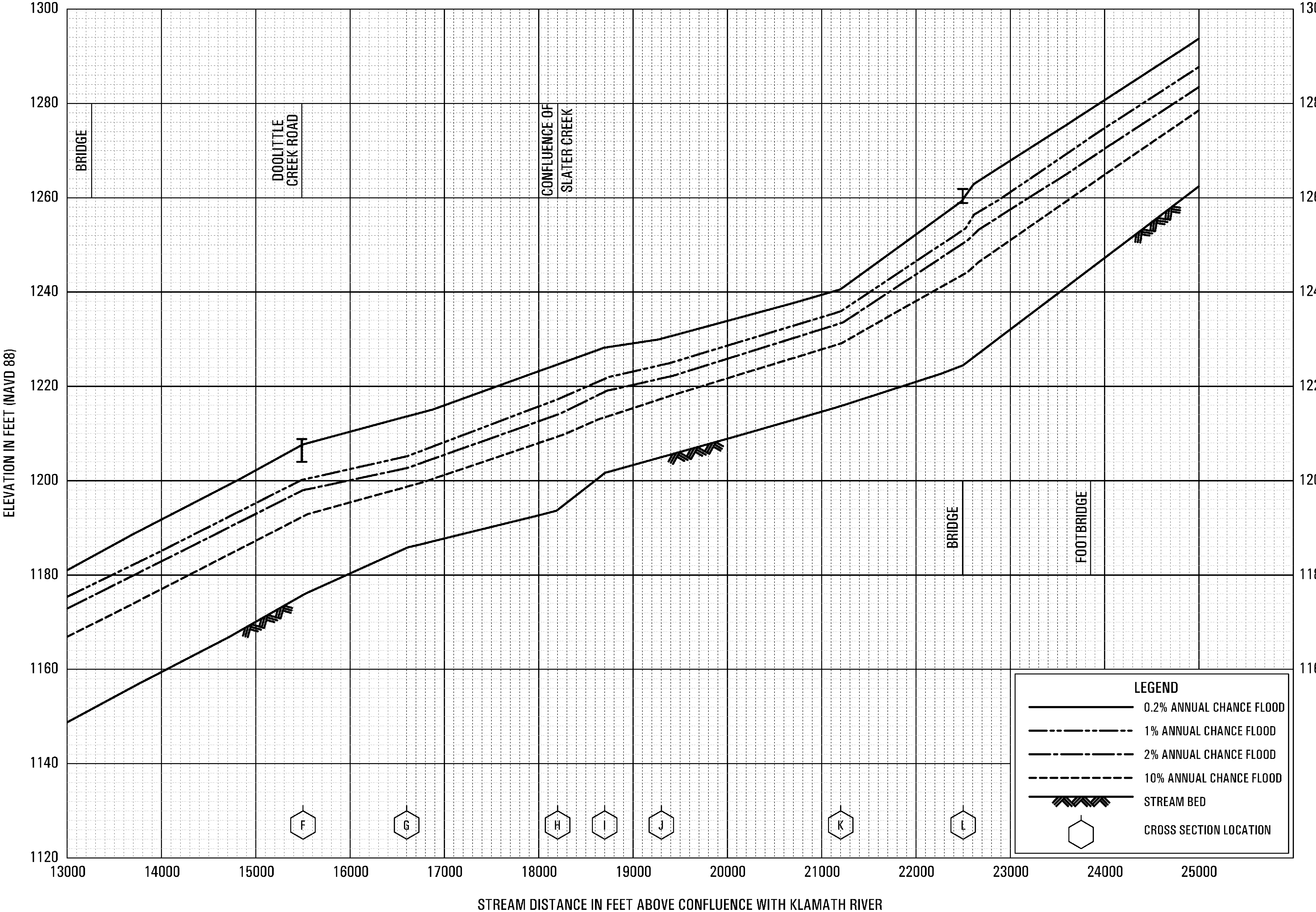
FLOOD PROFILES

INDIAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



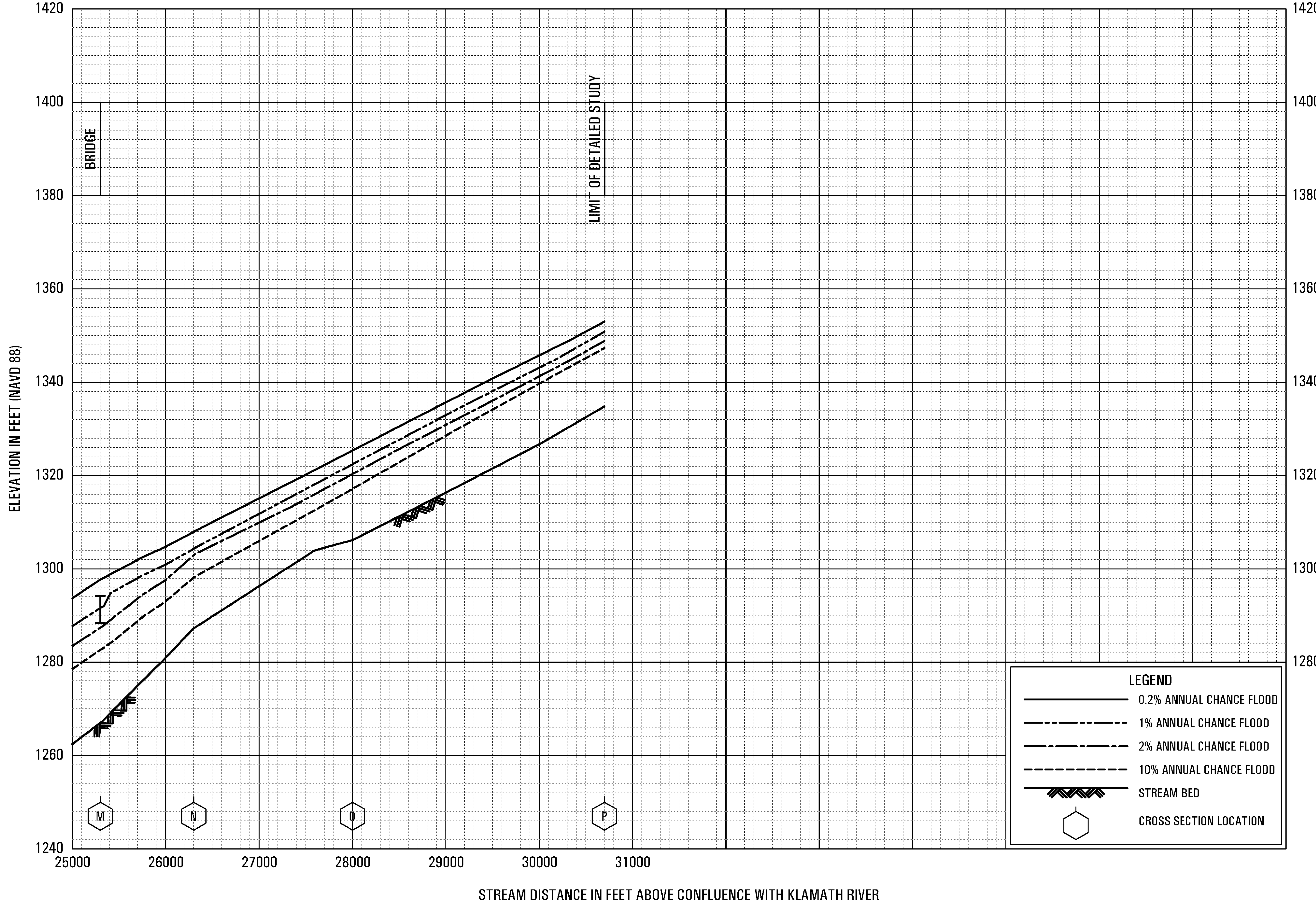
FLOOD PROFILES

INDIAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



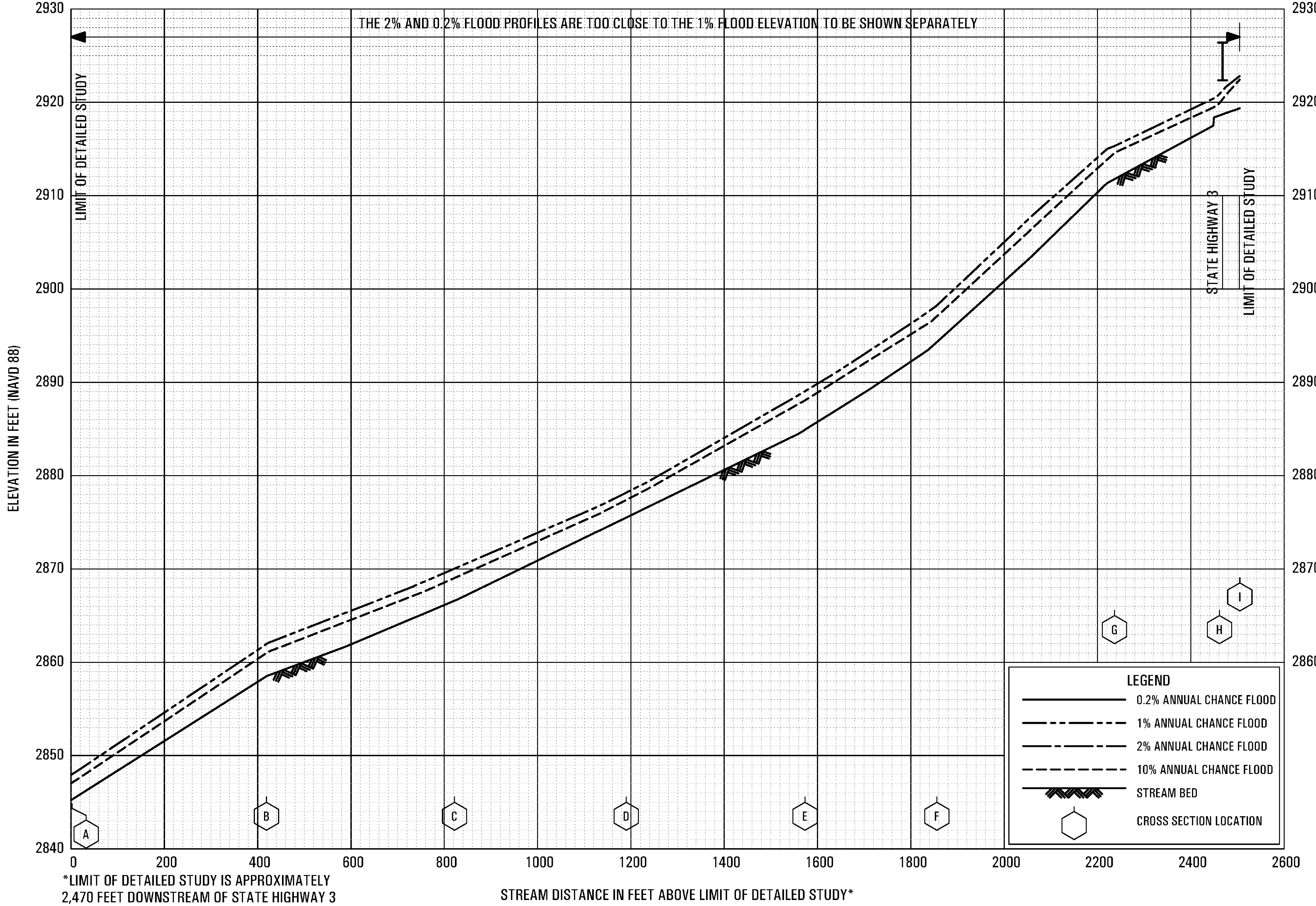
FLOOD PROFILES

INDIAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



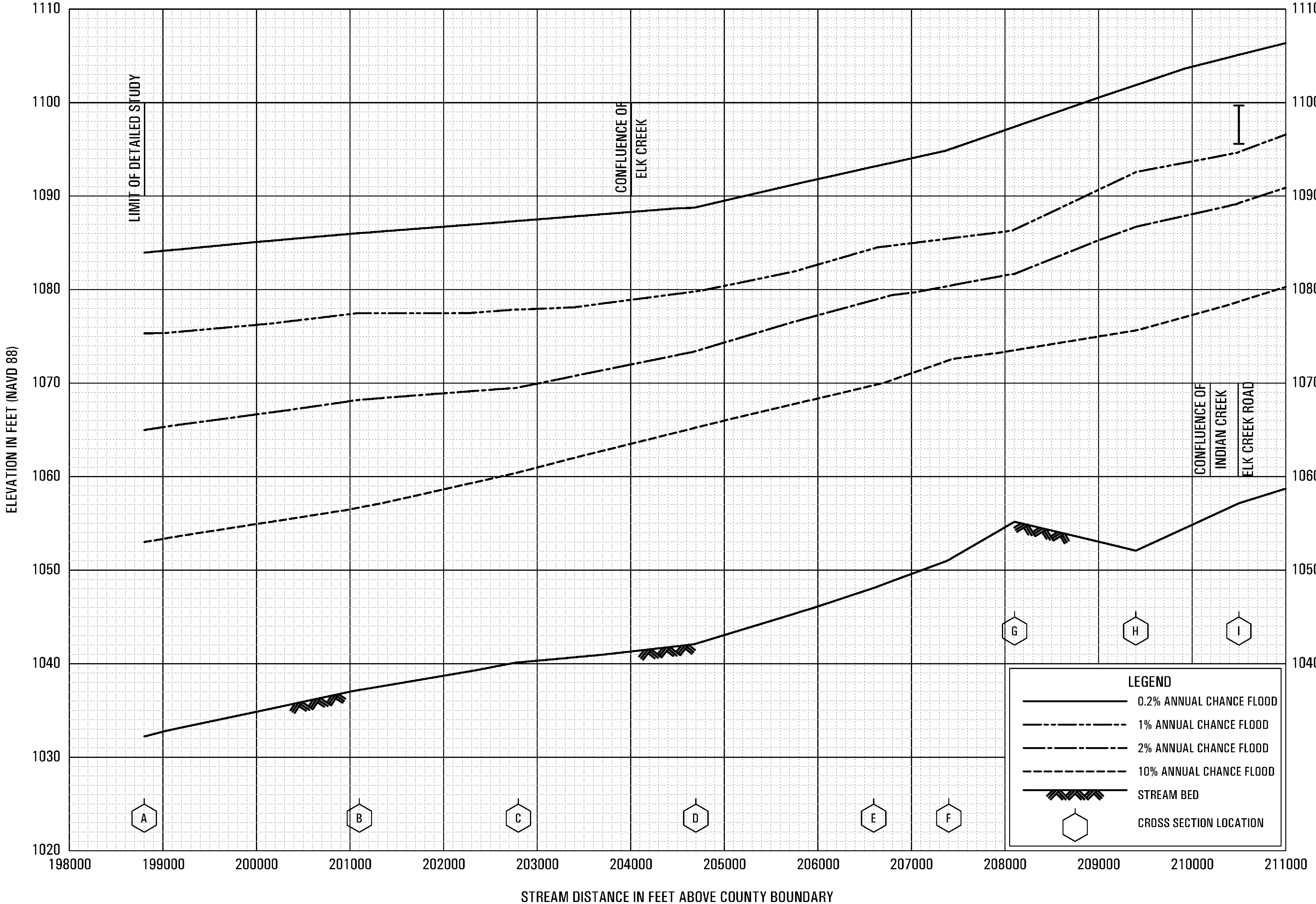
FLOOD PROFILES

JOHNSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



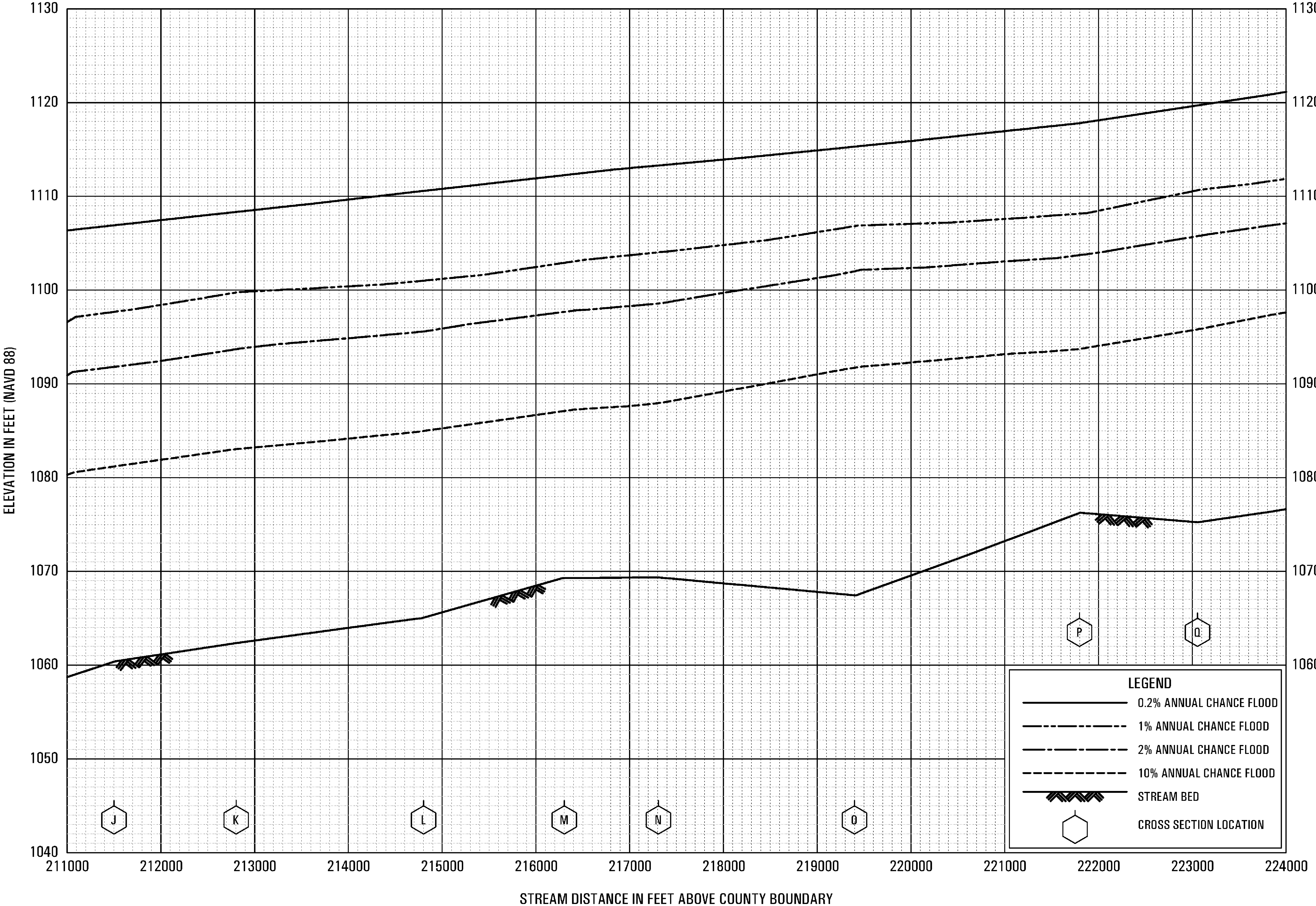
FLOOD PROFILES

KLAMATH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



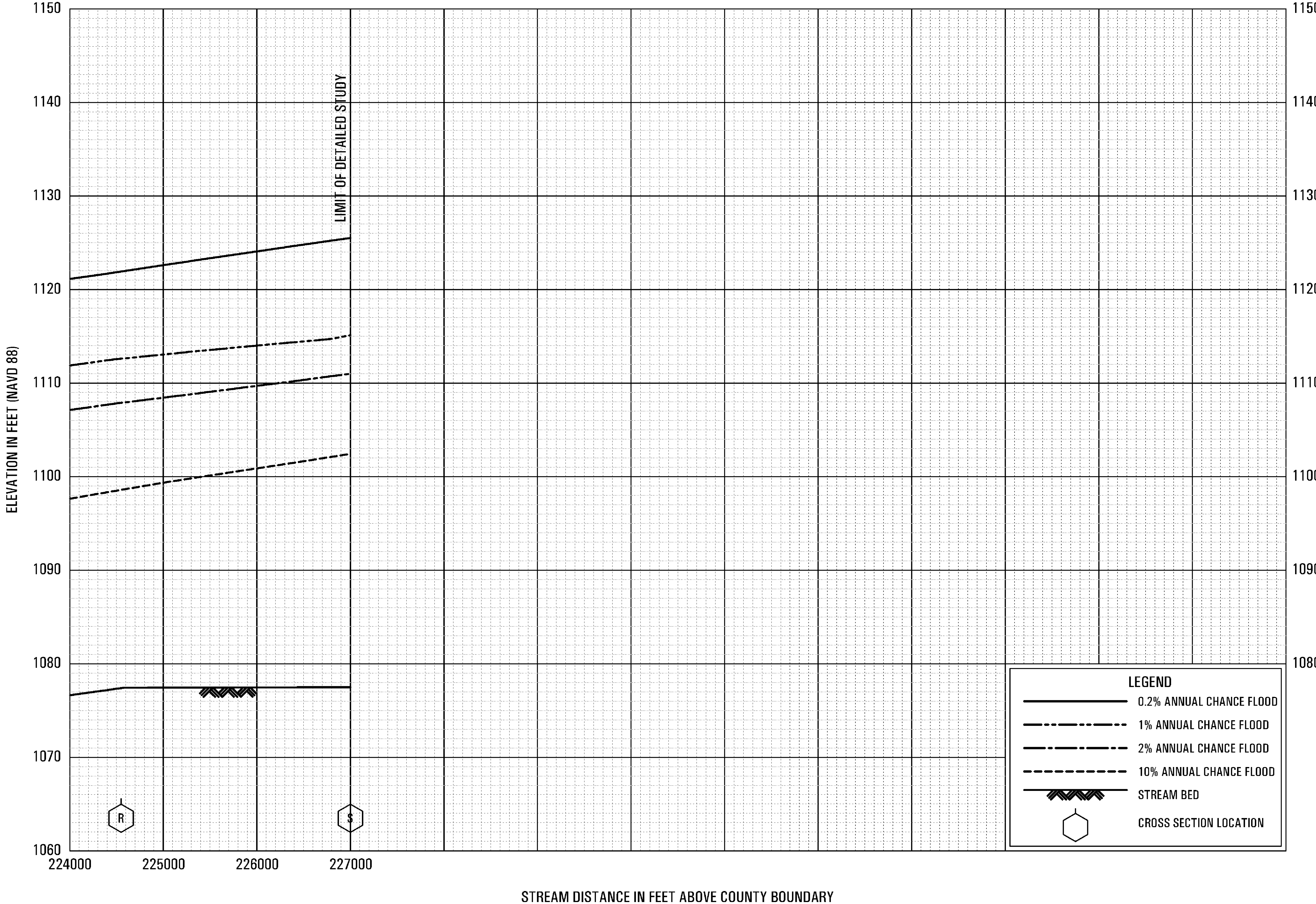
FLOOD PROFILES

KLAMATH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



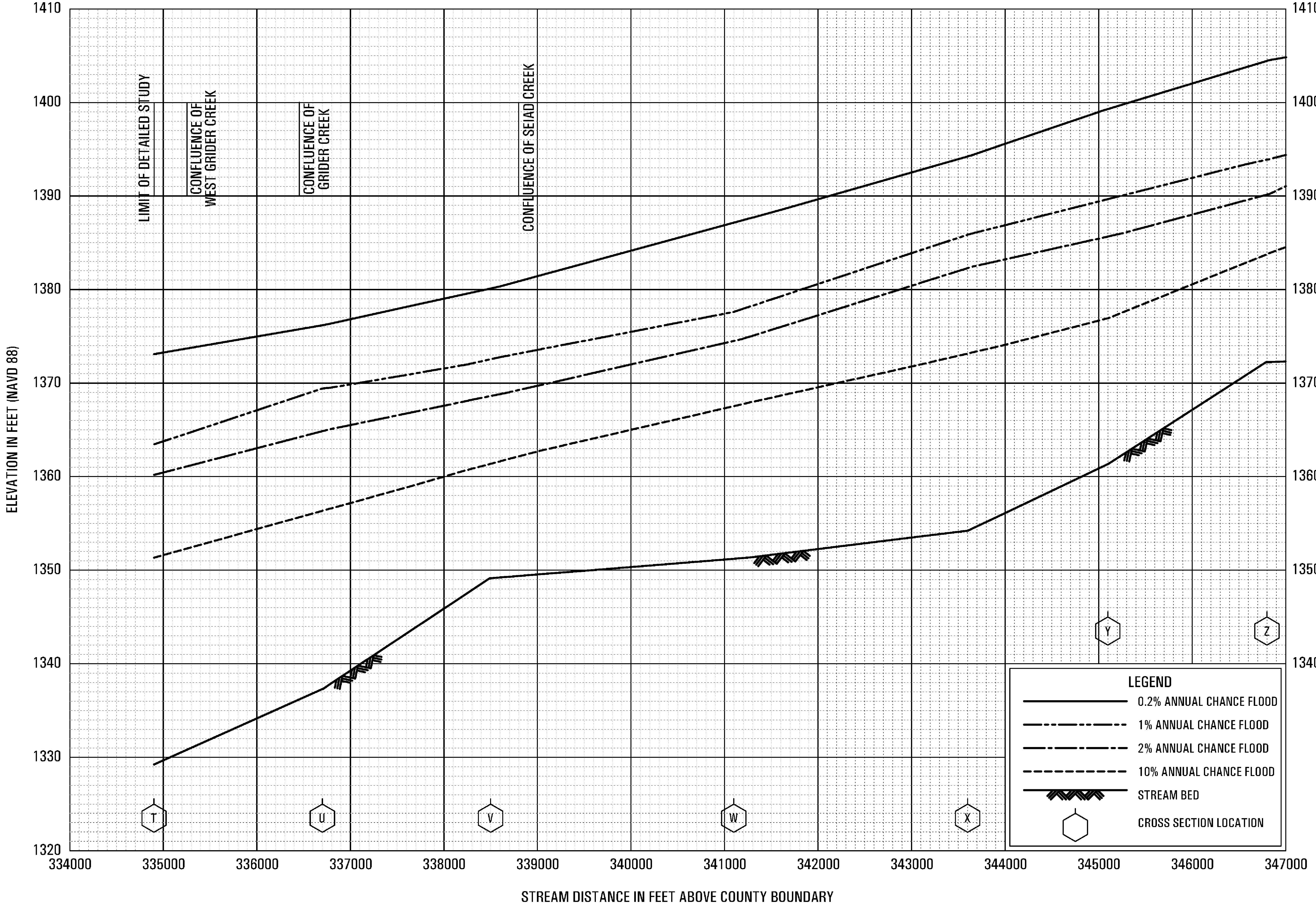
FLOOD PROFILES

KLAMATH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



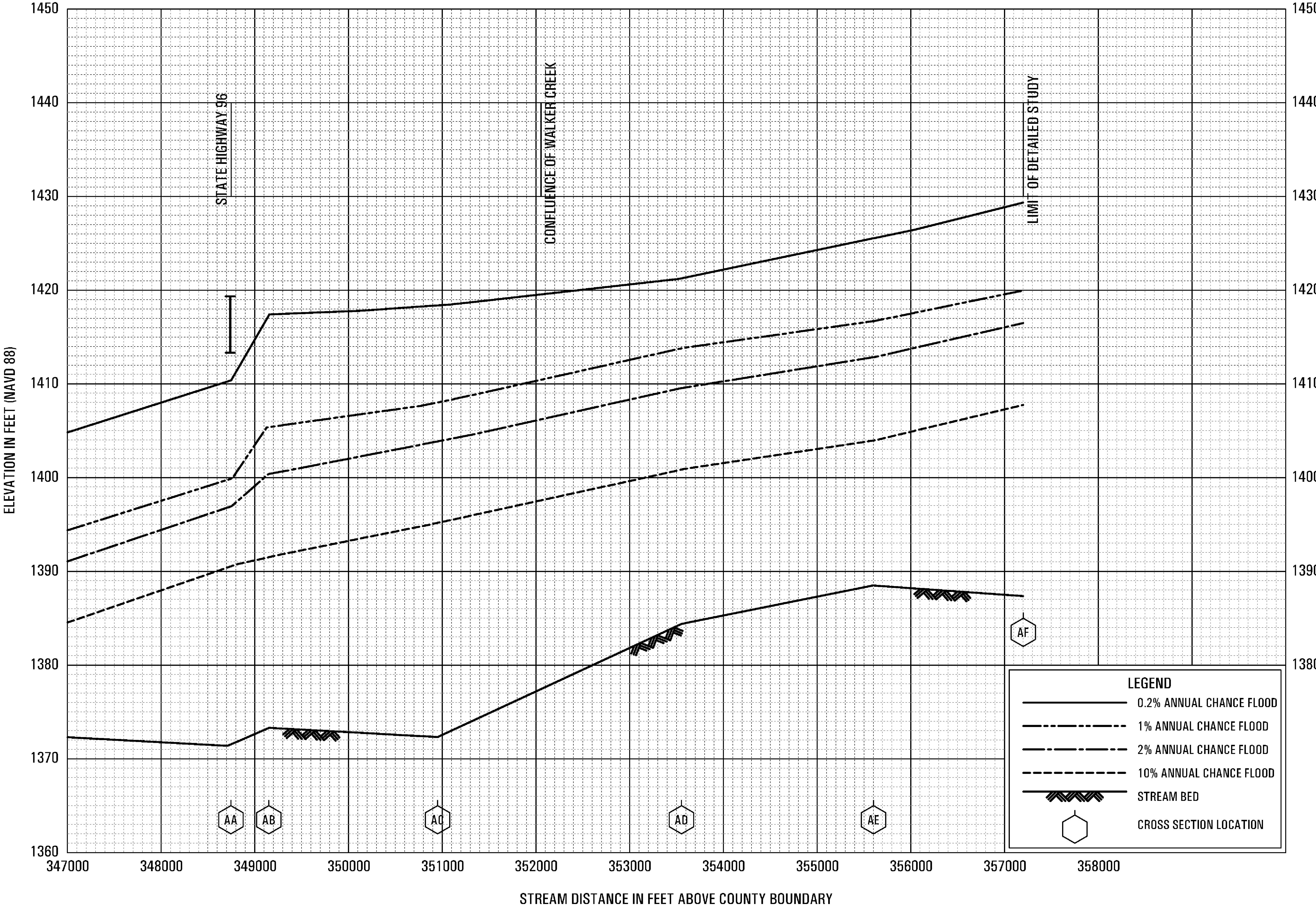
FLOOD PROFILES

KLAMATH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



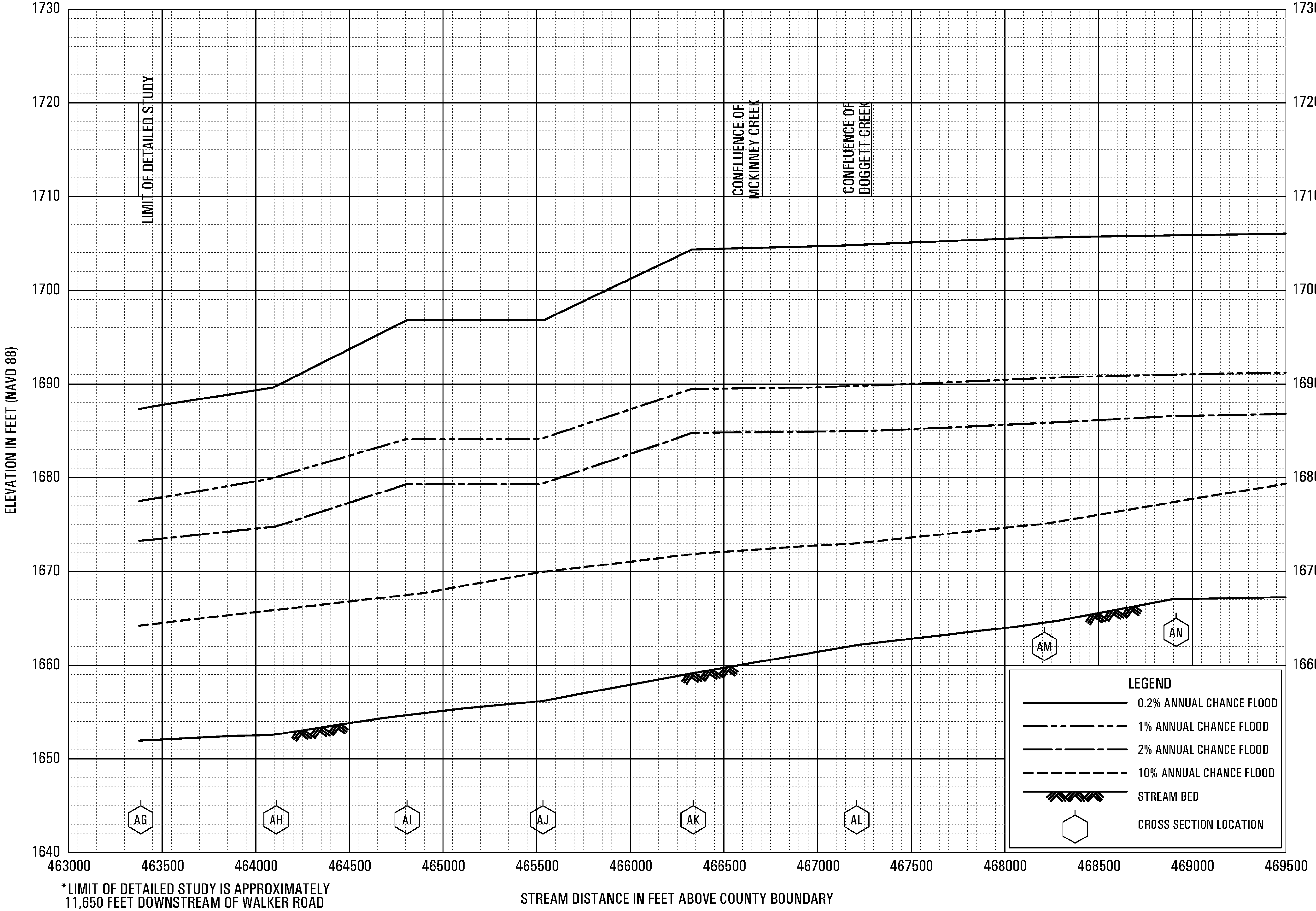
FLOOD PROFILES

KLAMATH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



*LIMIT OF DETAILED STUDY IS APPROXIMATELY
11,650 FEET DOWNSTREAM OF WALKER ROAD

FLOOD PROFILES

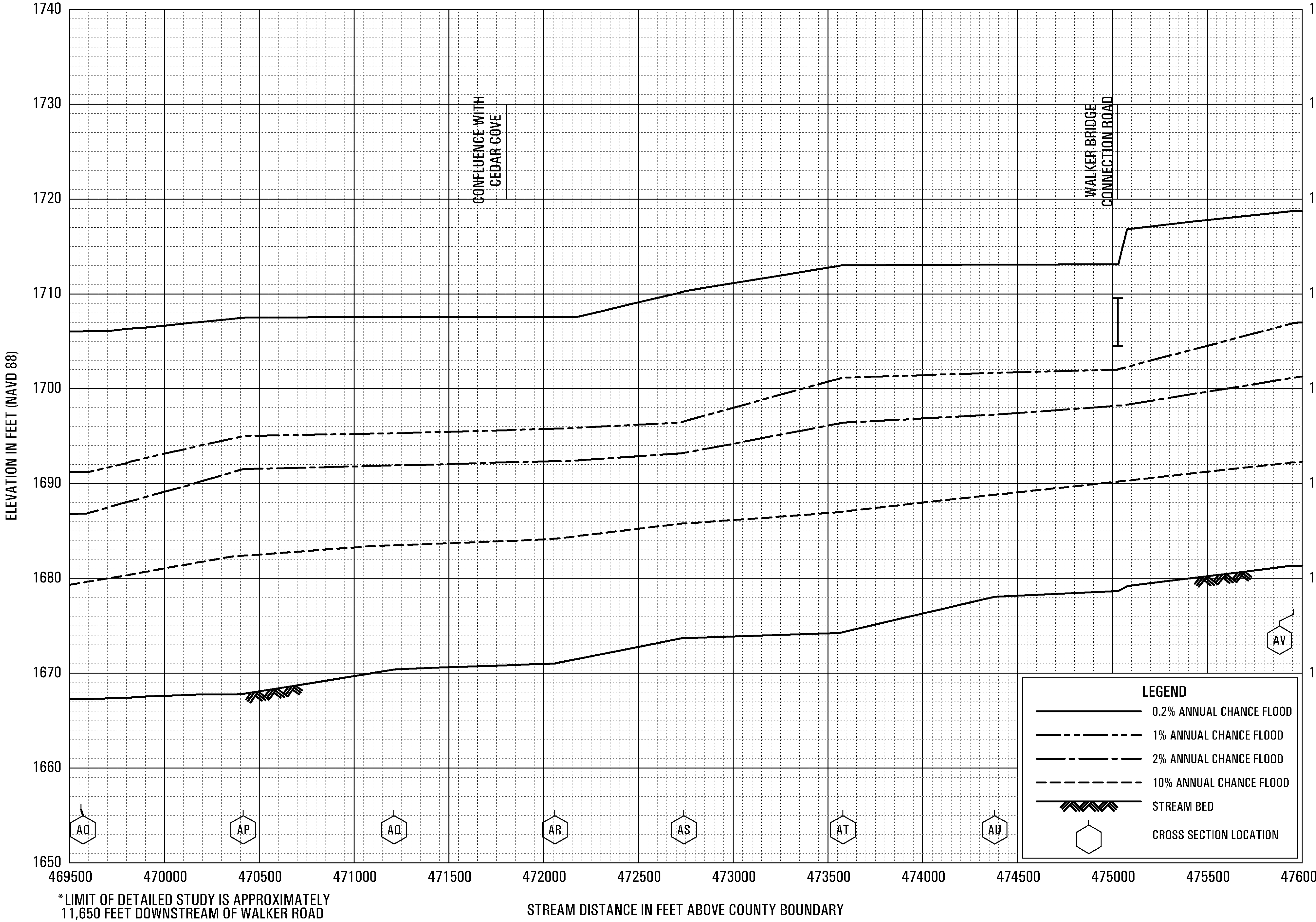
KLAMATH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS

22P



*LIMIT OF DETAILED STUDY IS APPROXIMATELY 11,650 FEET DOWNSTREAM OF WALKER ROAD

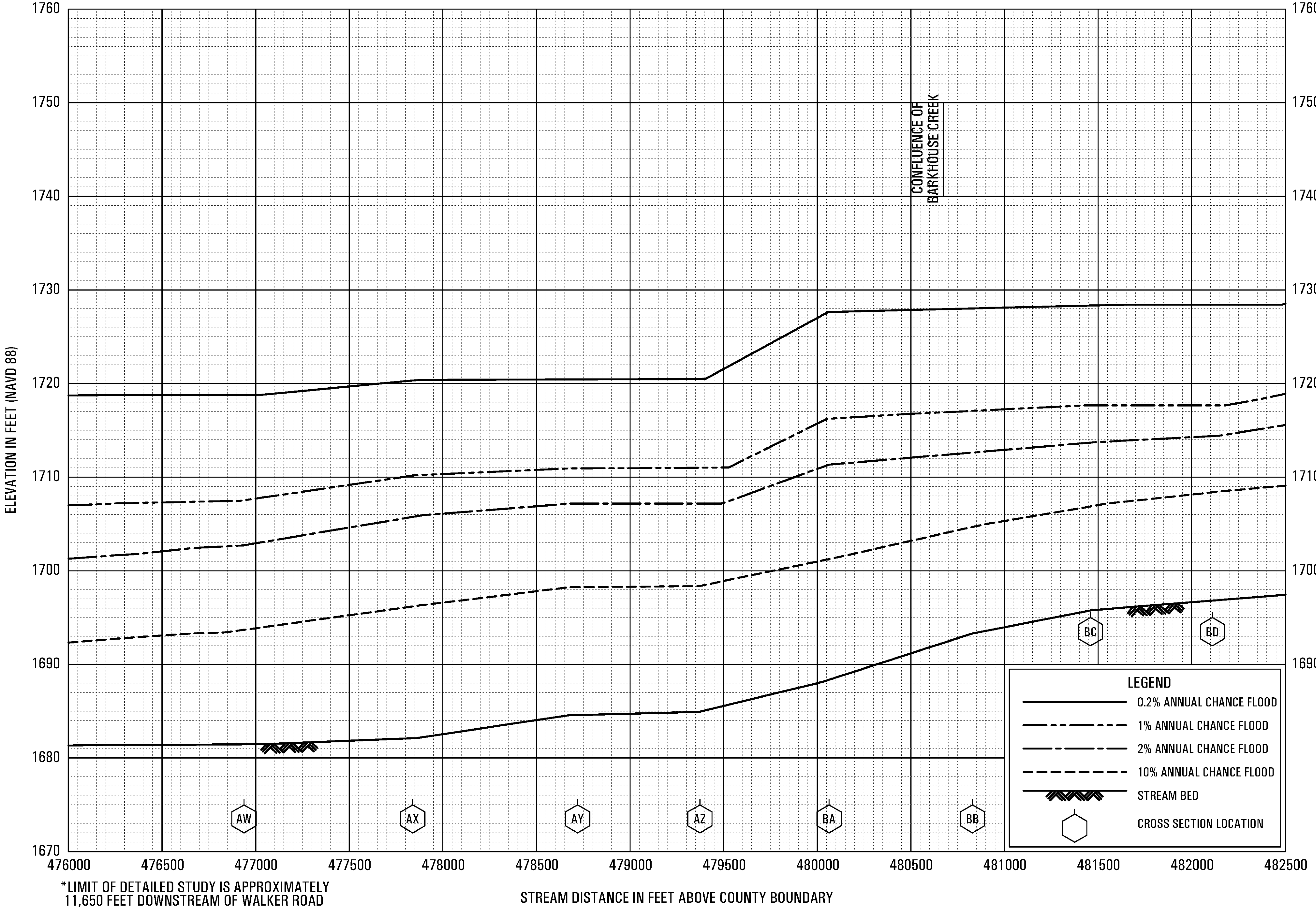
FLOOD PROFILES

KLAMATH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



*LIMIT OF DETAILED STUDY IS APPROXIMATELY 11,650 FEET DOWNSTREAM OF WALKER ROAD

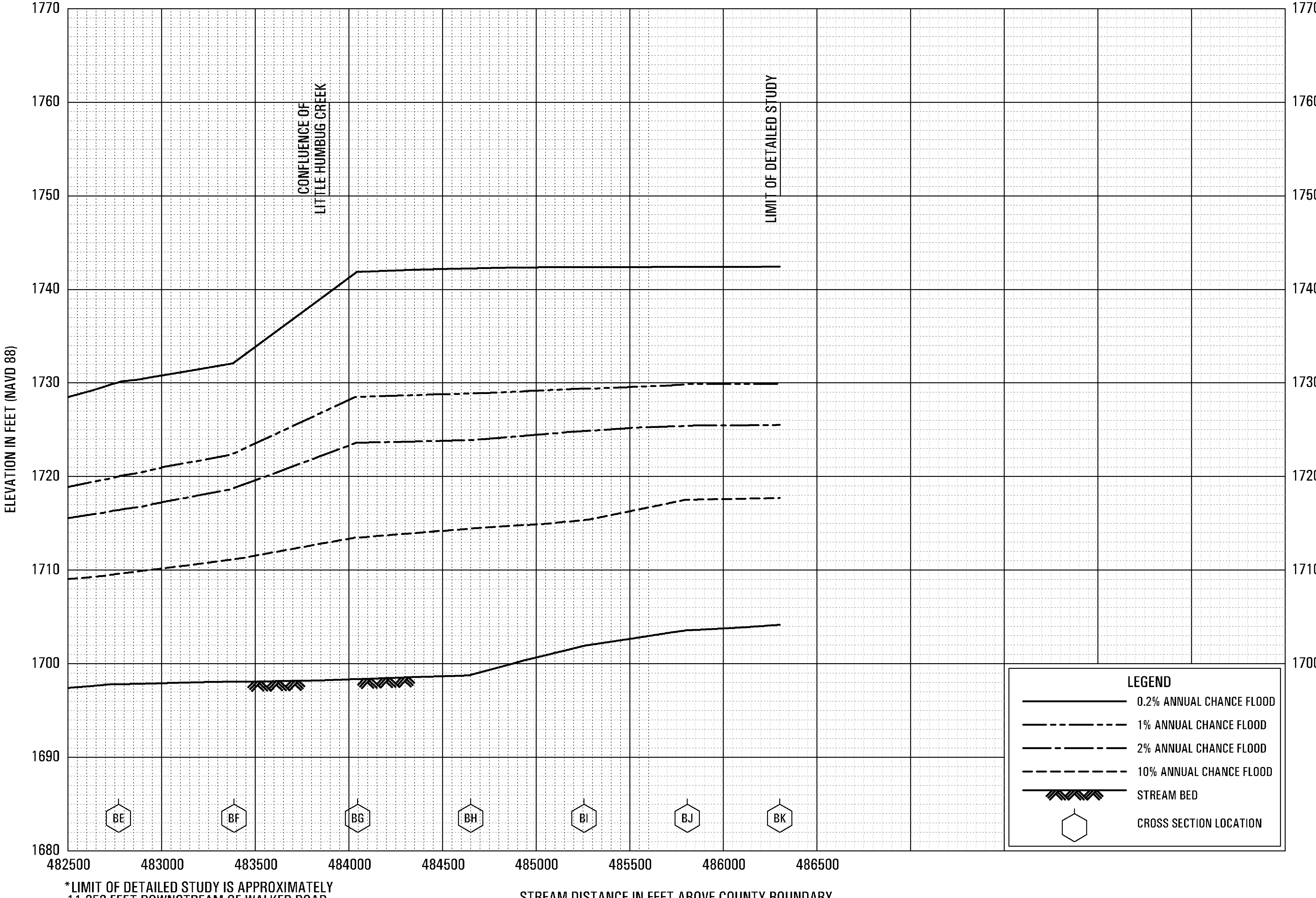
FLOOD PROFILES

KLAMATH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



*LIMIT OF DETAILED STUDY IS APPROXIMATELY 11,650 FEET DOWNSTREAM OF WALKER ROAD

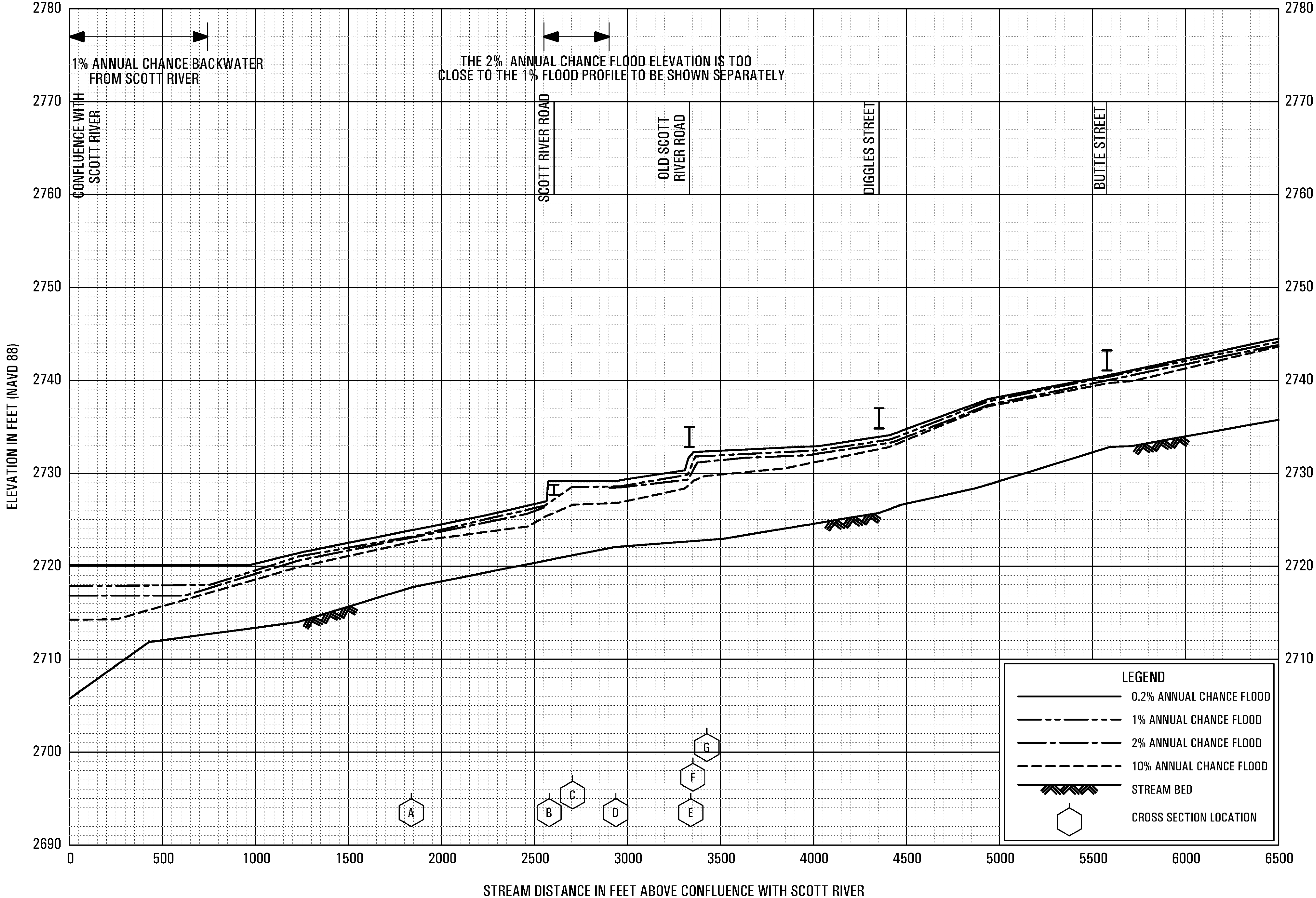
FLOOD PROFILES

KLAMATH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS

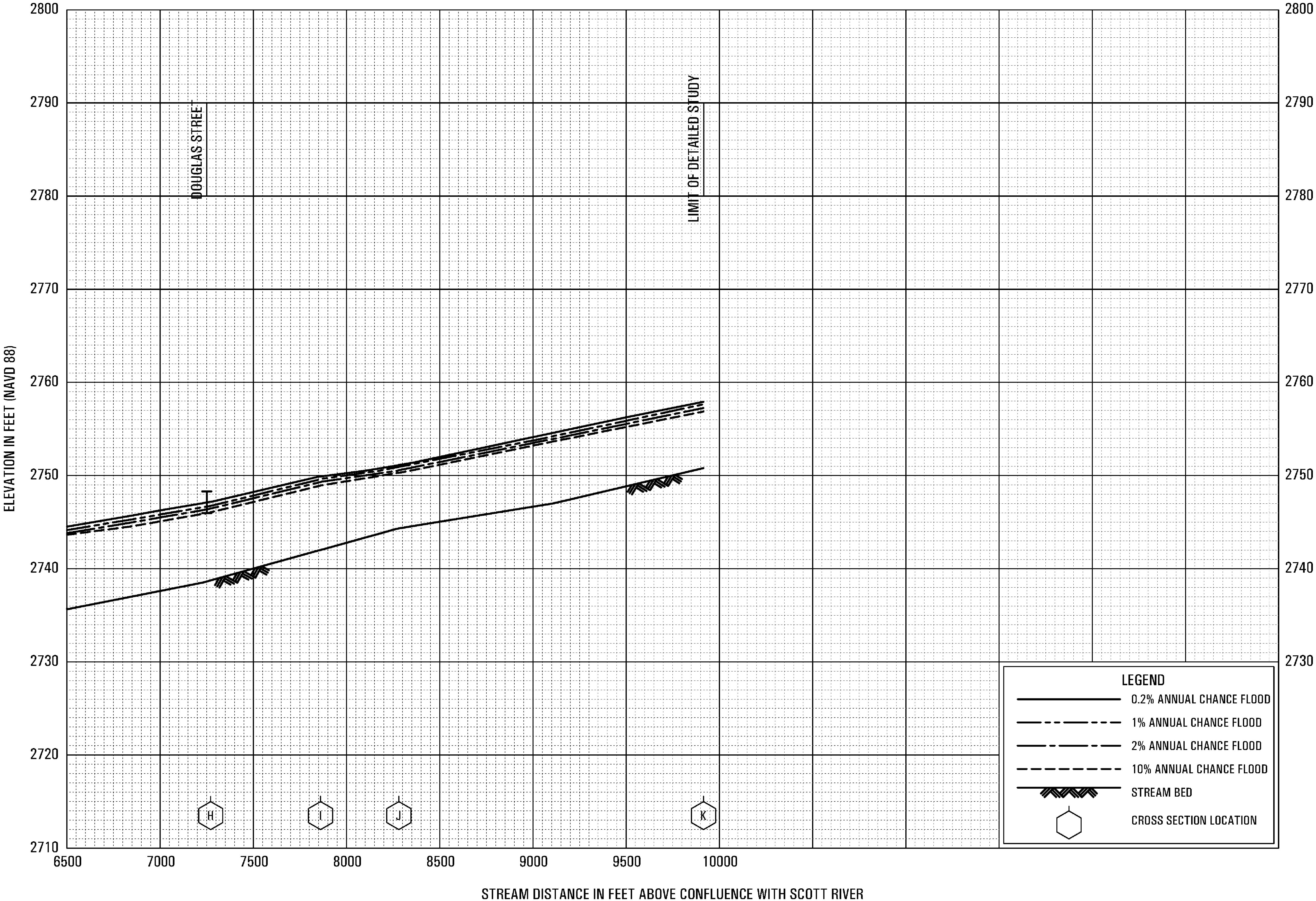


FLOOD PROFILES

MOFFETT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA AND INCORPORATED AREAS



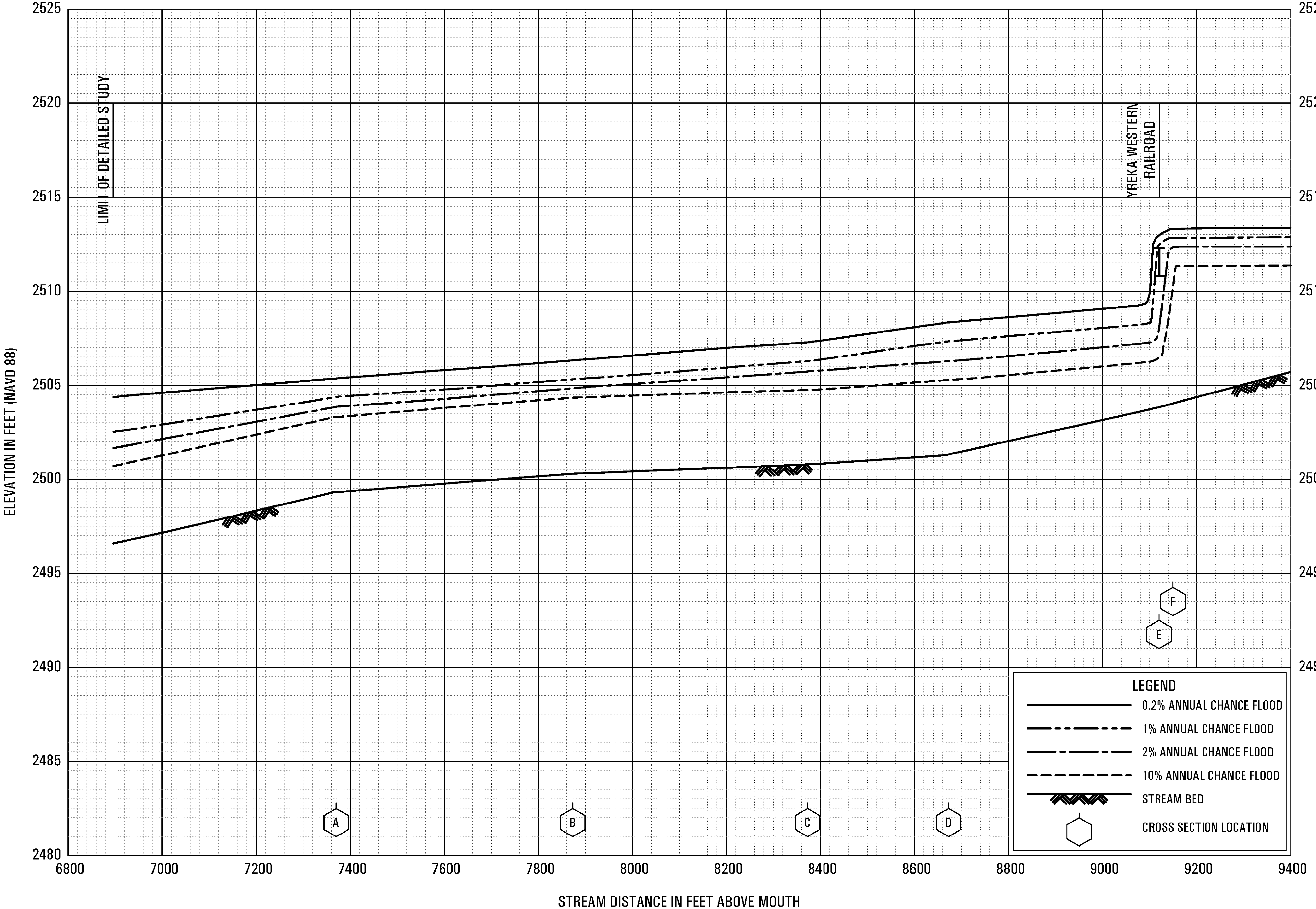
FLOOD PROFILES

MOFFETT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



FLOOD PROFILES

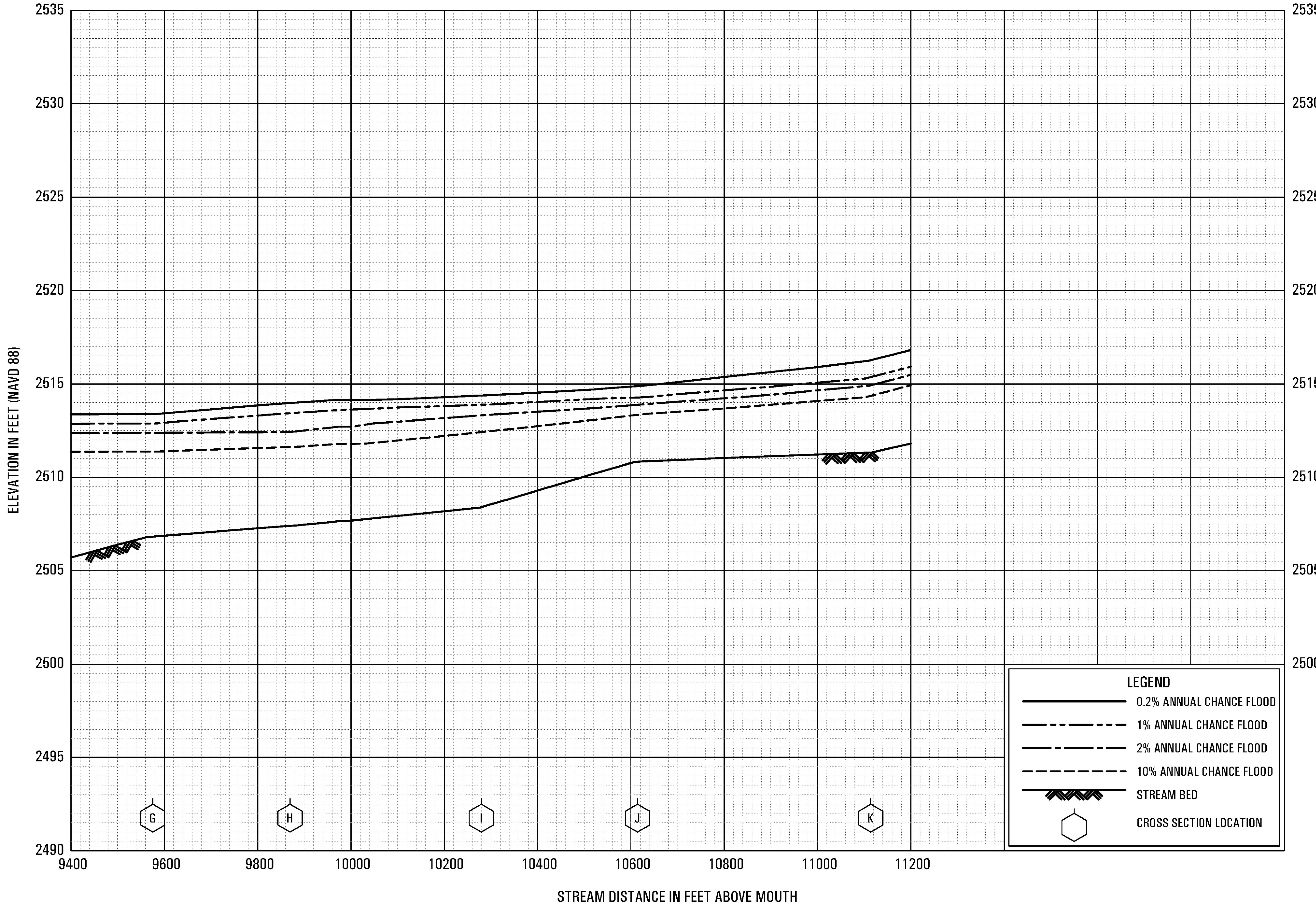
OREGON SLOUGH

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS

28P



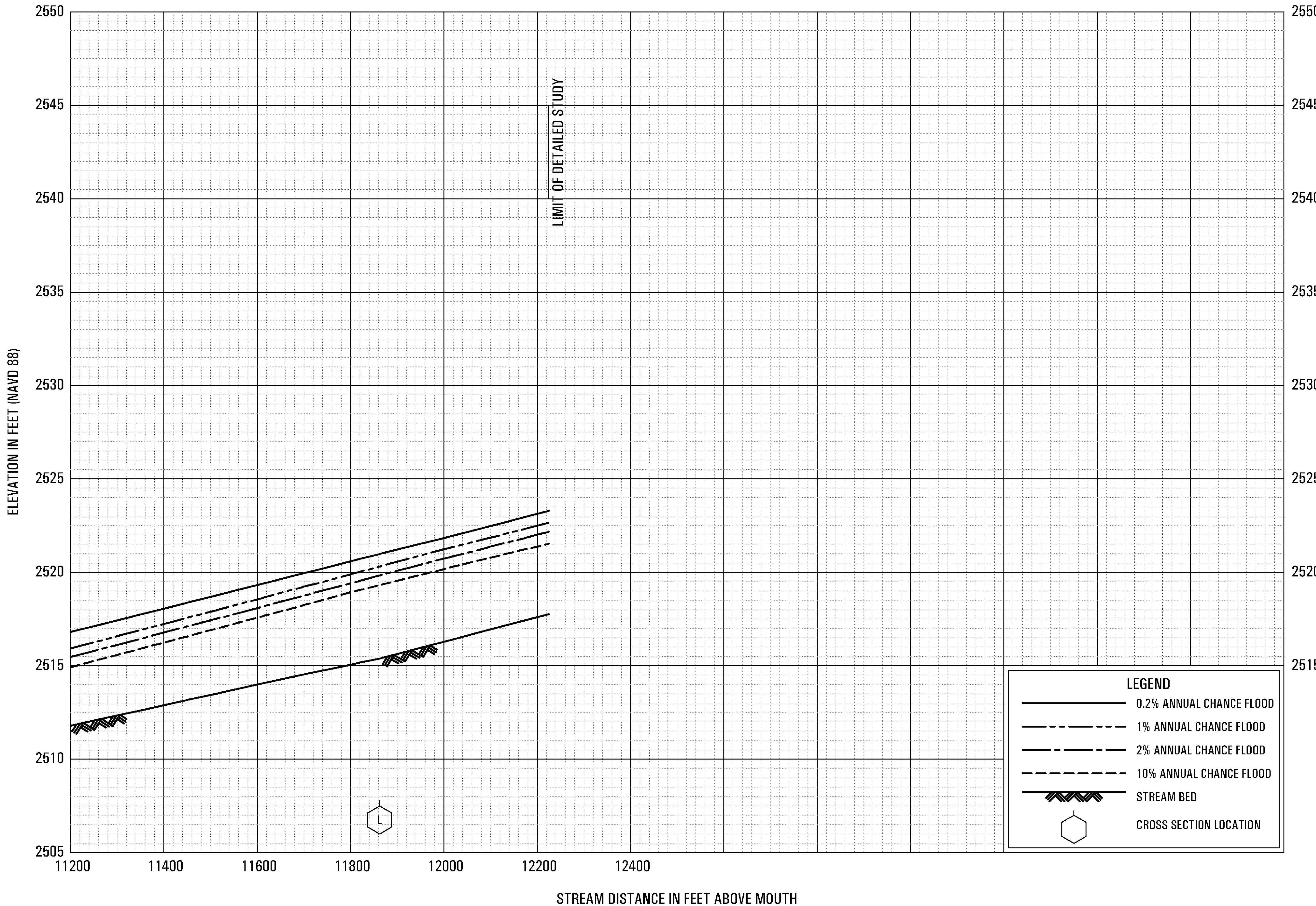
FLOOD PROFILES

OREGON SLOUGH

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



FLOOD PROFILES

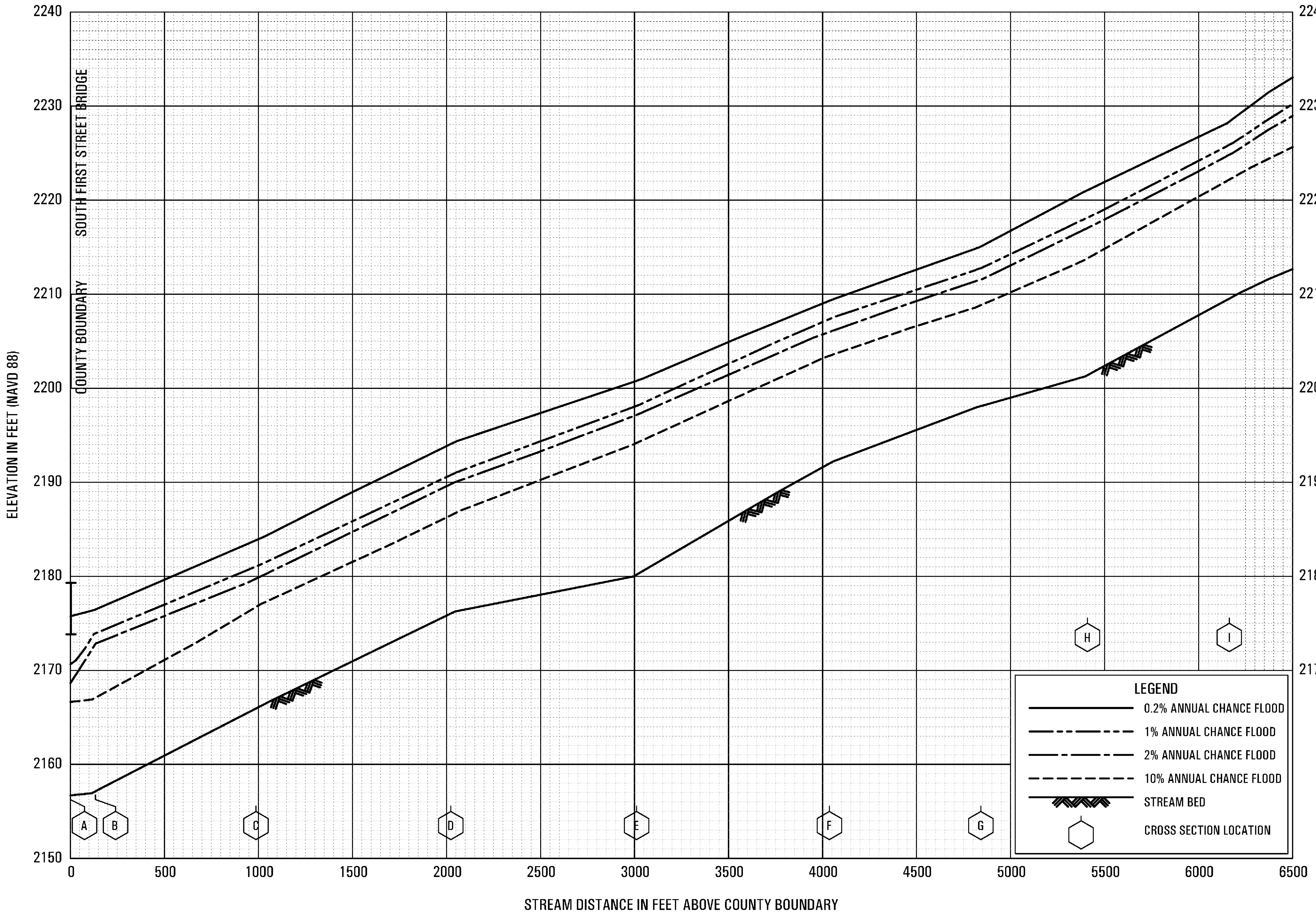
OREGON SLOUGH

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS

30P



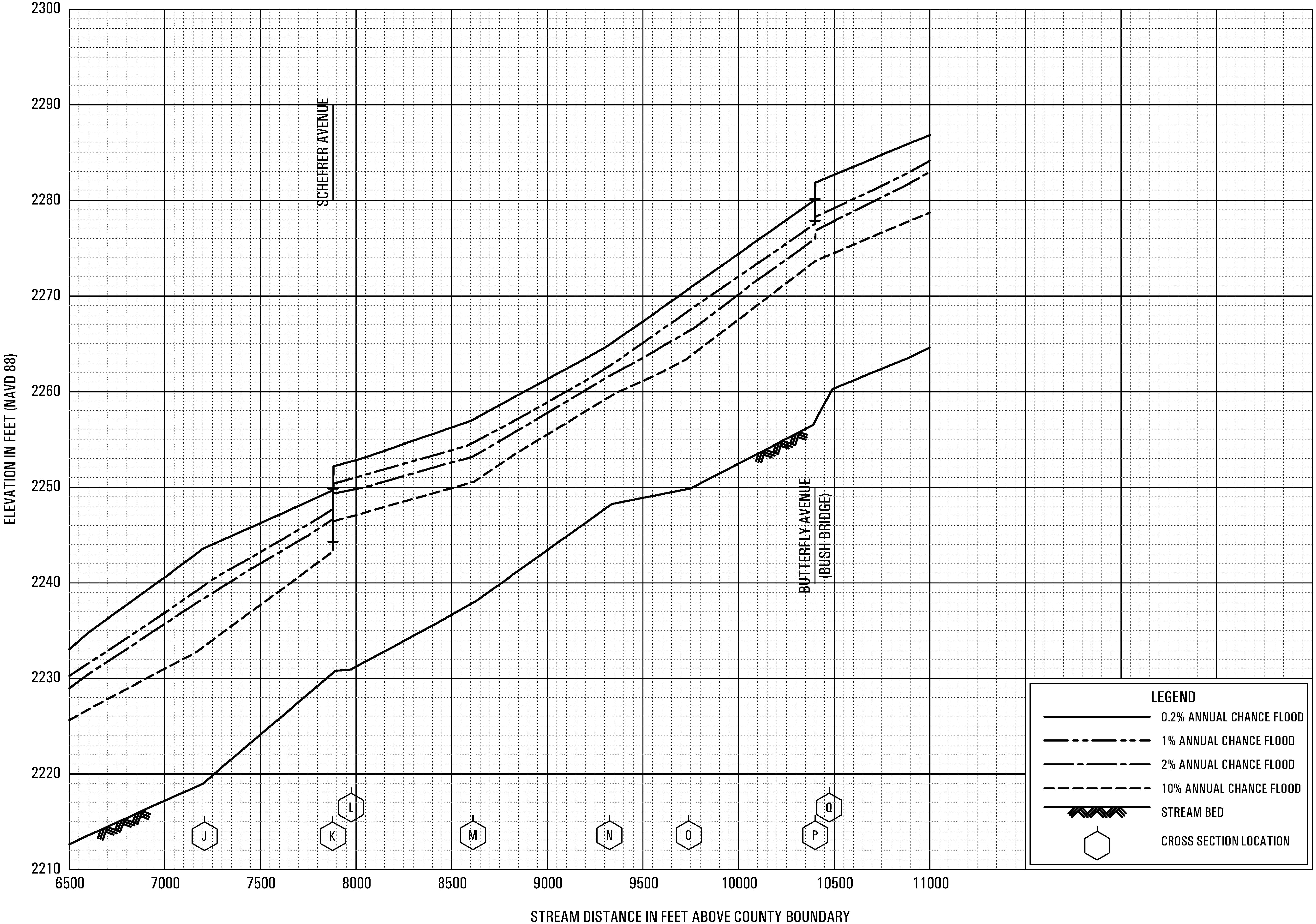
FLOOD PROFILES

SACRAMENTO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



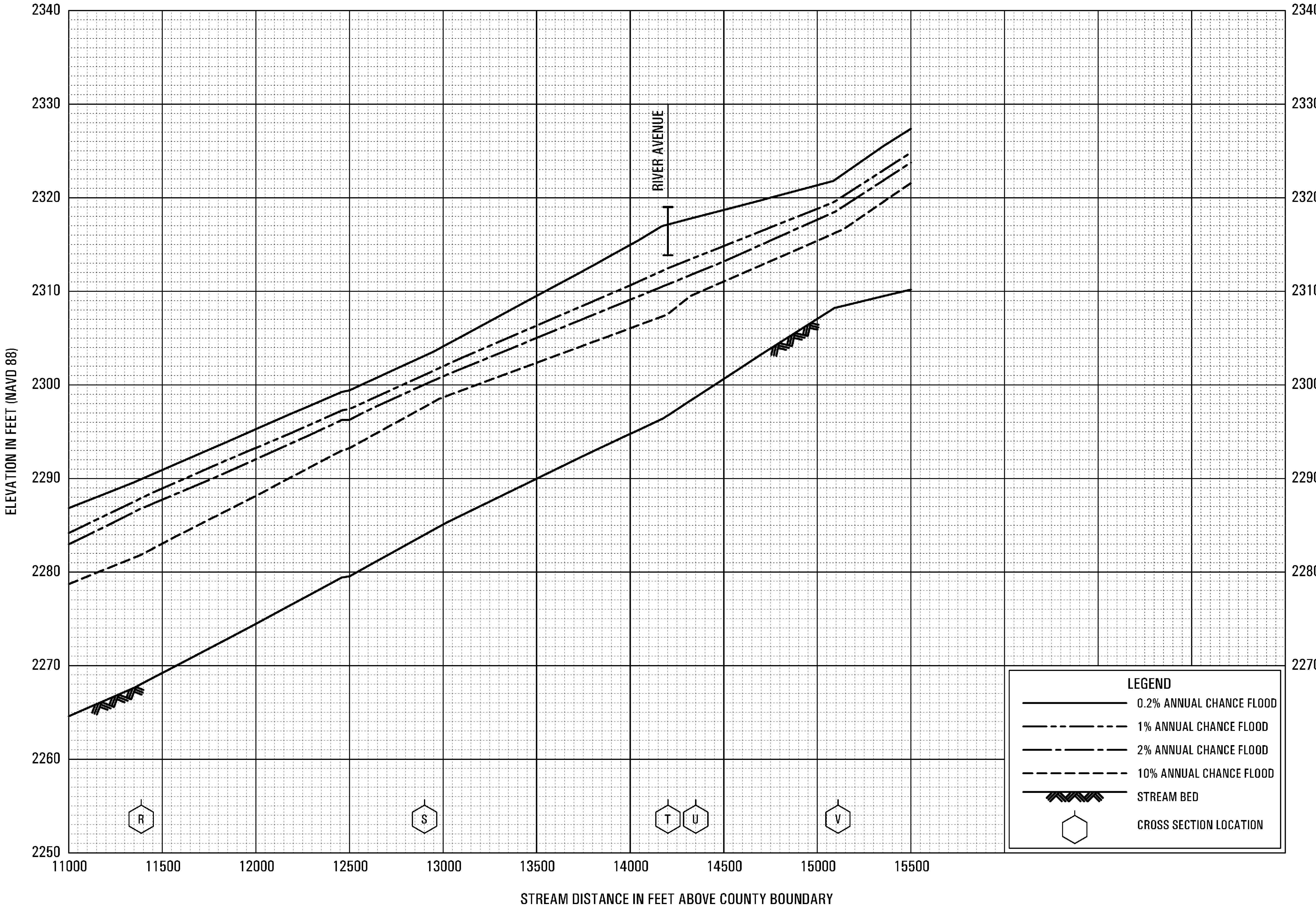
FLOOD PROFILES

SACRAMENTO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



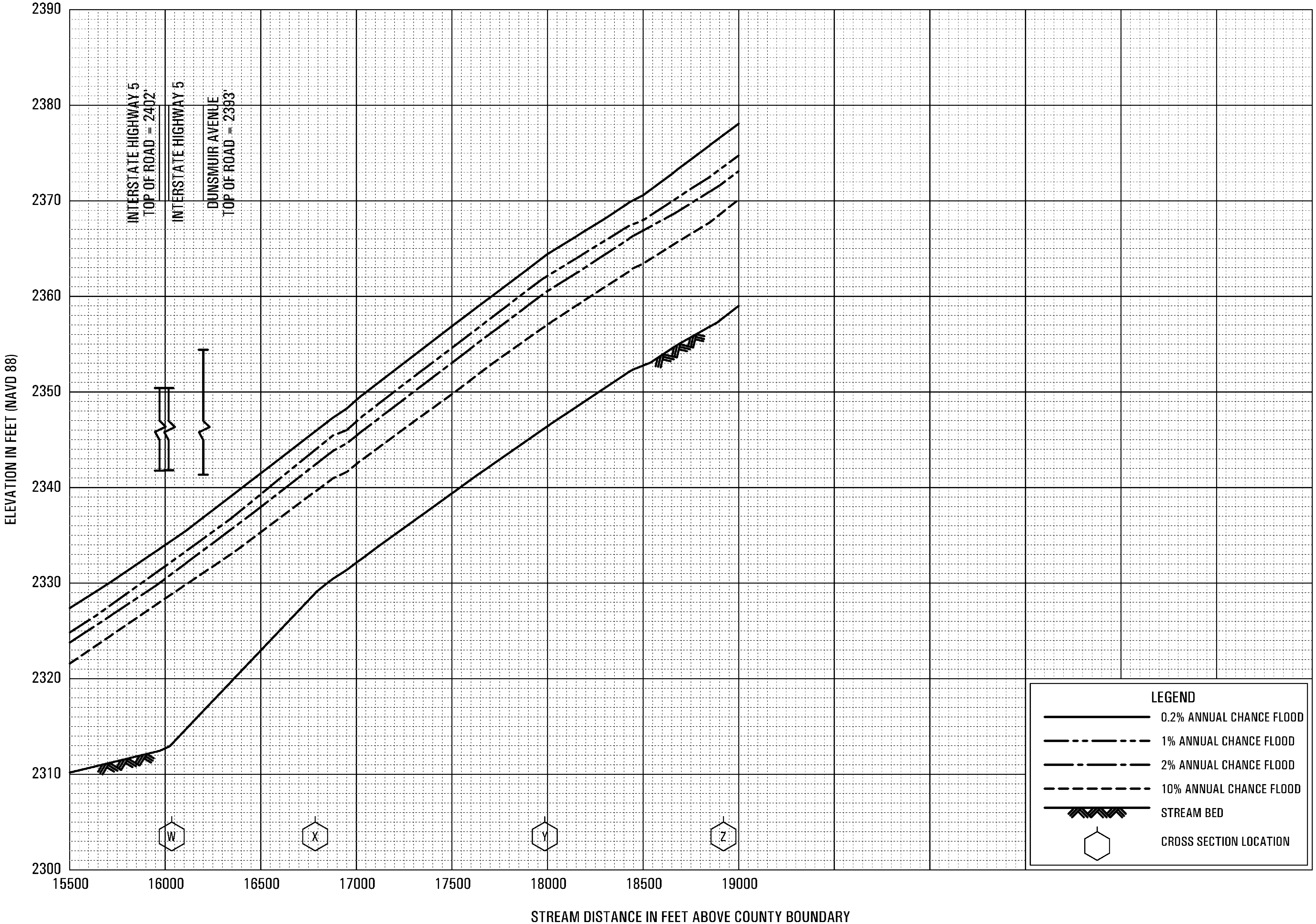
FLOOD PROFILES

SACRAMENTO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



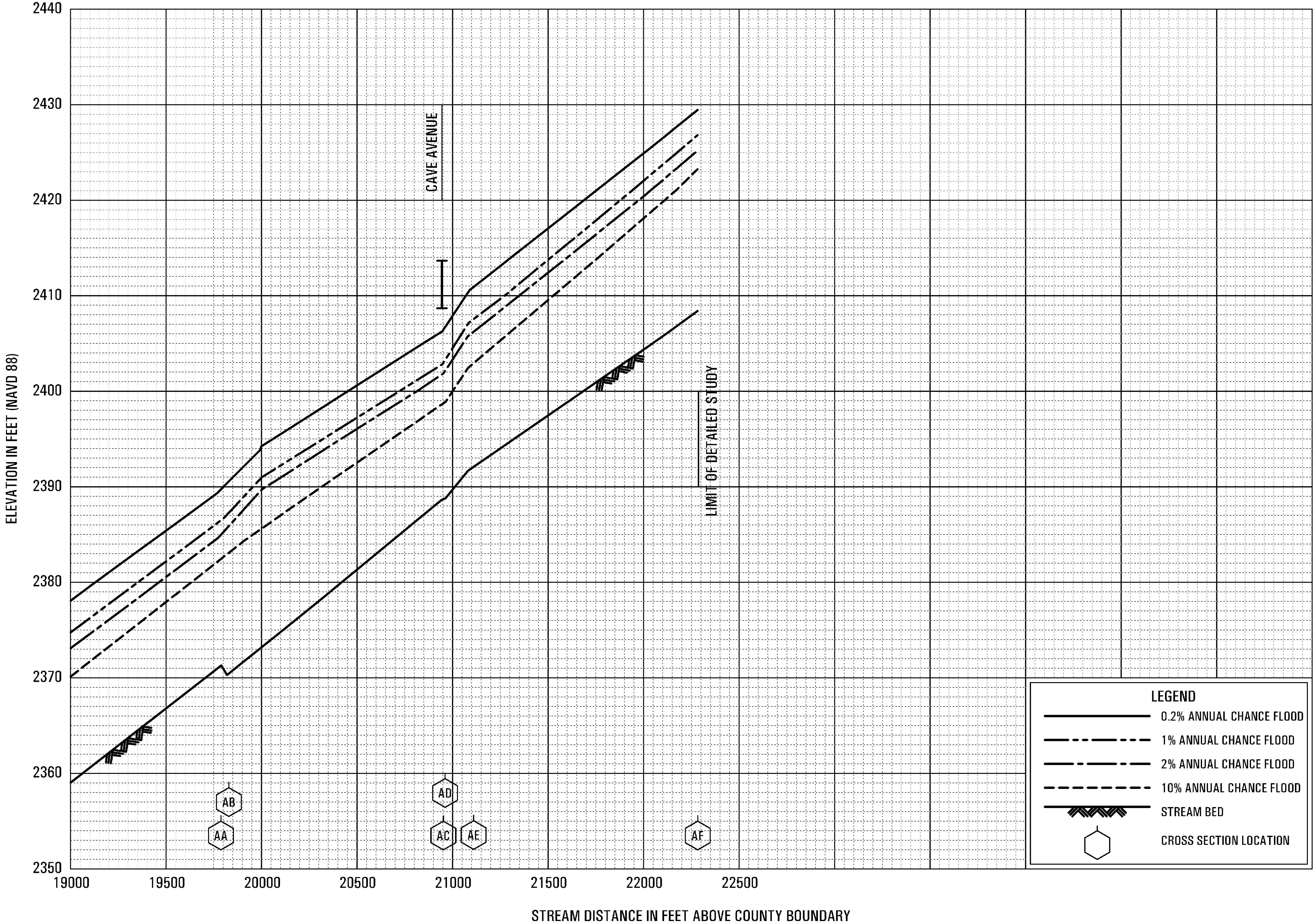
FLOOD PROFILES

SACRAMENTO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



FLOOD PROFILES

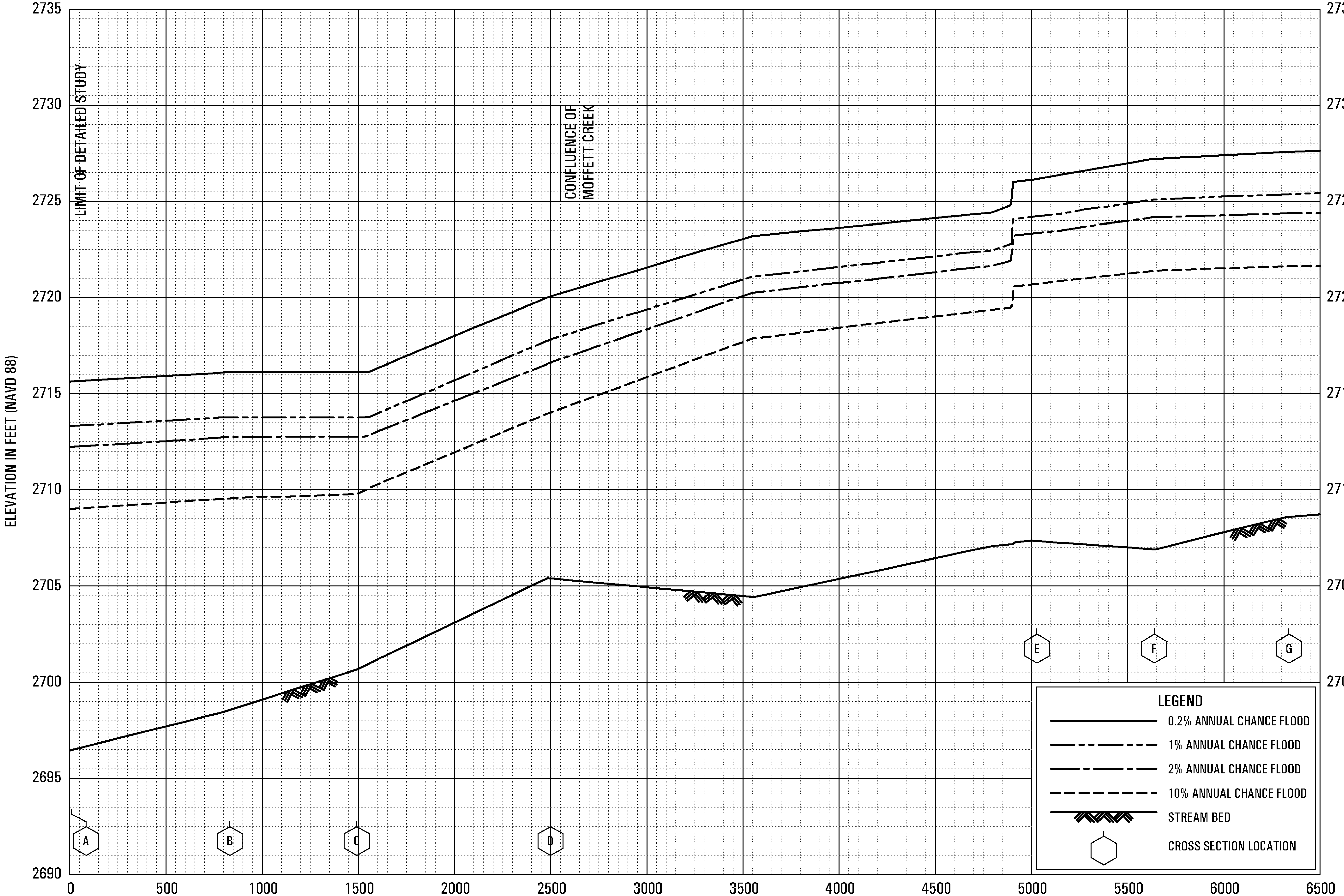
SACRAMENTO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS

35P



*LIMIT OF DETAILED STUDY IS APPROXIMATELY 7,360 FEET DOWNSTREAM OF STATE HIGHWAY 3

FLOOD PROFILES

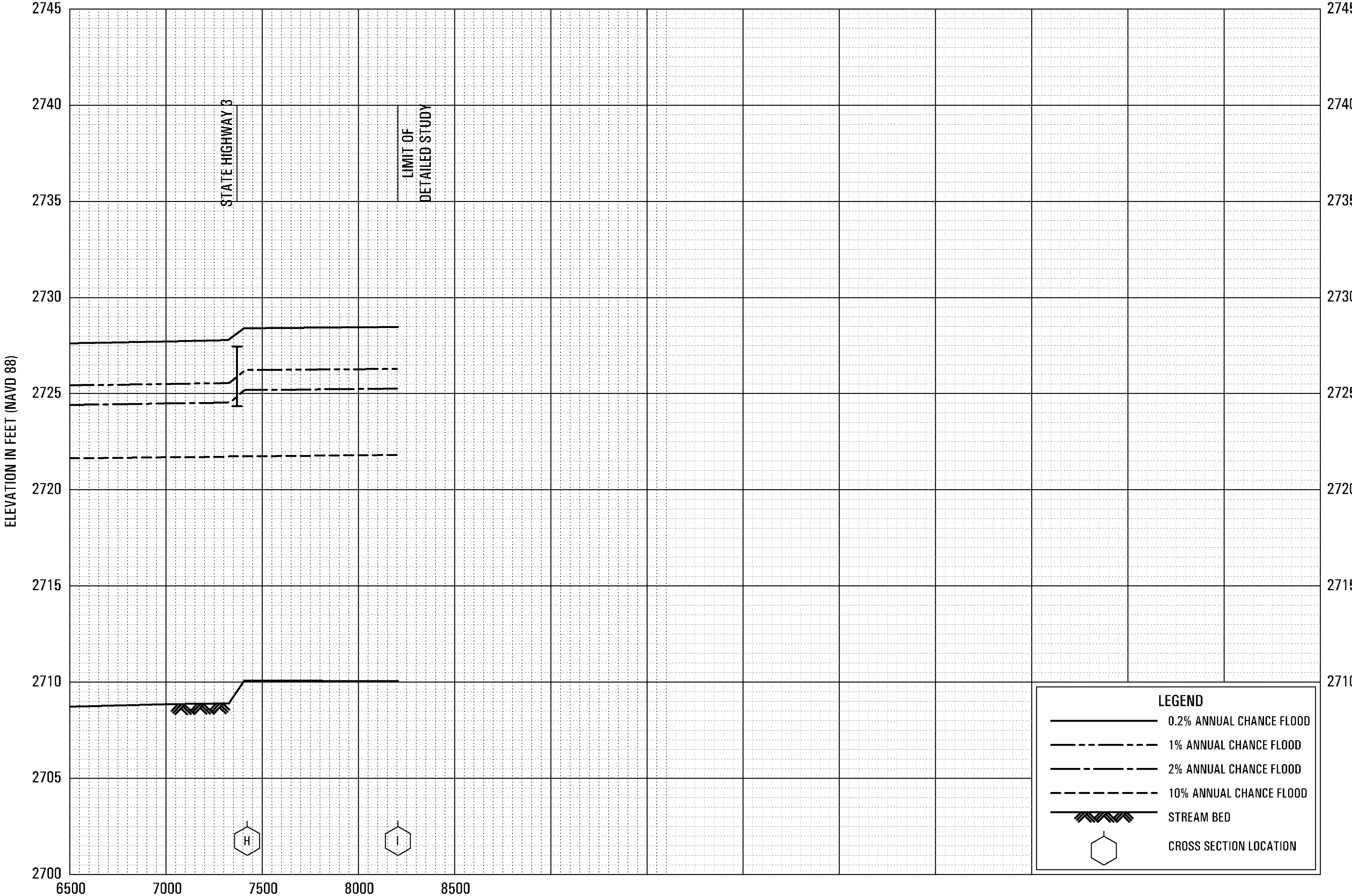
SCOTT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS

36P



*LIMIT OF DETAILED STUDY IS APPROXIMATELY
7,360 FEET DOWNSTREAM OF STATE HIGHWAY 3

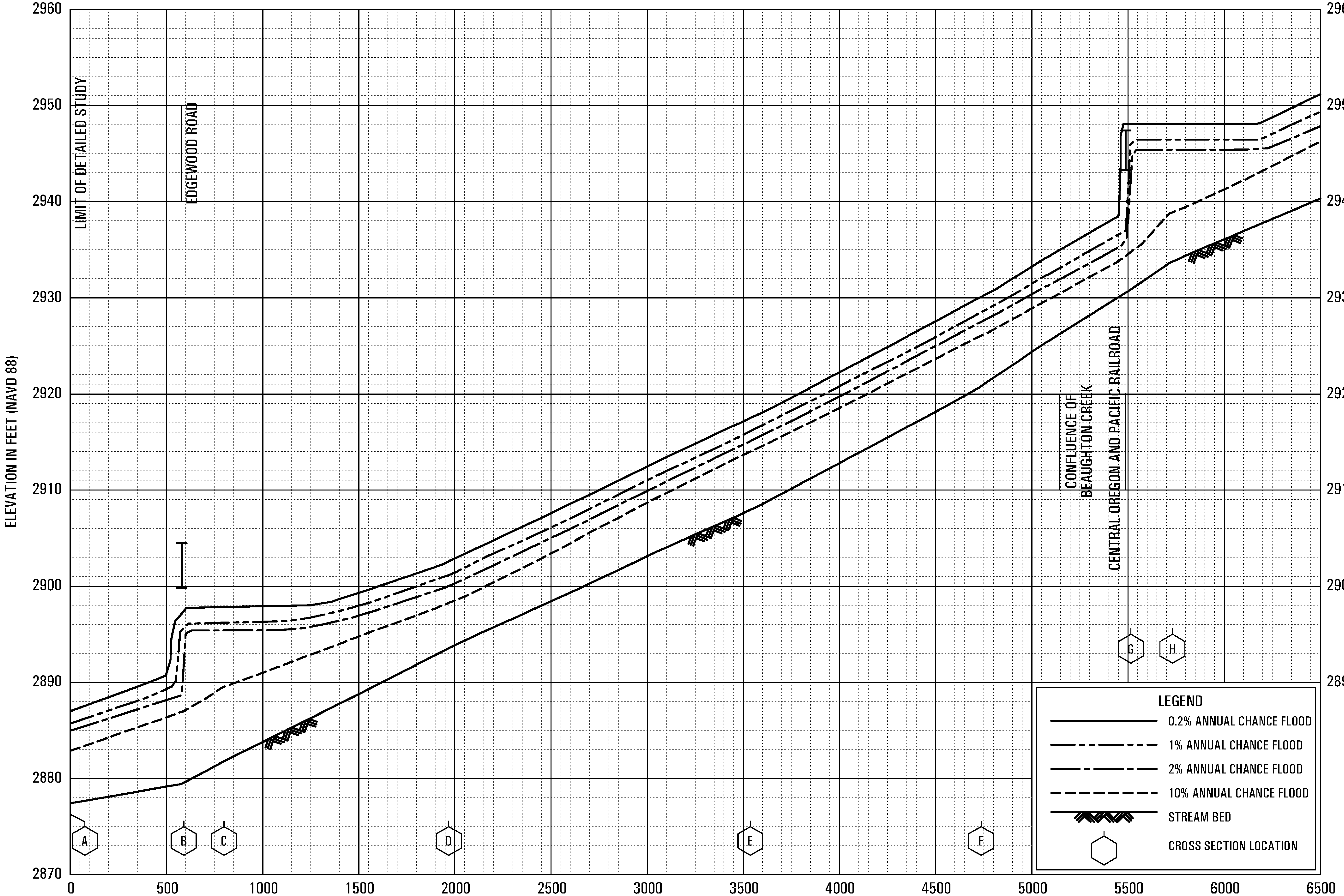
FLOOD PROFILES

SCOTT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



*LIMIT OF DETAILED STUDY IS APPROXIMATELY 575 FEET DOWNSTREAM OF EDGEWOOD ROAD

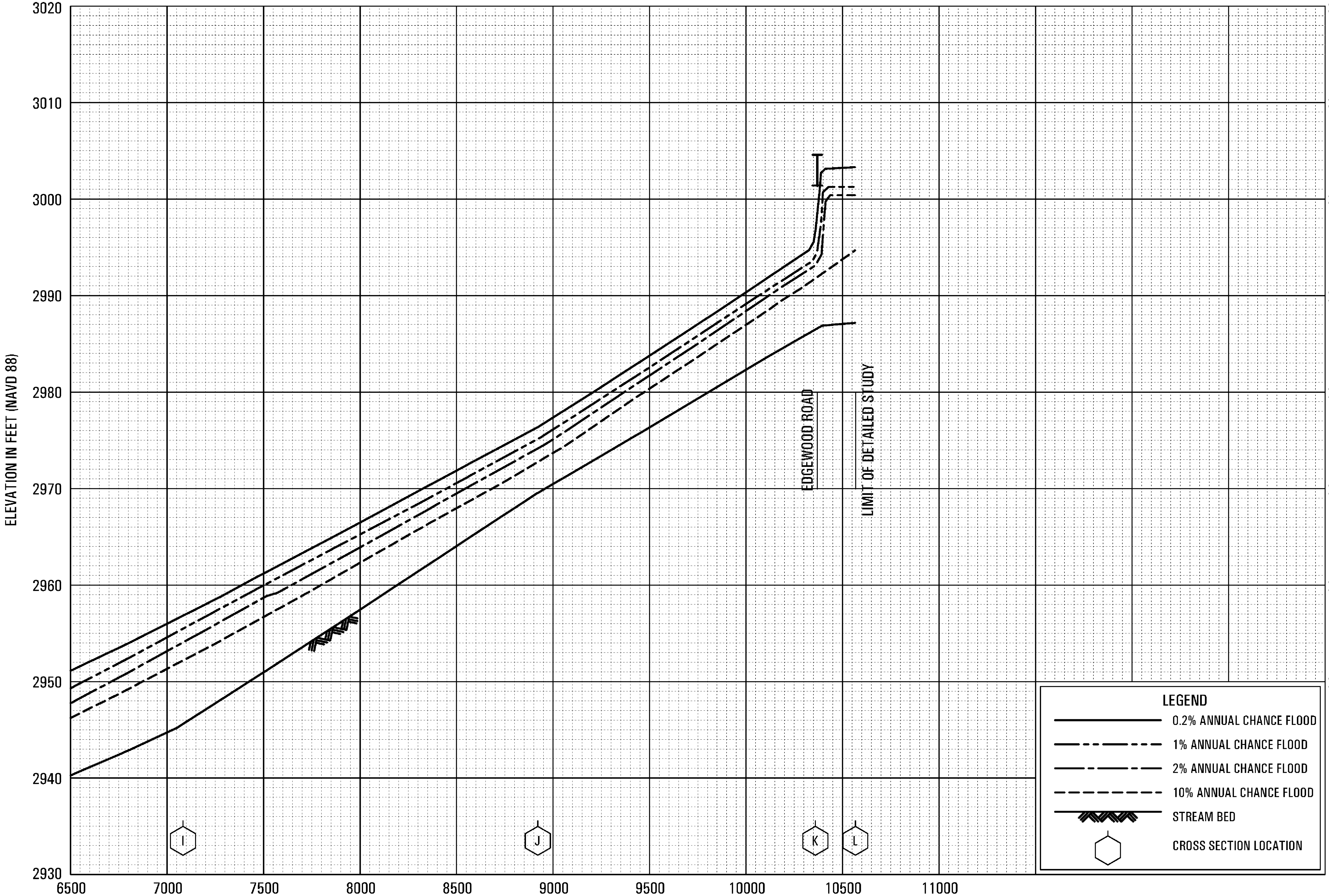
FLOOD PROFILES

SHASTA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



*LIMIT OF DETAILED STUDY IS APPROXIMATELY 575 FEET DOWNSTREAM OF EDGEWOOD ROAD

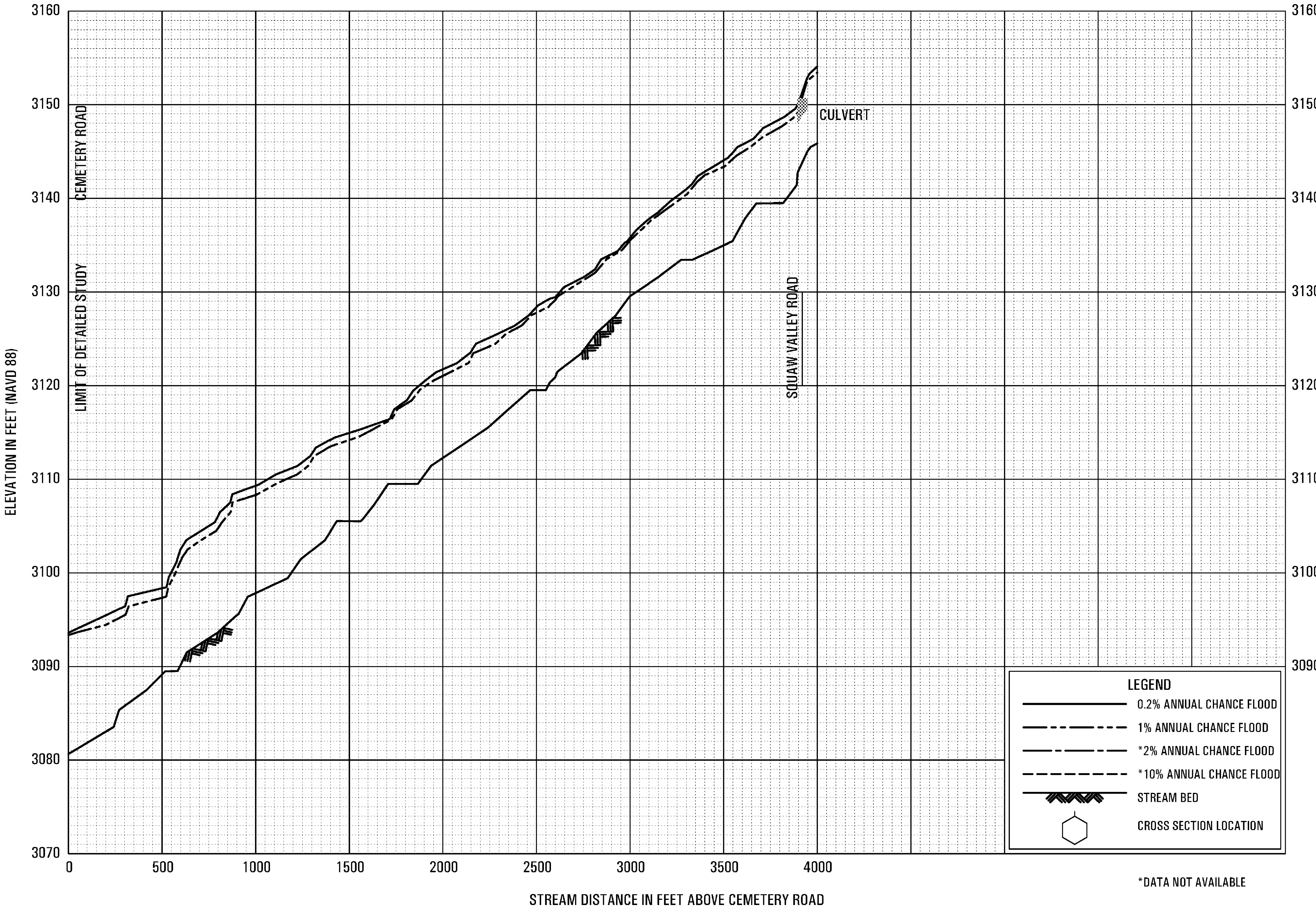
FLOOD PROFILES

SHASTA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



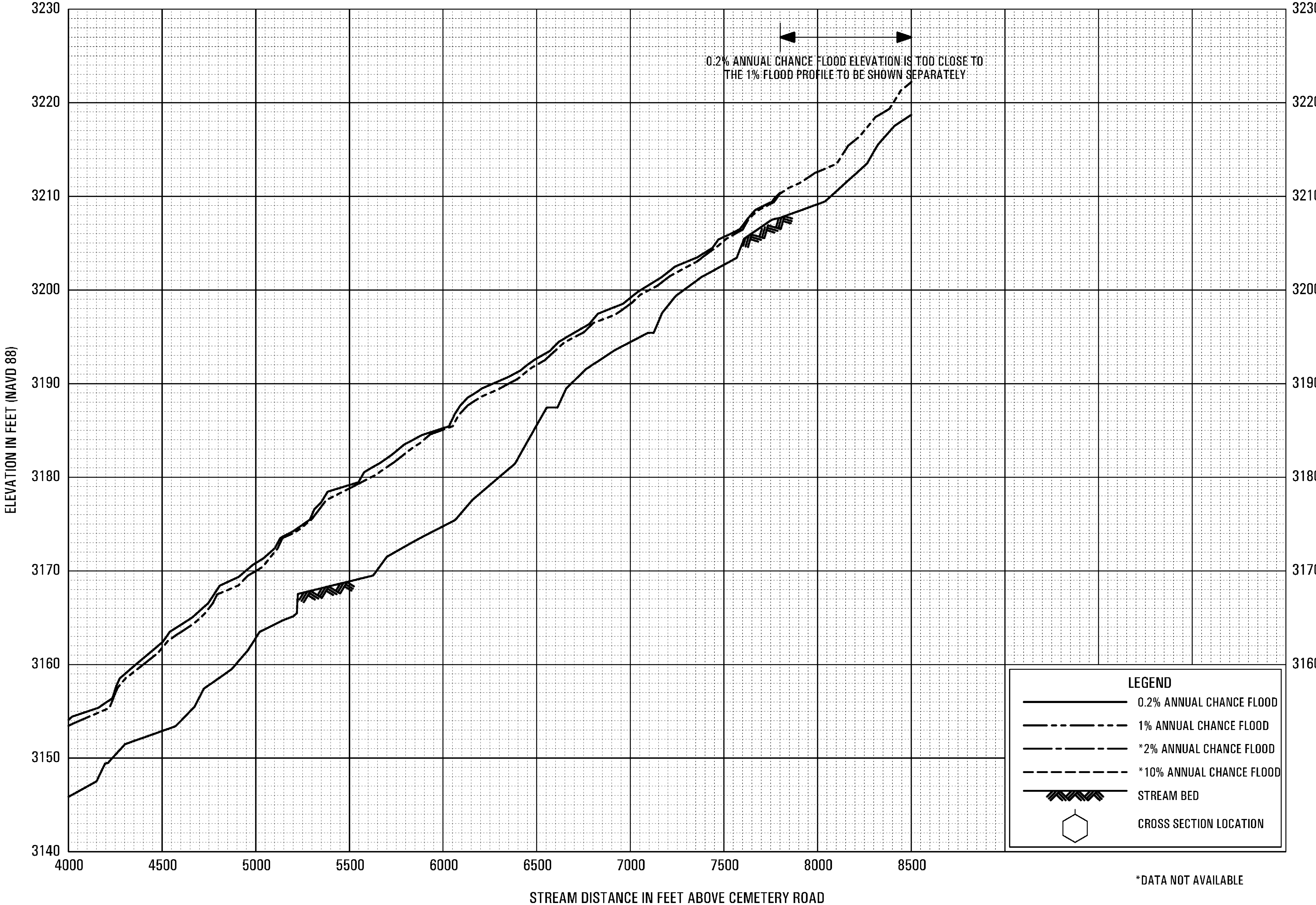
FLOOD PROFILES

SQUAW VALLEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



FLOOD PROFILES

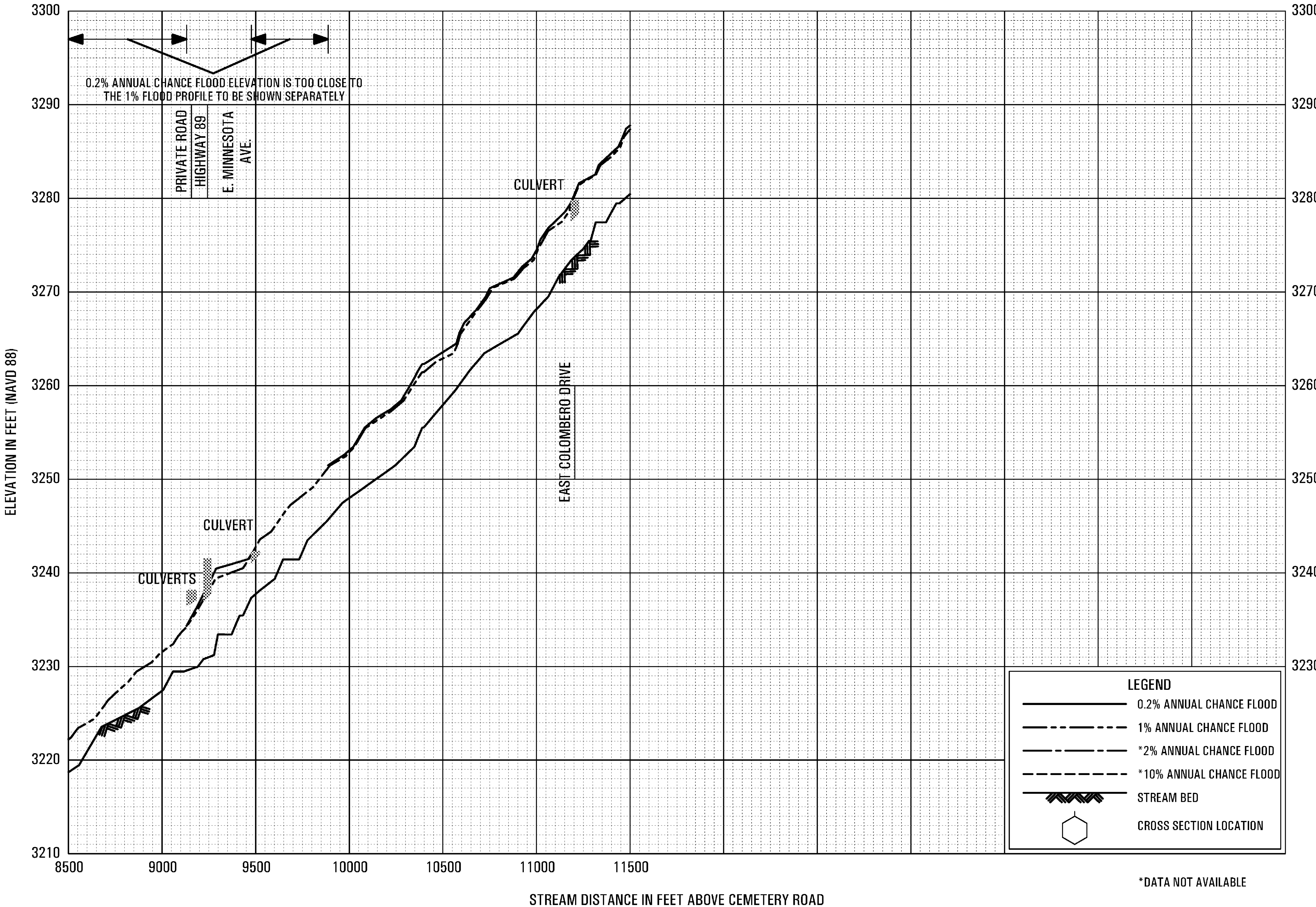
SQUAW VALLEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS

41P



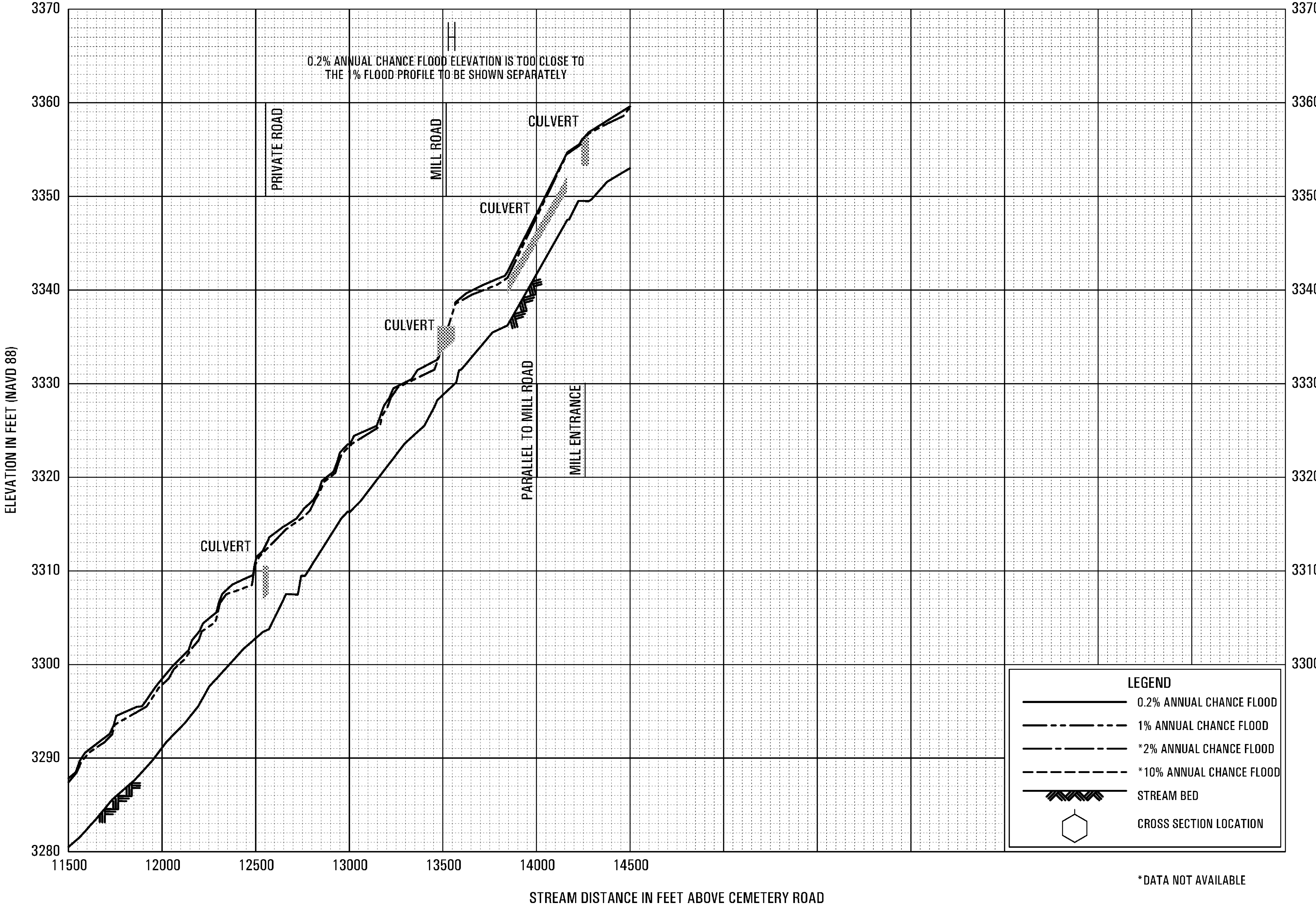
FLOOD PROFILES

SQUAW VALLEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



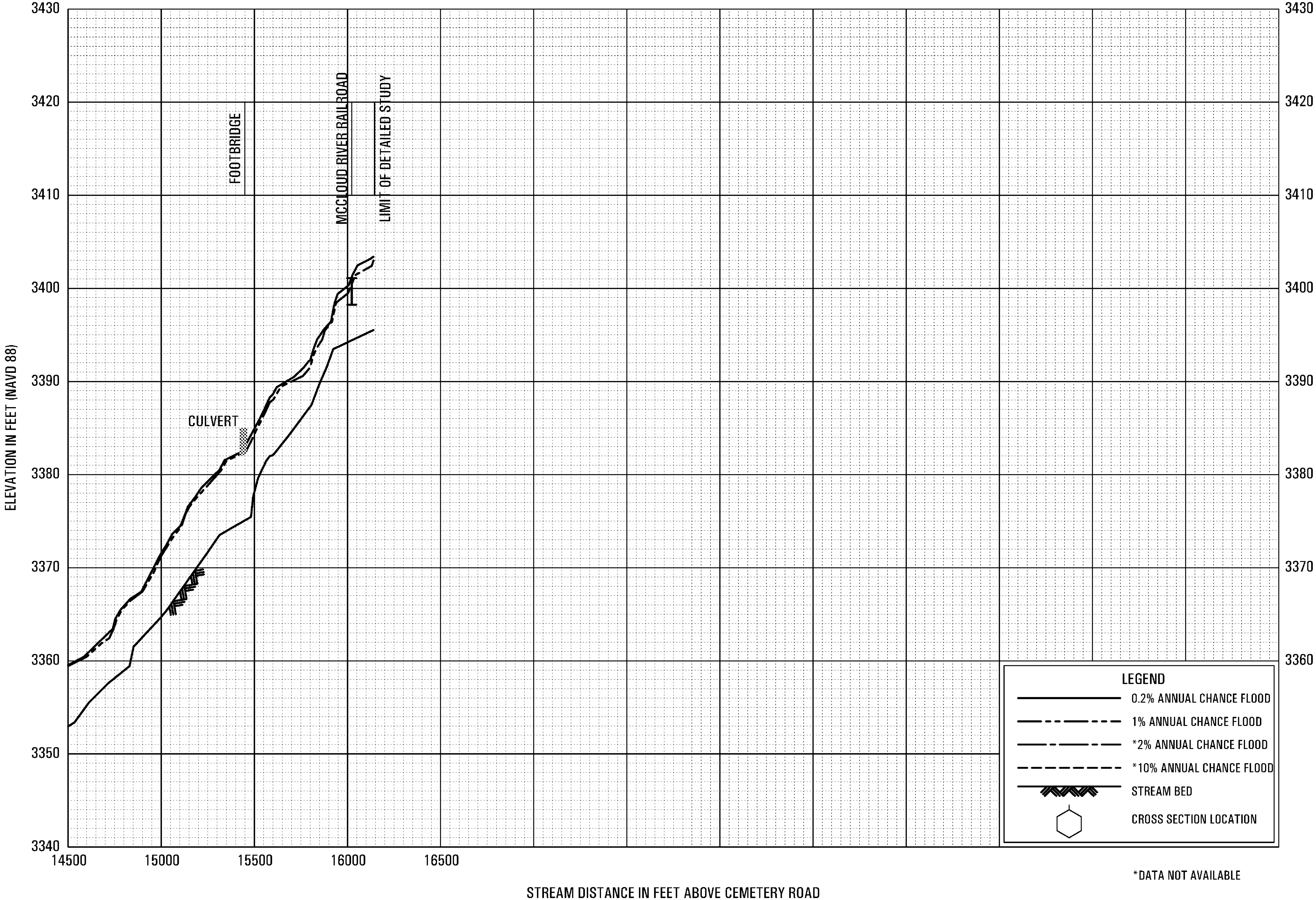
FLOOD PROFILES

SQUAW VALLEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



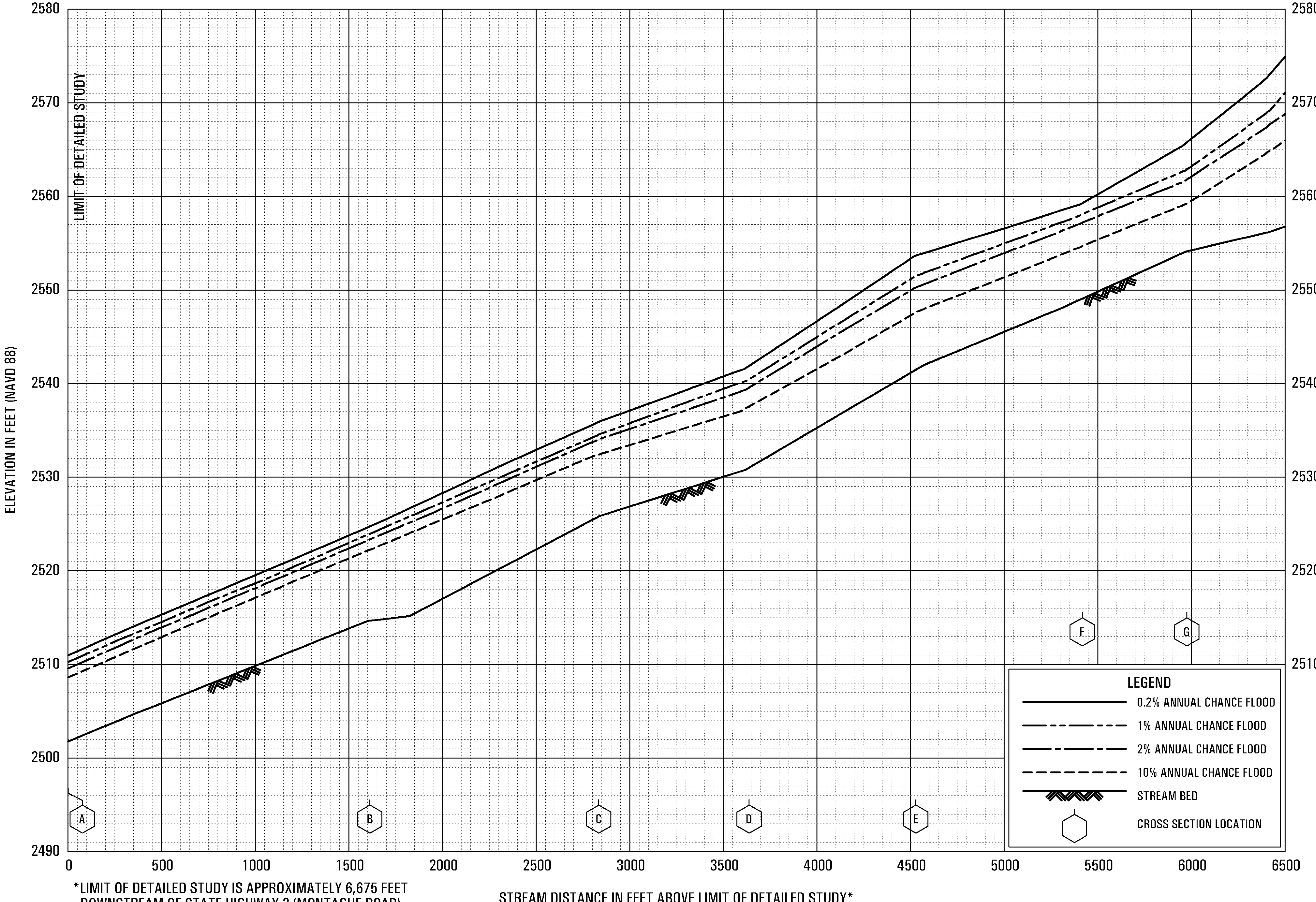
FLOOD PROFILES

SQUAW VALLEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



*LIMIT OF DETAILED STUDY IS APPROXIMATELY 6,675 FEET DOWNSTREAM OF STATE HIGHWAY 3 (MONTAGUE ROAD)

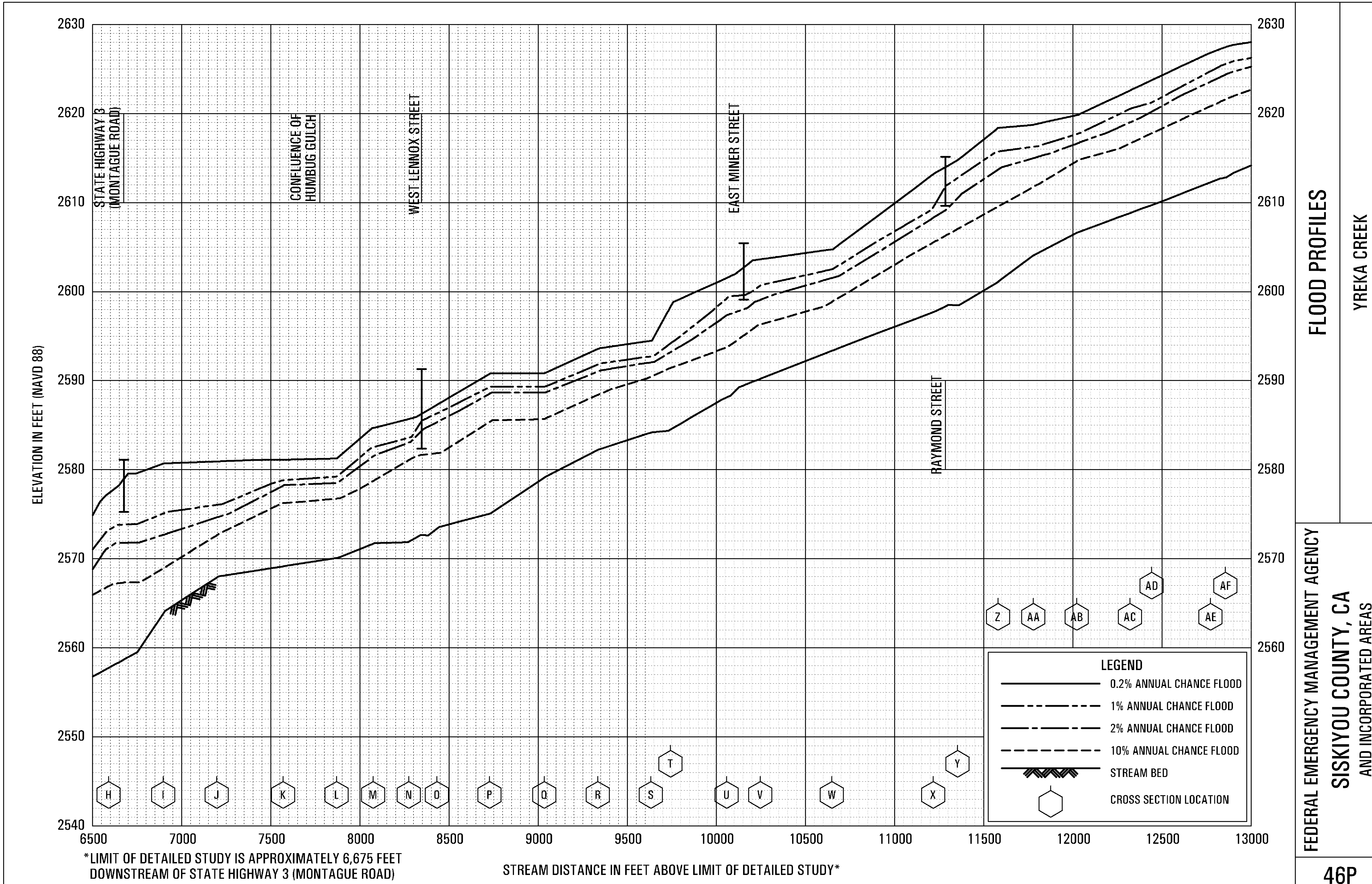
FLOOD PROFILES

YREKA CREEK

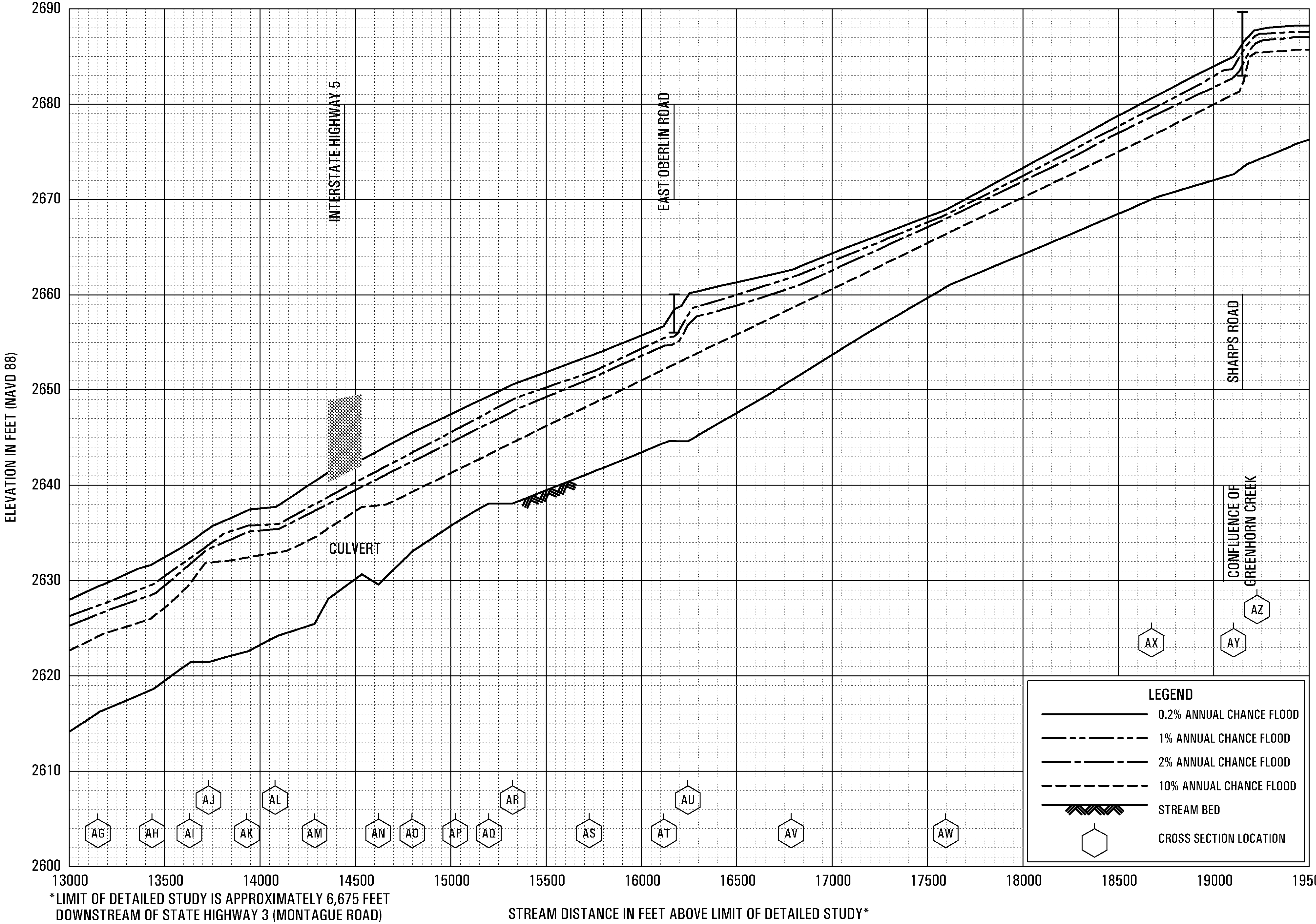
FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



FLOOD PROFILES
YREKA CREEK
FEDERAL EMERGENCY MANAGEMENT AGENCY
SISKIYOU COUNTY, CA
AND INCORPORATED AREAS
46P
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE LIMIT OF DETAILED STUDY*
*LIMIT OF DETAILED STUDY IS APPROXIMATELY 6,675 FEET DOWNSTREAM OF STATE HIGHWAY 3 (MONTAGUE ROAD)
STATE HIGHWAY 3 (MONTAGUE ROAD)
CONFLUENCE OF HUMBUG GULCH
WEST LENNOX STREET
EAST MINER STREET
RAYMOND STREET
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
2540
2550
2560
2570
2580
2590
2600
2610
2620
2630
6500
7000
7500
8000
8500
9000
9500
10000
10500
11000
11500
12000
12500
13000
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Y
Z
AA
AB
AC
AD
AE
AF



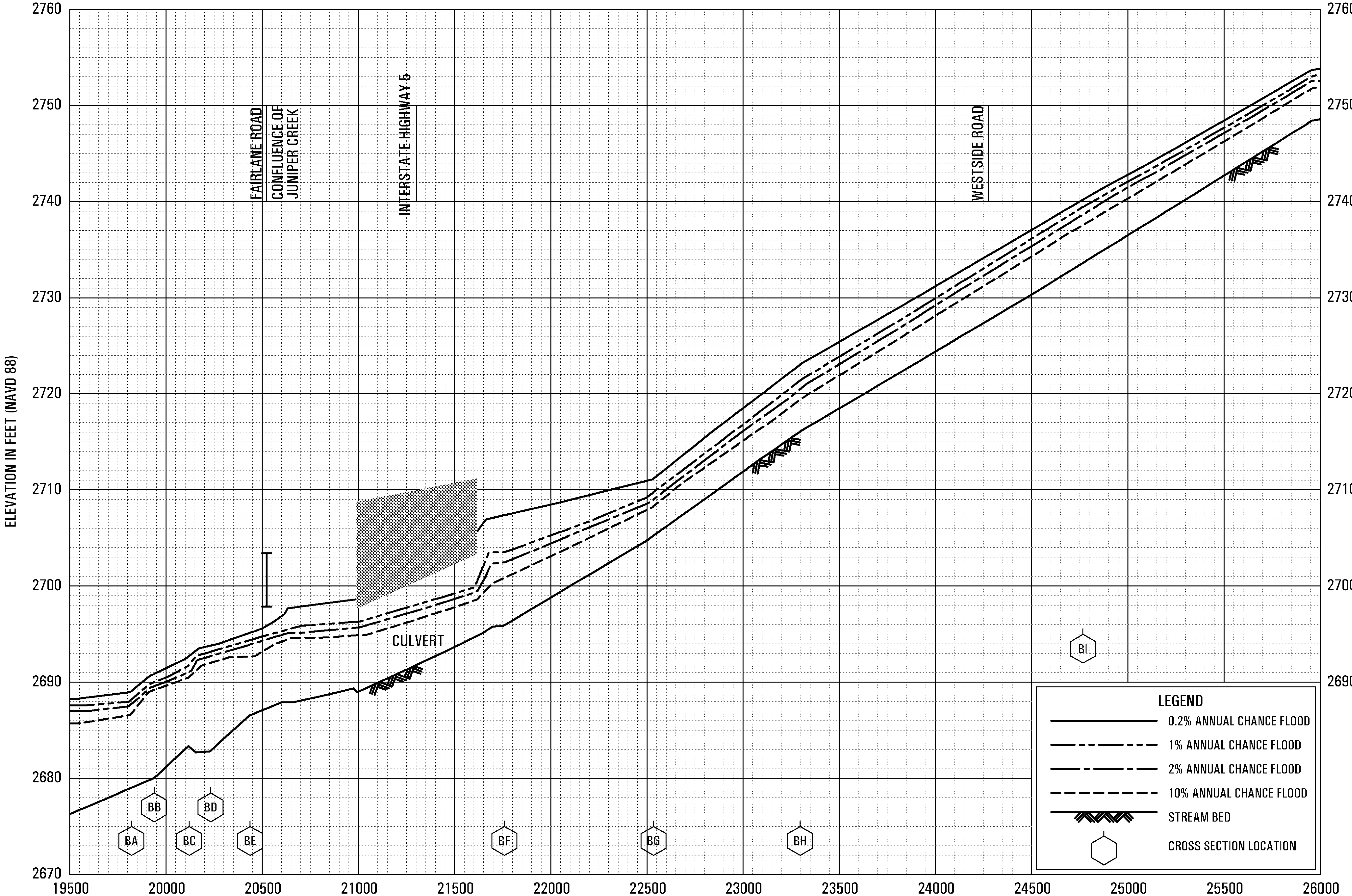
FLOOD PROFILES

YREKA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



*LIMIT OF DETAILED STUDY IS APPROXIMATELY 6,675 FEET DOWNSTREAM OF STATE HIGHWAY 3 (MONTAGUE ROAD)

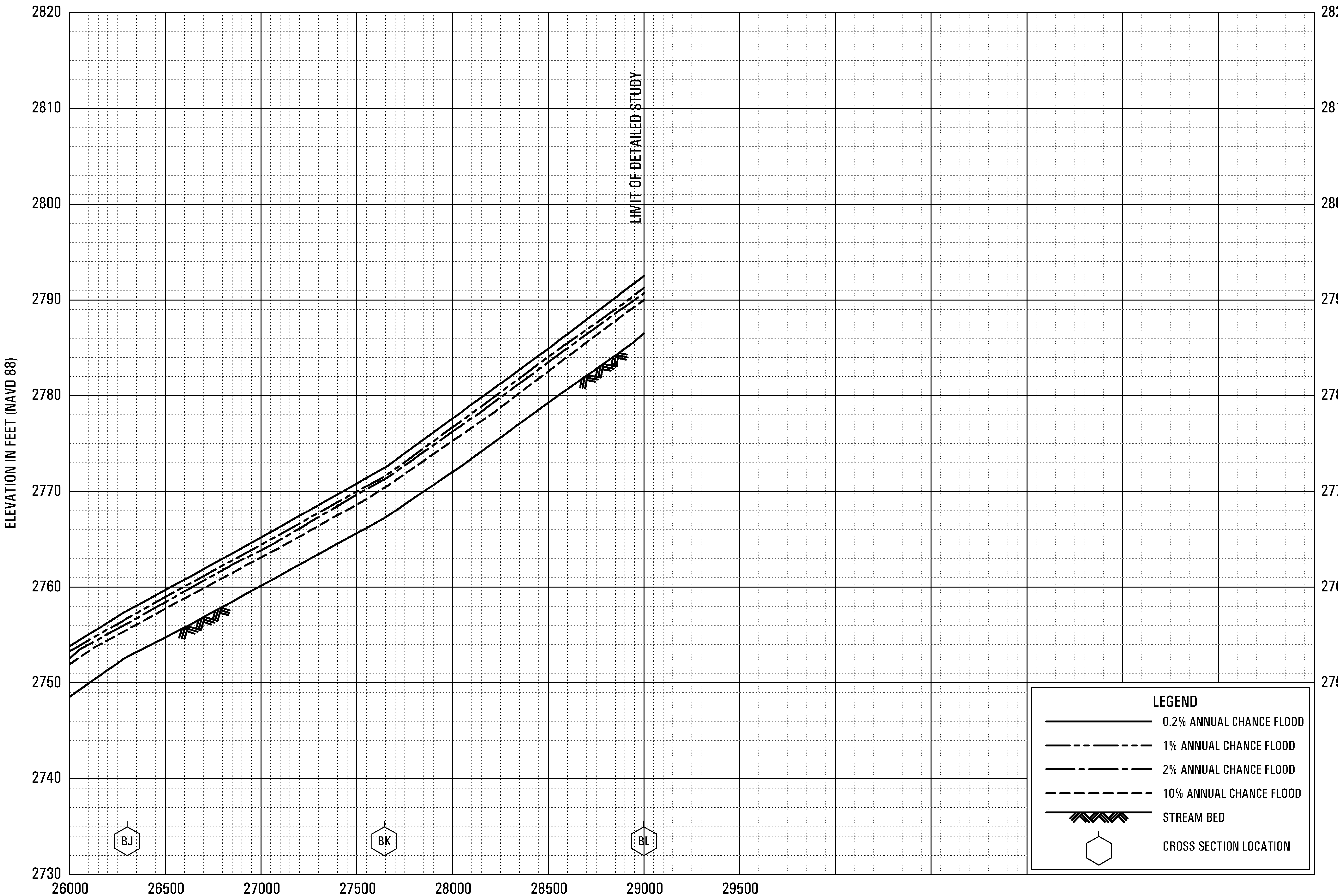
FLOOD PROFILES

YREKA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS



*LIMIT OF DETAILED STUDY IS APPROXIMATELY 6,675 FEET DOWNSTREAM OF STATE HIGHWAY 3 (MONTAGUE ROAD)

FLOOD PROFILES

YREKA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SISKIYOU COUNTY, CA

AND INCORPORATED AREAS