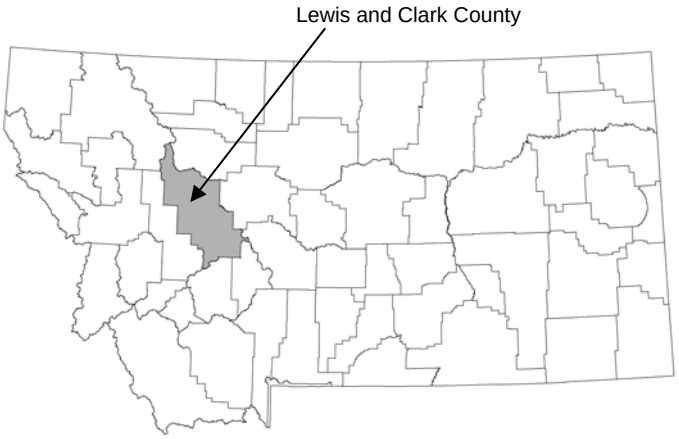
FLOOD INSURANCE STUDY

LEWIS AND CLARK COUNTY, MONTANA

AND INCORPORATED AREAS

Community Name	*Community Number*
EAST HELENA, CITY OF	300039
HELENA, CITY OF	300040
LEWIS AND CLARK COUNTY (UNINCORPORATED AREAS)	300038



Effective: September 19, 2012

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
30049CV000A

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) report may not contain all data available within the Community Map Repository. Please contact the Community Map Repository for any additional data.

The Federal Emergency Management Agency (FEMA) may revise and republish part or all of this FIS report at any time. In addition, FEMA may revise part of this FIS report by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS report. Therefore, users should consult with community officials and check the Community Map Repository to obtain the most current FIS report 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, cross-sections). In addition, former flood hazard designations have been changed as follows:

Old Zones	New Zone
A1 through A30	AE
A0	AO
B	X
C	X

Initial Countywide FIS Effective Date: September 19, 2012

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FLOOD INSURANCE STUDY
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1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and supersedes the FIS reports and/or Flood Insurance Rate Maps (FIRMs)/Flood Boundary and Floodway Maps in the geographic area of Lewis and Clark County, Montana, including the Cities of East Helena and Helena, and unincorporated areas of Lewis and Clark County (hereinafter referred to collectively as Lewis and Clark County) (References 1, 2, and 3) and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates. This information will also be used by Lewis and Clark County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

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

1.2 Authority and Acknowledgments

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

The hydrologic and hydraulic analyses for the original study were performed by U.S. Geological Survey (USGS), for the Federal Insurance Administration (FIA), under Inter-Agency Agreement No. IAA-H-9-77, Project Order No. 7. The original study, which was completed in January 1979, covered all significant flooding sources affecting Lewis and Clark County.

Revised hydrologic and hydraulic analyses were performed by Morrison-Maierle, Inc., for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-C-0945. This work was completed in August 1983 and covered primarily the flooding sources in the Helena Valley (Tenmile and Prickly Pear Creeks).

A revision of the floodway and floodplain of Tenmile Creek was performed because of updated topographic information, channel migration, and the addition and replacement of hydraulics structures along the channel. The hydrologic and hydraulics analysis was performed by the U.S. Geological Survey (USGS), for FEMA, under Contract No. EMW-

2002-IA-0115 and Contract No. EMD-2003-IA-0002. This work was completed in September 2006.

A revision of the floodway and floodplain for Silver Creek was performed by PBS&J, for the Montana Department of Natural Resources (DNRC), under Contract No. W0-PBSJ-045. This work was completed in November 2010.

The 2006 NAIP Imagery base map for Lewis & Clark County was originally produced by the United States Department of Agriculture – Farm Services Agency. The original aerial photos were natural color acquired by the Farm Services Agency in support of planning and delivery of USDA programs. The original digital images were then processed to an infra-red product with a 1 meter ground sample distance (GSD) and rectified to National Mapping Standards at the 1:24,000 scale. Images were combined to 10,000-meter by 10,000-meter tiles without a buffer. The tile imagery is formatted to the Montana State Plane coordinate system using NAD83. The color infrared tiles were acquired from the Montana State Library (www.nris.mt.gov). Tiles were joined together into a countywide dataset using Lizardtech GeoExpress 6.0 with a compression ratio of 18:1. They were then converted to black and white imagery using the GeoExpress 9.0.

1.3 Coordination

For the countywide FIS, the initial Consultation Coordination Officer (CCO) meeting was held on May 19, 2006 and was attended by representatives of the Montana Department of Natural Resources and Conservation (DNRC), Lewis and Clark County, the City of Helena, and the study contractor.

The final CCO meeting was held on date June 1, 2011 and was attended by representatives of FEMA, Montana DNRC, Lewis and Clark County, the City of East Helena, the City of Helena, and the study contractor. All problems raised at the meeting have been addressed.

Lewis and Clark County (Unincorporated Areas)
An initial coordination meeting, attended by Lewis and Clark County officials and representatives of FIA, the study contractor, and the Montana DNRC, was held on November 4, 1975. County officials helped to identify flooding sources requiring study by detailed and approximate methods.

The results of the original study were reviewed at a final community coordination meeting held on May 14, 1980, and attended by representatives of FIA, the study contractor, the Montana DNRC, and the county. No problems were raised at the meeting.

In May 1981, floods in the Helena Valley were significantly higher than the historic maximums, and this prompted a restudy of Tenmile and Prickly Peak Creek flood plains. A coordination meeting, during which stream reaches to be restudied were identified, was held on June 28, 1982. The meeting was attended by representatives of the county, study contractor, the Montana DNRC, and FEMA.

City of East Helena
In May, 1981, floods in the Helena Valley were significantly higher than the historic maximum floods and this prompted the need for a restudy of the Prickly Pear Creek floodplain. A coordination meeting, which identified stream reaches to be restudied, was

held on June 28, 1982. Attending the meeting were Lewis and Clark officials, and representatives of the study contractor, the Montana DNRC, and FEMA.

City of Helena
An initial community coordination meeting was held on November 4, 1975. This meeting was attended by representatives of the USGS, the study contractor, the Federal Insurance Administration, the Montana DNRC, the City of Helena, and Lewis and Clark County. The purpose of this meeting was to discuss the study and the National Flood Insurance Program; also, the flooding sources within the Helena corporate limits requiring detailed study were tentatively identified.

A FIS was also discussed for Lewis and Clark County, and that study is also being conducted by the USGS. Results of the two concurrent studies will thus be coordinated and completely compatible because hydrologic and hydraulic analyses are being made jointly.

The results of the study were reviewed at a final community coordination meeting held on February 28, 1979. Attending the meeting were representatives of the Federal Insurance Administration, the study contractor, and the city. The study incorporates all appropriate comments and all problems have been resolved.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Lewis and Clark County, Montana including the Cities of East Helena and Helena, and the unincorporated areas of Lewis and Clark County.

The streams studied by detailed methods are presented in Table 1.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through 2008.

Areas studied by approximate methods include segments of East Branch, Grosfield Ditch, Lake Helena Drive Branch, Last Chance Gulch, North Overflow of Prickly Pear Creek, Tenmile Creek, and Valley Drive Branch. Therefore, these areas were designated as zones of minimal flooding.

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 Lewis and Clark County.

Table 1 – Streams Studied by Detailed Methods

Blackfoot River	Prickly Pear Creek
East Overflow of Prickly Pear Creek	Silver Creek
Elk Creek	Silver Creek (Ryanns Lane)
Grizzly Gulch	Silver Creek (D2 Ditch)
Last Chance Gulch	South Braid of Prickly Pear Creek
North Overflow of Prickly Pear Creek	Tenmile Creek
Orofino Gulch	

2.2 Community Descriptions

Lewis and Clark County, covering an area of 3,498 square miles in west-central Montana, is largely mountainous. The Continental Divide runs through the county and defines part of the northwestern boundary. The adjacent counties are Teton County to the north, Flathead County to the northwest, Powell County to the west, Jefferson County to the south, Broadwater County to the southeast, and Meagher and Cascade Counties to the east.

The northwestern one-third of the county is extremely rugged and generally uninhabited. Portions of two wilderness areas and several of the streams' headwaters are included in this part of the county.

The unincorporated community of Lincoln (population 1,013 per the 2010 Census) is south of the Scapegoat Wilderness Area in west-central Lewis and Clark County along the Blackfoot River. Lincoln is the only sizable community west of the Continental Divide in the county.

The northeastern one-third of the county consists primarily of rolling foothills and rangeland along the eastern slope of the Continental Divide. Development is generally limited to the numerous scattered ranches and the unincorporated community of Augusta. Augusta, with a population of 309 per the 2010 Census, is along Elk Creek near the northeastern corner of the county.

The southern one-third of Lewis and Clark County contains the only two incorporated communities in the county, Helena and East Helena. Most of the county population of 63,395 (per the 2010 Census) is either in or adjacent to these two communities. Outside their corporate boundaries, there is residential development to the north in the broad, flat Helena Valley. This valley area is traversed by small streams (including Tenmile, Silver, and Prickly Pear Creeks) that combine before draining into Lake Helena. The county has seen steady growth over the last few years.

Prickly Peak Creek originates in the Elkhorn Mountains southeast of Helena and flows northerly toward Lake Helena. Along its nearly 40-mile reach, Prickly Peak passes through the communities of Jefferson City, Clancy, Montana City, and East Helena. Elevations within the Prickly Peak Creek basin range from 9,381 to 3,651 feet.

Tenmile Creek originates along the eastern side of the Continental Divide, southwest of Helena. Flowing northerly through the community of Rimini, Tenmile Creek collects tributary drainages. Elevations range from 8,150 to 3,658 feet. At its confluence with Walker Creek, Tenmile Creek begins flowing northeasterly and continues through the Helena Valley toward Prickly Peak Creek and Lake Helena.

The Missouri River, which is the largest river in the county and one of the largest in the state, flows through the southern one-third of Lewis and Clark County.

The climate of Lewis and Clark County is typically semiarid continental and is characterized by extremes in temperatures and precipitation. Summer temperatures commonly exceed 100° Fahrenheit (°F), and winter temperatures of below -30°F are also common. Average annual precipitation ranges from approximately 10 inches in the Helena Valley area north of Helena to more than 40 inches in the mountain areas (Reference 4).

Soil in valley flood plain areas is predominantly shallow gravelly loam. The soil in some portions of the Helena Valley is deep silty loam. However, all of the Blackfoot River area is gravel.

Vegetation along flood plain areas is sparse to moderate, and the dominant species are willow and cottonwood. Vegetation along the Blackfoot River consists predominantly of pine and fir species.

City of East Helena

The City of East Helena is located near the southern boundary of Lewis and Clark County, in west-central Montana, approximately 5 miles east of Helena, Montana. East Helena began to prosper in 1887, when construction began on the Helena and Livingston Smelting and Reduction Company. This custom smelter operation was later purchased by the American Smelting and Refining Company (ASARCO) and was a primary source of employment in East Helena for many years. Smelting operations continued until 2001 when ASARCO placed the smelter in "indefinite closed status." The population grew from 1,490 to 1,647 between 1960 and 1980. By 1990 the population had decreased to 1,538. As of 2000, the census reports indicated a population of 1,642 and due to extensive residential development in the area, the population increased to 1,984 by 2010.

Prickly Pear Creek, which rises in the mountains south of East Helena, flows northerly toward the center of the town. Prickly Pear Creek drains an area of approximately 251 square miles at East Helena and discharges into Lake Helena, located approximately 8 miles north of the city.

Development on the Prickly Pear Creek flood plain is extensive within the East Helena corporate limits. Single-family residences and a few private businesses have been constructed along the stream banks for almost the entire distance through the city. The only portions of the corporate flood plain yet undeveloped are two municipal parks and several blocks of open-space and near the northern corporate limits.

Soil in valley flood plain areas is predominantly shallow gravelly loam. The soil in some portions of the Helena Valley is deep silty loam.

City of Helena

The City of Helena is located in west-central Montana, on hilly terrain, just east of the Continental Divide. Helena was the site of a gold strike in 1864, and it rapidly grew to an estimated population of 5,000 by 1868. Although many gold camps rapidly became ghost towns after the gold disappeared, Helena's location on important north-south and east-west transportation routes enhanced its stable development. In 1894, Helena became the State capital. Being designated as the center of State governmental activities further ensured Helena's position as one of the principal communities of Montana. Helena has exhibited a fairly steady, moderate growth from approximately 1930 to the present. The 1970 census showed a population of 22,730, an increase of approximately 2,500 over the previous decade. By the year 2000, the census indicated that the city population had grown to 25,270. An even larger growth period would follow. By 2010, the population was 28,190, a growth of over eleven percent in just ten years.

The primary sources of flooding in Helena are two ephemeral streams draining the hills south of the city. These drainages, Dry Gulch and Last Chance Gulch, were both extensively placer

mined during Helena's early history, and have been extensively urbanized since then. The thread of the old Dry Gulch channel now lies almost entirely in residential development, and Last Chance Gulch now forms the primary north-south street through the main business district of Helena. Grizzly Gulch and Orofino Gulch combine to form Last Chance Gulch near the southern corporate limits. Neither Grizzly Gulch nor Orofino Gulch is yet developed within the study area.

2.3 Principal Flood Problems

Large floods in Lewis and Clark County are generally caused by heavy rainfall combined with snowmelt. However, in some drainage areas, either rainfall or snowmelt alone can cause flooding. The peak of the flood season is during May and June, which usually are the wettest months of the year, with June having the most rainfall.

Widespread flooding occurred in Lewis and Clark County in 1908, 1964, 1975, 1981, 1982, 1985, 1996, 2003, and 2007. The most significant floods occurred in June, 1975, May, 1981 and February, 1996. The 1996 flood was given a Presidential Disaster Declaration.

Little is known about the magnitude of the 1908 flood, but photographs and newspaper accounts indicate that it was probably greater than a 1-percent-annual-chance flood on Prickly Pear and Tenmile Creeks. Records from the National Weather Service (Helena) indicate that the 1908 flood had a similar precipitation pattern as the 1981 flood. The antecedent conditions were primed with over 6 inches of precipitation in May. The 1908 flood struck when an additional 4 inches of precipitation accumulated in 3 days in early June. The magnitude and extent of 1908 flooding on the Blackfoot River, Elk Creek, and Silver Creek are unknown.

The 1964 flood was particularly severe on Elk Creek at Augusta. Most of the community was flooded, and agricultural damage upstream and downstream from Augusta was extensive. The estimated peak discharge of the 1964 flood was 10,000 cubic feet per second (cfs). The magnitude of this flood was greater than a 1-percent-annual-chance flood. The 1964 flood was less than a 1-percent-annual-chance flood on the Blackfoot River and Tenmile, Prickly Pear, and Silver Creeks.

The 1975 flood caused substantial flooding on the Blackfoot River and Elk, Tenmile, Silver, and Prickly Pear Creeks. The discharge for the 1975 flood was 7,370 cfs, with a magnitude greater than the 1-percent-annual-chance flood, for the Blackfoot River at Lincoln, 8,500 cfs, with a magnitude of nearly the 1-percent-annual-chance flood, for Elk Creek at Augusta; 1,200 cfs and 1,400 cfs, with a magnitude of nearly the 3-percent-annual-chance flood, for Prickly Pear Creek near Clancy in Jefferson County and at East Helena, respectively; and 1,360 cfs with a magnitude of the 4-percent-annual-chance flood, for Tenmile Creek at Williams Street. No discharge was measured for Silver Creek, but the magnitude was estimated to be at the 10-percent-annual-chance flood.

The greatest structural damage to buildings and residences caused by the 1975 flood occurred in the Helena Valley along Tenmile Creek and in Augusta along Elk Creek. In both areas, basement and their contents in many homes were flooded, and some foundations of buildings were damaged.

The 1981 flood was the result of a combination of snowmelt and heavy rainfall. Records

from the National Weather Service (Helena) indicate that a total of six inches of precipitation fell in May 1981. Of that amount, 3.4 inches fell during the three days leading to the flood on May 22, 1981. The Tenmile Creek flood peaks, determined by the U.S. Geological Survey gages near Rimini (No. 06062500) and near Helena (Williams Street, No. 06063000), were 3,290 and 3,770 cfs, respectively. This event was three times larger than the 1975 flood and created nearly three times as much damage as the previous flood. On Prickly Pear Creek, the 1981 flood near Clancy (gage No. 06061500) was 2,300 cfs, nearly twice the 1975 level; at East Helena (gage No. 0606200), the peak increased to 4,030 cfs.

A small earthen dam at the American Smelting and Refinery Company, located on the south end of East Helena, failed during the 1981 flood and may have contributed to the indirect peak measurement made at East Helena.

The 1981 flows on both Tenmile and Prickly Peak Creeks far exceeded the 0.2-percent-annual-chance flood estimate from the flood-frequency analysis in the original Flood Insurance Study, which used over 67 years of flood records. The magnitude of the 1981 flood based on this updated study is greater than the 0.5-percent-annual-chance flood for Tenmile Creek at Williams Street; for Prickly Pear Creek, it is the 0.5-percent-annual-chance flood near Clancy and greater than the 1-percent-annual-chance flood at East Helena.

The main stream channels of Tenmile and Prickly Pear Creeks are higher, in many places, than the adjoining valley land to the north and east. Thus, floodflows in excess of the main channel capacities cause shallow flooding over large areas far removed from the main channels. This shallow flooding problem is the most severe along Tenmile Creek, where floodflows greater than 800 cfs leave the main channel near Green Meadow Drive. While some of this overflow moves along the overbanks, most of its flows out of the floodplain and moves generally northeasterly through heavily developed residential areas up to two miles from the main stream. Similar conditions prevail on Prickly Pear Creek just north of East Helena, where floodflows greater than 1,100 cfs leave the main channel and move northward.

Flooding from Silver Creek is also aggravated by the poorly defined channel that runs through the areas studied by detailed methods. Therefore, flows of much less volume than the 1-percent-annual-chance flood can spread over a large area along Silver Creek. However, flood damage to structures and their contents is usually not severe because flood depths are relatively shallow (less than three feet).

Dry Gulch and Last Chance Gulch have flooded in the past, although damage has generally been minor. The largest known floods on both drainages occurred in 1908 and 1915. Newspaper and eyewitness accounts of these two floods indicate that some structures were significantly damaged. Other known floods on Last Chance Gulch occurred during the late 1920's and early 1930's. Little damage was reported, but many merchants on Last Chance Gulch used sandbags to prevent basement flooding. All known floods in Helena resulted from heavy rainfall. Rainfall runoff from side streets has also contributed to the approximate flooding on Last Chance Gulch.

2.4 Flood Protection Measures

Flood protection along Tenmile Creek has been investigated by the U.S. Amy Corps of Engineers, the U.S. Soil Conservation Service, and a consulting engineer.

Three dams on the Missouri River create the largest bodies of water in the county. The Missouri River is not a significant source of flooding in Lewis and Clark County because of the degree of regulation and little development along the river.

Land-use and building regulations consistent with State regulations and FEMA policy are in effect within high-risk flood areas throughout the county.

A 54-inch diameter storm sewer was constructed under Last Chance Gulch in the early 1900's. The storm sewer inlet is located just upstream from the intersection of Cruse Avenue and Park Avenue. The inlet capacity is considerably less than the calculated 1-percent-annual-chance flood discharge for Last Chance Gulch. The threat of flooding on Last Chance Gulch has, thus, been lessened substantially as a result of storm sewer construction, but it has not been completely eliminated.

A small dam is located on Prickly Pear Creek just inside the upstream (south) East Helena corporate limits. This structures stores water for use in the American Smelting and Refining Company smelter facilities, but provides no appreciable flood storage or flood regulation. No other flood-control structures exist on Prickly Pear Creek.

Downstream of North Montana Avenue, a levee has been constructed along the right (south) bank of Tenmile Creek to protect homes in the Tenmile Estates subdivision from flooding. No information on this levee, which was constructed before 1981, could be found. The levee does not meet FEMA certification standards and therefore cannot be modeled as providing flood protection in this study.

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 study. 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 flood plain 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 one 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 study. 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 each flooding source studied by detailed methods affecting the community.

The peak discharge-frequency relationship for the Prickly Pear Creeks was recalculated to include data from the 1981 flood.

For the Blackfoot River at Lincoln, flood discharge values are based on a statistical analysis of discharge records at the old USGS gaging station near Helmville, Montana (References 5 and 6). Sixteen years of peak flow records from this gaging station and records of two historic floods (1964 and 1975) were included in the analysis to effectively extend the period of flood record to 35 years. The recorded and historic floods were analyzed by the standard log-Pearson Type III method (Reference 7). The flood discharges determined at the gaging station were transferred from the station site to Lincoln by the following transfer relation (Reference 8):

$$Qt = (Au/Ag)\ 0.6Qg$$

where Qt = Flood magnitude in cfs at the ungaged site

Au = Drainage area in square miles at the ungaged site

Ag = Drainage area in square miles at the gaged site

Qg = Flood magnitude in cfs at the gaged site.

An independent determination of flood discharges on the Blackfoot River at Lincoln was made using a regional formula developed by the USGS (Reference 8). This method yielded results close to those developed from the recorded and historic peak discharges at the gaging station near Helmville. Final values used in this study are an average of flood discharges determined by the two different methods.

Flood discharges for Elk Creek and Prickly Pear Creek were also determined from a statistical analysis of recorded and historic peak flow values.

For Elk Creek, 22 years of peak flow records are available at the old USGS gaging station at Augusta, Montana (Reference 9). By combining the historical flood records for 1964 and 1975 with the gaging station records, the period of record analyzed was effectively extended to 71 years.

The peak discharge-frequency relationship for the Prickly Pear Creeks is based in part on Flood Drainage Studies for the stream (References 10). These Flood Drainage Study updated discharge estimates to include data through 1981. The information was then further refined for this study.

For Prickly Pear Creek, 44 years of peak flow records from the USGS gaging station near Clancy, Montana (References 9 and 12 through 14) were combined with historic peak flow records for 1908 (2,000 cfs estimated), 1975 (1,200 cfs), and 1981 (2,300 cfs). The period of record with historic flows was extended to 73 years and analyzed using U.S. Water

Resources Council guidelines (Reference 15). The flow-frequency characteristics at the gaged site were then weighted with the results obtained by using regional flood-frequency equations (Reference 16). The weighed results are the best estimate for determining flood frequencies. The flood discharges at East Helena were obtained by transferring the results from the Clancy station. The transfer method follows the procedures detailed in U.S. Geological Survey Open-File Report 81-917 (Reference 16). The transfer technique used on Prickly Pear Creek is an updated transfer method and is as follows:

$$Qt = (Au/Ag)aQw,t$$

Where Qt = Flood magnitude in cfs estimated at ungaged site

Au=Drainage area in square miles at ungaged site

Ag=Drainage area in square miles at ungaged site

a=Exponent of drainage area for appropriate region and desired exceedence probability

Qw,t=Weighted value of flood magnitude in cfs at gaged site

The Prickly Pear Creek flood discharges downstream of East Helena are reduced by the amount of the overflow that flows into the East and North overflows of Prickly Peak Creek. A portion of the over-flow later returns to the Prickly Pear channel; therefore, increases in the discharge amount are compatible with previously established losses.

Northwest of East Helena, as Prickly Pear Creek leaves the corporate limits, overflow to the north occurs when flows exceed 1,100 cfs. The overflow branches into many small drainages and roadside ditches. One branch, the North Overflow of Prickly Pear Creek, conveys overflow directly north to Lake Helena. The flood-frequency relationships for the North Overflow of Prickly Pear Creek were established by overflow calculations. The 10-percent-annual-chance flood was not analyzed because it does not overflow the Prickly Pear Creek flood plain at this point.

Another branch carrying overflow is the East Overflow of Prickly Pear Creek. This branch separates from Prickly Pear Creek at a right angle and then flows along Wylie Drive to the Helena Valley Canal. The flood-frequency relationships for the East Branch of Prickly Pear Creek were established by overflow calculations.

In addition, approximately 1,000 feet downstream of North Overflow of Prickly Pear Creek, the Prickly Pear Creek flood plain splits. The discharges for this area were determined by routing all flows above the channel capacity on the south channel into the north channel. Although the south channel is the natural main channel, for this analysis the north channel is considered to be Prickly Pear Creek because it has the larger discharge. The south channel is then referred to as South Braid of Prickly Pear Creek.

The flood-frequency characteristics at both USGS gaging stations were determined by fitting a log-Pearson Type 3 distribution to the recorded annual peak discharges in accordance with methods outlined by the Interagency Advisory Committee on Water Data in Bulletin 17B of the Hydrology Subcommittee (Reference 17). At the station near Rimini, 82 years of annual peak discharge record through 1998 were analyzed, and at the

station near Helena 50 years of annual peak discharge were analyzed. At both sites, the largest known annual peak discharges were in 1975 and 1981. At the station near Rimini, the 1975 and 1981 annual peak discharges were 995 and 3,290 cubic feet per second, respectively. At the station near Helena, the 1975 and 1981 annual peak discharges were 1,360 and 3,770 cubic feet per second, respectively. At both sites, the annual peak discharges for 1975 and 1981 are the largest since the flood of 1908. The annual peak discharge associated with the 1908 flood is unknown at both sites. For purposes of fitting the log-Pearson Type 3 distribution to the annual peak discharges at both Tenmile Creek gaging stations, the 1975 and 1981 peak discharges were considered to be high outlier/historic discharges that were the largest in 90 years (1908 to 1998).

The logarithms of the flood-frequency characteristics for Tenmile Creek at Highway 12 were linearly interpolated, based on drainage area, between logarithms of flood-frequency characteristics at the station near Rimini and the station near Helena, as described by Parrett and Johnson (Reference 18).

Flood-frequency data for Tenmile Creek at Williams Street were based on the analysis of gaged data for the station near Helena.

The USGS regional regression equations based on basin characteristics, Parrett and Johnson (Reference 18), were used to determine flood-frequency data for Tenmile Creek at Green Meadow Drive. The Tenmile Creek watershed is in the Southwest Region of Montana, where the regional equations were based on data from 44 gaged sites with record lengths ranging from 12 to 82 years (total station years of data = 1,337). Basin-characteristics data required for the regression equations in the Southwest Region of Montana are drainage area and percent of the basin above 6,000 ft elevation. The drainage area for Tenmile Creek at Green Meadow Drive is about 188 square miles, and the percent of the basin above 6,000 ft elevation is 20.3.

No recorded flow information is available for Silver Creek. Twenty years of peak flow records are available; however, for Little Prickly Pear Creek near Marysville (Reference 9). This stream is close to Silver Creek and drains an area of approximately the same size. Because of the proximity, similar size, and similar geography, flood discharges determined for Little Prickly Pear Creek were considered applicable to Silver Creek. Consequently, flood discharges for Silver Creek were developed from a log-Pearson Type III analysis (Reference 7) of the 20 years of peak flow data available at the Little Prickly Pear Creek gaging station.

Peak discharge-drainage area relationships for the Blackfoot River; Elk Creek, Silver Creek, Prickly Pear Creek, Tenmile Creek, the South Braid of Prickly Pear Creek, the East Overflow of Prickly Pear Creek, the North Overflow of Prickly Pear Creek, Last Chance Gulch, Grizzly Gulch, and Orofino Gulch are shown in Table 2 below.

No gaging stations have been operated on any of the drainages in the City of Helena. Consequently, the discharge-frequency relations were determined by relating regional basin characteristics to regional steam flow characteristics (Reference 8) The results were compared with regional relationships of peak discharge and drainage area for nearby stream gaging stations and were found to be reasonable.

Table 2 - Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
Blackfoot River					
At Lincoln	255	3,380	5,740	7,040	10,400
At Gage Near Helmville (No. 12335000)	481	5,010	8,110	9,570	13,300
East Branch of Prickly Pear Creek					
At Mouth	--[1]	1	1	50	325
Elk Creek					
At Gage at Augusta (No. 06084500)	157	3,400	6,860	8,610	13,200
Grizzly Gulch					
At Mouth	8.3	90	200	255	350
Last Chance Gulch					
At Storm Sewer Inlet	12.4	105	230	300	465
At Storm Sewer Outlet	13.4	105	235	310	500
North Overflow of Prickly Pear Creek					
At Mouth	--[1]	0	700	1,100	1,900
Orofino Gulch					
At Mouth	4.0	50	110	140	185
Prickly Pear Creek					
At Gage Near Clancy (No. 06061500)	192	715	1,400	1,805	3,200
At East Helena	251	890	1,710	2,190	3,500
Just Downstream of North Overflow of Prickly Pear Creek Divergence	251	890	1,000	1,100	1,600
Just Downstream of South Braid of Prickly Pear Creek Divergence[2]	251	440	525	600	1,075
Below Helena Valley Irrigation Canal	255	890	1,250	1,400	1,725

Table 2 - Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
Prickly Pear Creek (Continued)					
Below Confluence with East Branch	260	915	1,300	1,475	1,825
Below Sierra Road East	268	935	1,350	1,550	1,925
Silver Creek[3]					
At Green Meadow Drive	44	340	560	660	910
Silver Creek Overflow (Ryanns Lane)[3]					
At North Montana Avenue	--[2]	237	391	455	612
Silver Creek Overflow (D2 Ditch)[3]					
At Sta. 5162	--[2]	19	66	92	179
At Sta. 3716	--[2]	206	355	426	623
At Sta. 2061	--[2]	332	552	642	890
South Braid of Prickly Pear Creek At Wylie Drive	--[1]	450	475	500	525
Tenmile Creek					
At Highway 12	78	680	1,290	1,620	2,620
At Williams Street Bridge	97	730	1,380	1,730	2,740
Below Confluence with Sevenmile Creek	188	1,200	2,300	2,910	4,610
Below Green Meadow Drive[4]	188	808	1,450	1,640	2,560
Below McHugh Drive	--[1]	808	930	930	1,490
At North Montana Road	--[1]	808	890	890	1,380
At Confluence with Prickly Pear Creek	--[1]	808	890	890	1,380

[1]Data Not Available
[2]Split Flow
[3] Split Flow Simulation –Flow Discharges given for major sections of the study. Please refer to Silver Creek Hydraulic Analysis for additional information
[4] Begin Split Flow – Flow is estimated based on HEC-RAS split flow simulation

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the Flood Insurance Rate Map (FIRM) represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data Table in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS report in conjunction with the data shown on the FIRM.

Water-surface elevations of floods of the selected recurrence intervals were computed using the USGS E-431 step-backwater computer program for the Blackfoot River, Elk Creek, Last Chance Gulch and the upstream reach of Silver Creek (Reference 19) and the U.S. Army Corps of Engineers (USACE) HEC-2 computer program for Prickly Pear Creek and its overflows (Reference 20).

Cross sections for the backwater analyses of the Blackfoot River, Elk Creek, and the upstream reach of Silver Creek were obtained from aerial photographs in April 1977 (Reference 21). The horizontal control for the aerial photogrammetry consisted of Government monuments and coordinate values of landmarks digitized from USGS topographic maps. Specified accuracy for the aerial photogrammetry is approximately 1 foot. The below-water sections were obtained by field measurement. All bridges, dams, and culverts were field checked to obtain elevation data and structural geometry.

Cross sections for Prickly Pear Creek and its overflows were obtained from field surveys by the study contractor. All bridges and culverts were surveyed to obtain elevation data and structural geometry.

The step-backwater analyses on Last Chance Gulch were terminated just downstream from the Burlington Northern Railroad tracks near Carroll College. Below this point, extensive mine tailings and gravel mounds have virtually eliminated the natural drainage course. Floodwater from Last Chance Gulch entering this disturbed area would pond and be absorbed by the gravel instead of continuing overland. Thus, no surface water flooding downstream from the tailings area is shown. Sound land use practice will require that provisions be made for maintaining adequate subsurface drainage where the tailings area is disturbed in the future by activities such as land leveling and new construction.

In several other areas, steep channel slopes and complete-channel obstruction made a backwater analysis of flow conditions in Last Chance Gulch impossible. In these areas, flow depths were computed assuming critical flow conditions in the steep areas and assuming weir flow conditions at the obstructions. Water ponding upstream from the obstructions also causes shallow flooding on Last Chance Gulch upstream from the storm sewer inlet. Shallow overland flooding with depths less than one foot, occur during the 1-percent-annual-chance flood in the area served by the underground storm sewer as a result of inadequate inlet capacity. Shallow flooding depths were determined using topographic maps (Reference 22) and normal depth calculations.

Approximate areas were determined by field investigation and engineering judgment.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 feet for floods of the selected recurrence intervals (Exhibit 1).

Roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and are based on field observations of the stream and flood plain areas. Roughness factors used for the channel ranged from 0.035 to 0.055; for the flood plain areas, values ranged from 0.040 to 0.150.

Starting water-surface elevations for the Blackfoot River were determined from step-backwater computations made at cross sections downstream from the area studied by detailed methods. Starting water-surface elevations for Elk Creek were determined from a rating curve prepared from a 1975 high-water mark. Starting water-surface elevations for Prickly Pear Creek were determined by the slope-area method at the starting (downstream) cross section. Starting water-surface elevations for the South Braid of Prickly Pear Creek were taken from the main stem downstream of the conference point. Starting water-surface elevations for East and North Overflow of Prickly Pear Creek were computed by the slope-area method.

Generally, the distances on the flood profiles correspond to distances measured along the centerline of the designated water-courses. In several areas, however, the meandering nature of the low flow streambeds necessitated use of distances measured along the centerline of the 1-percent-annual-chance event flow paths. On the maps, these flow lines, used to establish the respective profile distances, are delineated and labeled as Profile Base Lines.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Flood elevations were not determined for the areas of shallow sheet flooding adjacent to Prickly Pear Creek. Average flood depths were estimated from the photographs of the 1975 and 1981 floods for these areas and were determined to be 1 foot or less.

On the Blackfoot River and Elk, Prickly Pear, Silver, and Tenmile Creeks, several island areas are within the 1-percent-annual-chance flood plain. A routed-flow method was used to determine water-surface elevations in areas of flow that are separated from the main channel by these islands. This method assumes the same energy gradeline across the cross section. Therefore, the water-surface elevation in the split channel is the same as that in the main channel at a particular cross section.

The flood elevations determined do not incorporate the effects of emergency flood protection measures, such as diking or sandbagging. Although such measures may limit the width of flooding, particularly in the areas of shallow sheet flooding, they may also raise flood elevations in the main channel.

Aerial photography of the 1975 flood (Reference 23) was used to determine the 1-percent-annual-chance flood elevations for the approximate-study reach of Grosfield Ditch, a tributary to the Blackfoot River. Aerial photography of the 1981 flood (Reference 24) was

used to delineate the flood plain along the approximate-study reaches of Prickly Pear Creek, North Overflow, East Branch, and several unnamed flooding sources. For Lake Helena Drive Branch and Valley Drive Branch, the 1-percent annual chance flood elevations were determined by field observations. Oblique 1981 flood photos were also used to delineate the flooding on Valley Drive Branch.

HEC-RAS version 3.1 (Reference 25) was used to simulate hydraulics for the Tenmile Creek main channel and for Tenmile Creek Estates. Areas of initial concern were resolved and warnings generated by HEC-RAS were reviewed and judged acceptable for the final models presented in this restudy.

The Surfacewater Modeling System (SMS) Version 9.0 and Depth-Average Flow and Sediment Transport Module (FST2DH) Release 3.2.2 were used to simulate the 1- and 0.2-percent annual chance floods leaving the Tenmile Creek main channel and traveling across the Helena Valley

Cross sections surveyed in the field were used to establish the 10-, 2-, 1-, and 0.2-percent annual chance profiles and the 1-percent annual chance floodway profile for Tenmile Creek. Estimates of 10-, 2-, 1-, and 0.2-percent annual chance peak discharges were used with cross-sectional data as input data to develop a step-backwater model.

Seventy-six cross sections were surveyed, along with twenty-four bridges and one culvert for Tenmile Creek. Contracted opening and road geometry for the North Montana Avenue Bridge were obtained from site plans as this bridge was in the process of being replaced during the study.

The starting water-surface elevations at the initial cross section for the 10-, 2-, 1-, and 0.2-percent annual chance profiles for Tenmile Creek were obtained using the normal depth calculated by the Manning's equation within HEC-RAS. An energy slope of 0.004 was estimated based on the creek channel slope.

Silver Creek, Silver Creek Overflow (Ryanns Lane), and Silver Creek Overflow (D2 Ditch) water-surface elevations were computed through the use of USACE HEC-RAS Version 4.0 computer program (Reference 26). Initial and final results for the models incorporated the use of HEC-GeoRAS (Reference 27). The HEC-RAS model for these studies was executed under the assumption of subcritical flow. The "normal depth" option was selected as the downstream boundary condition used to compute the starting water-surface elevations.

Field survey was performed by Professional Consultant Inc. during March 2010 (Reference 28). The survey data was captured in Montana State Plane NAD 1983 International Feet and the vertical datum is based on NAVD 1988 elevations. Field surveyed cross sections were obtained at or near all structures located on Silver Creek, Silver Creek Overflow (Ryanns Lane), and Silver Creek Overflow (D2 Ditch). Additional survey information was gathered in the surrounding area for reference purposes. All survey data was certified by PCI as meeting FEMA guidelines and specifications. Topographic Data on Silver Creek was collected using LiDAR techniques provided by Watershed Sciences (flight data 3/11/2010) (Reference 29).

Manning's n values were determined for the main channel and left and right overbanks for input into the HEC-RAS model. Manning's n values were developed using field reconnaissance, aerial photographs, published reference material, and professional judgment (Reference 30). The investigation determined that values between 0.025 to 0.040 would be used for all three channels which include Silver Creek, Silver Creek Overflow (Ryanns Lane), and Silver Creek Overflow (D2 Ditch). Because of the complexity of the model, multiple overbank n values were used. For undeveloped areas with light brush, heavy weeds, and trees values, 0.035 to 0.050 were used. For rural development, short grass and row crops, 0.025 to 0.035 were used.

Analysis for the upstream reach of Silver Creek was performed in 1977. In order to match the 1977 study to the newer 2010 study, the upstream end of the Silver Creek study ties into the existing effective Silver Creek flood study. The tie-in between the new model and the effective study is at cross section "H".

Initial floodway computations for Tenmile Creek were based upon equal conveyance reduction. In some cases, subsequent floodway boundaries were then modified, to reduce significant variation in floodway widths or undesirable fluctuation in surcharges, using best engineering judgment to produce the final floodway for the reaches. All floodway profiles for Tenmile Creek and Silver Creek were computed using HEC-RAS. Surcharges for all cross sections in the final HEC-RAS floodway run were 0.5 ft or less.

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

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the finalization of the North American Vertical Datum of 1988 (NAVD88), many FIS reports and FIRMs are being prepared using the NAVD88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. Elevation Reference Marks (ERMs) shown on the FIRM represent those used during the preparation of this and previous FIS reports. Users should be aware that these ERM elevations may have changed since the publication of this FIS report. To obtain up-to-date elevation information on National Geodetic Survey (NGS) ERMs shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes. It is important to note that adjacent communities may be referenced to NGVD. This may result in differences in Base Flood Elevations (BFEs) across the corporate limits between communities.

For this revision, a vertical datum conversion was completed for each studied reach. The range of conversion factors was prohibitively high; therefore, a standard conversion factor was not applied for the entire community. The Profile Panel and FDT conversion from NGVD29 to NAVD88 was carried out in accordance to the procedure outlined in the FEMA document Map Modernization – Guidelines and Specifications for Flood Hazard Mapping Partners Appendix B: Guidance for Converting to the North American Vertical Datum of 1988.

Using the multiple conversion factor approach, an average conversion factor for each flooding source was developed by establishing separate conversion factors at the upstream end, at the downstream end and at an intermediate point of the studied reach. From this data, the average conversion factors for each reach were developed.

For more information on NAVD88, see the FEMA publication entitled *Converting the National Flood Insurance Program to the North American Vertical Datum of 1988* (FEMA, June 1992), or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Rockville, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

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

Conversion factors for each studied reach are shown in Table 3.

Table 3 – Datum Conversion Factors

Stream/Reach	Conversion from NGVD29 to NAVD88 (feet)
Blackfoot River	3.7
East Overflow of Prickly Pear Creek	3.4
Elk Creek	3.3
Grizzly Gulch	3.5
Last Chance Gulch	3.4
North Overflow of Prickly Pear Creek	3.4
Orofino Gulch	3.5
Prickly Pear Creek	3.4
South Braid of Prickly Pear Creek	3.4
Tenmile Creek	3.4

4.0 FLOOD PLAIN MANAGEMENT APPLICATION

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS provides 1-percent annual chance flood elevations and delineations of the 1- and 0.2-percent annual chance floodplain boundaries and 1-percent annual chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS

report, including Flood Profiles and Floodway Data Tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Flood 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 flood plain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 1- and 0.2-percent annual chance flood plain boundaries have been delineated using the flood elevations determined at each cross section. For Lewis and Clark County, between cross sections, the boundaries were developed either photogrammetrically, using aerial photographs at scales of 1:10,560 and 1:4,800 (References 21 and 24) or topographic maps at scales of 1:2,400, 1:24,000, and 1:62,500 with contour intervals of 5, 20, and 40 feet, respectively (References 22 and 26). In addition, 0.2-percent annual chance flood plain boundaries were adjusted based on the 1981 flood photos (Reference 24) in cases where actual flooding was wider than the calculated results.

Topographic maps at scales of 1:62,500 and 1:24,000 with contour intervals of 40 and 20 feet, respectively (Reference 31), and aerial photography of the 1975 flood (Reference 23) and 1981 flood (Reference 24) were used to delineate flood plain boundaries for areas studied by approximate methods.

The 1975 and 1985 flood photos (References 23 and 24) were used to delineate shallow flooding boundaries based on the estimated depths.

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

For the streams studied by approximate methods, only the 1-percent annual chance flood plain boundary is shown.

Approximate 1-percent annual chance floodplain boundaries in some portions of the study area were taken directly from the Flood Hazard Boundary Map (Reference 32).

The boundaries between the previous FIRM panel scheme and the current DFIRM panel scheme were changed at the time of the digital conversion. Areas in which Zone D's were redelineated were determined by the overlap between the old and new panel schemes. "Panels not printed" that overlapped onto "panels printed" regions in the previous FIRM panel layout had reaches of Zone D redelineated in the new DFIRM panel layout. The remainder of the County became unshaded Zone X. Zone D boundaries were redelineated to watersheds of unknown flooding amounts based on a length of 1 mile or longer. A small reach of Zone A on Wolf Creek was tied into a redelineated reach of Zone D based on the effective information and upon analysis of the 2005 Color Infrared Photography.

The Zone A was redelineated to the riparian zone based on observations of the aerial photo.

Zone A flood hazard areas for the remainder of the county were adjusted based on aerial photography and contour data.

4.2 Floodways

Encroachment on flood plains, 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 flood plain management involves balancing the economic gain from flood plain 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 flood plain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain 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 stands limit such increase to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as a minimum standard that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated at selected cross sections (Table 4). In cases where the floodway and 1-percent annual chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

The floodways were computed by assuming that no ice jamming or severe debris accumulation at hydraulic structures or in meandering stream reaches would occur. Except as noted in the following, starting water-surface elevations for the floodway analysis were determined by adding 0.5 foot to the 1-percent annual chance starting water-surface elevation as discussed in Section 3.2.

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 100-year flood by more than 0.5 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 1.

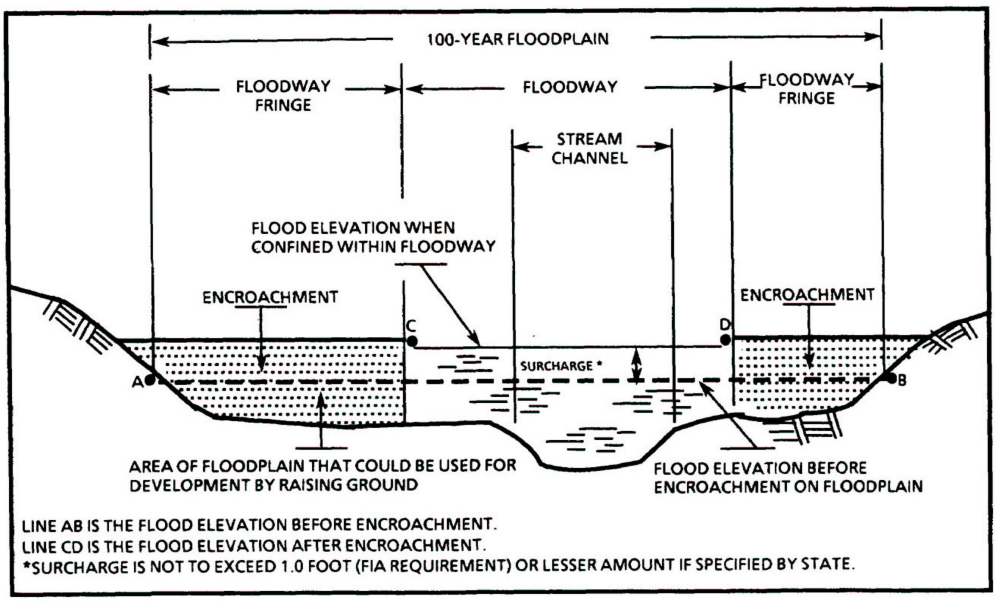

Figure 1 – Floodway Schematic

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BLACKFOOT RIVER								
A	2,645	680/1,730[2]	2,996	2.4	4,472.2	4,472.2	4,472.2	0.0
B	3,580	850/2,050[2]	5,501	1.3	4,474.8	4,474.8	4,474.9	0.1
C	4,435	1,160/1,760[2]	3,546	2.0	4,476.5	4,476.5	4,477.0	0.5
D	5,660	1,140/1,770[2]	4,820	1.5	4,479.2	4,479.2	4,479.2	0.0
E	6,195	2,300	2,549	2.8	4,480.5	4,480.5	4,480.7	0.2
F	8,230	1,344	4,525	1.6	4,485.8	4,485.8	4,486.3	0.5
G	9,175	980	3,292	2.1	4,487.7	4,487.7	4,488.1	0.4
H	10,000	1,340	4,330	1.6	4,489.2	4,489.5	4,489.9	0.4
I	10,845	1,940[3]	5,792	1.2	4,491.0	4,491.0	4,491.2	0.2
J	11,535	2,360[3]	3,538	2.0	4,492.8	4,492.8	4,493.0	0.2
K	12,360	1,560[3]	3,388	2.1	4,496.9	4,496.9	4,497.4	0.5
L	13,250	1,840[3]	3,735	1.9	4,501.4	4,501.4	4,501.5	0.1
M	14,130	2,150[3]	3,550	2.0	4,506.2	4,506.2	4,506.3	0.1
N	14,650	2,109	3,807	1.8	4,508.9	4,508.9	4,508.9	0.0
O	15,620	1,380[3]	3,538	2.0	4,512.1	4,512.1	4,512.5	0.4
P	16,635	1,430[3]	3,246	2.2	4,516.0	4,516.0	4,516.2	0.2
Q	17,275	1,500[3]	3,152	2.2	4,518.1	4,518.1	4,518.4	0.3
R	18,355	1,950[3]	4,934	1.4	4,520.5	4,520.5	4,521.0	0.5
S	19,240	1,675[3]	3,547	2.0	4,523.2	4,523.2	4,523.5	0.3
T	20,100	1,670[3]	4,038	1.7	4,526.0	4,526.0	4,526.4	0.4
U	20,840	610[3]	1,150	6.1	4,530.7	4,530.7	4,531.0	0.3
V	22,690	2,000[3]	5,245	1.3	4,538.1	4,538.1	4,538.3	0.2

[1]Feet above Dalton Mountain Road [2]Left channel/Right channel [3]This width excludes islands

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

BLACKFOOT RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BLACKFOOT RIVER (continued)								
W	23,350	850[2]	943	7.5	4,539.6	4,539.6	4,540.1	0.5
X	23,575	640	3,854	1.8	4,545.0	4,545.0	4,545.0	0.0
Y	24,420	730	2,245	3.1	4,545.5	4,545.5	4,545.7	0.2
Z	25,470	670[2]	1,964	3.6	4,548.9	4,548.9	4,549.1	0.2
AA	26,380	1,170[2]	2,387	3.0	4,552.4	4,552.4	4,552.4	0.0
AB	27,510	1,110[2]	2,516	2.8	4,556.3	4,556.3	4,556.5	0.2
AC	28,350	1,240[2]	2,102	3.4	4,559.9	4,559.9	4,560.3	0.4
AD	29,495	1,050[2]	2,695	2.6	4,564.0	4,564.0	4,564.2	0.2
AE	30,510	884[2]	1,482	4.8	4,568.5	4,568.5	4,568.5	0.0
AF	31,375	560	2,076	3.4	4,572.4	4,572.4	4,572.4	0.0
AG	32,165	675	1,411	5.0	4,575.1	4,575.1	4,575.1	0.0
AH	33,050	554	1,325	5.3	4,580.9	4,580.9	4,581.0	0.1
AI	33,930	820	1,722	4.1	4,586.2	4,586.2	4,586.2	0.0
AJ	34,960	559	1,578	4.5	4,590.9	4,590.9	4,590.9	0.0
AK	35,805	898	1,850	3.8	4,594.6	4,594.6	4,594.6	0.0
AL	37,030	705	1,632	4.3	4,600.5	4,600.5	4,600.5	0.0
AM	38,710	780	2,074	3.4	4,609.5	4,609.5	4,609.5	0.0
AN	39,400	620	1,440	4.9	4,613.5	4,613.5	4,613.5	0.0
AO	40,150	493	1,616	4.4	4,617.6	4,617.6	4,617.9	0.3
AP	41,630	460	1,373	5.1	4,624.8	4,624.8	4,624.9	0.1
AQ	42,900	750	1,879	3.8	4,631.4	4,631.4	4,631.7	0.3

[1]Feet above Dalton Mountain Road [2]This width excludes islands

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

BLACKFOOT RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BLACKFOOT RIVER (continued)								
AR	43,620	668	1,516	4.6	4,635.7	4,635.7	4,635.9	0.2
AS	44,410	935[2]	1,786	3.9	4,641.5	4,641.5	4,641.7	0.2
AT	45,000	1,026	3,905	1.8	4,643.3	4,643.3	4,643.8	0.5
AU	45,950	873	1,521	4.6	4,647.4	4,647.4	4,647.4	0.0
AV	46,750	1,040	3,270	2.2	4,651.1	4,651.1	4,651.5	0.4
AW	47,490	556	942	7.5	4,655.0	4,655.0	4,655.0	0.0
AX	48,270	812	2,737	2.6	4,660.5	4,660.5	4,661.0	0.5
AY	48,870	300	906	7.8	4,665.1	4,665.1	4,665.6	0.5
AZ	49,660	538	1,833	3.8	4,670.4	4,670.4	4,670.9	0.5
BA	50,460	490	1,175	6.0	4,673.9	4,673.9	4,674.4	0.5
BB	50,915	351	1,408	5.0	4,676.9	4,676.9	4,677.4	0.5
BC	51,555	177	826	8.5	4,679.9	4,679.9	4,680.1	0.2
BD	52,460	290	1,397	5.0	4,684.8	4,684.8	4,685.0	0.2
BE	53,225	268	1,093	6.4	4,688.0	4,688.0	4,688.2	0.2
BF	54,070	413	1,442	4.9	4,692.6	4,692.6	4,692.7	0.1
BG	54,915	288	868	8.1	4,698.3	4,698.3	4,698.4	0.1
BH	55,800	915	2,584	2.7	4,703.6	4,703.6	4,703.8	0.2
BI	56,850	770[2]	1,056	6.7	4,709.3	4,709.3	4,709.5	0.2
BJ	57,750	345	1,604	4.4	4,715.8	4,715.8	4,716.3	0.5
BK	58,540	166	951	7.4	4,718.5	4,718.5	4,718.7	0.2
BL	59,575	303	1,574	4.5	4,722.5	4,722.5	4,722.6	0.1

[1]Feet above Dalton Mountain Road [2]This width excludes islands

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

BLACKFOOT RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
EAST OVERFLOW OF PRICKLY PEAR CREEK								
A	0	63	31	1.6	3,804.7	3,804.7	3,805.0	0.3
B	1,700	48	16	3.1	3,817.6	3,817.6	3,817.8	0.2
C	4,900	23	21	2.4	3,839.6	3,839.6	3,840.1	0.5
D	6,020	87	25	2.0	3,846.2	3,846.2	3,846.3	0.1

[1]Feet above downstream limit of detailed study

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

EAST OVERFLOW OF PRICKLY PEAR CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
ELK CREEK								
A	35	964	3,135	2.8	4,023.7	4,023.7	4,023.7	0.0
B	960	1,120	2,879	3.0	4,027.6	4,027.6	4,027.9	0.3
C	1,420	1,170	3,436	2.5	4,029.3	4,029.3	4,029.8	0.5
D	2,500	795	2,543	3.4	4,034.1	4,034.1	4,034.6	0.5
E	3,195	2,200	4,322	2.0	4,038.2	4,038.2	4,038.5	0.3
F	4,865	1,630[2]	1,620	5.3	4,048.4	4,048.4	4,048.4	0.0
G	6,630	2,697	2,777	3.1	4,063.5	4,063.5	4,063.6	0.1
H	7,700	1,790[2]	3,063	2.8	4,071.7	4,071.7	4,071.8	0.1
I	8,740	1,730[2]	3,320	2.6	4,078.1	4,078.1	4,078.3	0.2
J	10,375	2,150	4,130	2.1	4,085.0	4,085.0	4,085.4	0.4
K	11,670	1,375	2,741	3.1	4,090.5	4,090.5	4,090.9	0.4
L	13,200	1,120	2,306	3.7	4,099.5	4,099.5	4,099.8	0.3
M	14,530	840	2,572	3.4	4,108.2	4,108.2	4,108.6	0.4
N	16,240	1,614	3,809	2.3	4,119.2	4,119.2	4,119.5	0.3

[1]Feet above State Highway 21 Bridge [2]This width excludes islands

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

ELK CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
GRIZZLY GULCH								
A	200	12	44	5.83	4,219.2	4,219.2	4,219.7	0.5
B	265	69	22	1.77	4,223.5	4,223.5	4,223.5	0.0
C	295	55	51	5.03	4,224.3	4,224.3	4,224.3	0.0
D	460	79	65	3.94	4,229.3	4,229.3	4,229.3	0.0
E	680	88	55	4.64	4,236.3	4,236.3	4,236.3	0.0
F	890	60	56	4.54	4,243.5	4,243.5	4,243.5	0.0
G	1,070	76	53	4.79	4,249.2	4,249.2	4,249.2	0.0
H	1,260	39	43	5.97	4,258.6	4,258.6	4,258.6	0.0
I	1,450	79	70	3.68	4,266.3	4,266.3	4,266.3	0.0
J	1,655	22	30	8.48	4,273.9	4,273.9	4,273.9	0.0
K	1,785	39	50	5.12	4,279.7	4,279.7	4,279.7	0.0
L	2,005	13	27	9.49	4,286.9	4,286.9	4,286.9	0.0
M	2,190	28	66	3.87	4,291.6	4,291.6	4,291.6	0.0
N	2,390	104	57	4.49	4,300.4	4,300.4	4,300.4	0.0
O	2,615	19	47	5.42	4,308.7	4,308.7	4,308.7	0.0
P	2,830	19	35	7.36	4,314.7	4,314.7	4,314.7	0.0
Q	3,055	58	81	3.17	4,320.5	4,320.5	4,320.5	0.0

[1]Feet above confluence with Last Chance Gulch

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

GRIZZLY GULCH

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
LAST CHANCE GULCH								
A	1,975	226	1,124	0.3	3,942.0	3,942.0	3,942.0	0.0
B	2,060	175	80	3.9	3,943.1	3,943.1	3,943.1	0.0
C	2,095	11	32	9.7	3,943.4	3,943.4	3,943.4	0.0
D	2,165	12	43	7.2	3,944.0	3,944.0	3,944.5	0.5
E	2,260	43	109	2.8	3,945.5	3,945.5	3,946.0	0.5
F	2,380	25	60	5.1	3,946.4	3,946.4	3,946.8	0.4
G	2,480	18	56	5.5	3,947.5	3,947.5	3,948.0	0.5
H	2,570	28	55	5.7	3,949.0	3,949.0	3,949.5	0.5
I	2,680	22	71	4.4	3,950.9	3,950.9	3,950.9	0.0
J	10,665	65	57	5.2	4,146.2	4,146.2	4,146.2	0.0
K	10,725	129	158	1.9	4,147.2	4,147.2	4,147.2	0.0
L	10,795	101	68	4.3	4,147.5	4,147.5	4,147.5	0.0
M	10,915	81	70	4.2	4,150.2	4,150.2	4,150.2	0.0
N	10,970	61	41	7.3	4,153.4	4,153.4	4,153.4	0.0
O	11,070	41	64	4.7	4,156.8	4,156.8	4,156.8	0.0
P	11,165	24	32	9.2	4,160.8	4,160.8	4,160.8	0.0
Q	11,245	28	66	4.5	4,164.6	4,164.6	4,164.6	0.0
R	11,335	18	29	10.4	4,167.2	4,167.2	4,167.2	0.0
S	11,440	18	55	5.4	4,172.4	4,172.4	4,172.4	0.0
T	11,520	80	86	3.4	4,178.2	4,178.2	4,178.2	0.0
U	11,590	49	94	3.1	4,179.0	4,179.0	4,179.0	0.0
V	11,655	27	98	3.0	4,179.3	4,179.3	4,179.3	0.0

[1]Feet above Cole Avenue

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

LAST CHANCE GULCH

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
LAST CHANCE GULCH (continued)								
W	11,725	65	73	3.1	4,184.7	4,184.7	4,184.7	0.0
X	11,785	42	121	2.5	4,184.7	4,184.7	4,184.7	0.0
Y	11,865	64	81	3.7	4,188.8	4,188.8	4,188.8	0.0
Z	11,980	91	172	1.7	4,189.8	4,189.8	4,189.8	0.0
AA	12,090	67	72	4.1	4,190.4	4,190.4	4,190.4	0.0
AB	12,140	72	96	3.1	4,197.9	4,197.9	4,198.4	0.5
AC	12,330	37	51	5.8	4,202.0	4,202.0	4,202.5	0.5
AD	12,525	44	70	4.2	4,207.7	4,207.7	4,208.2	0.5
AE	12,685	68	59	5.0	4,212.8	4,212.8	4,213.3	0.5

[1]Feet above Cole Avenue

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

LAST CHANCE GULCH

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
NORTH OVERFLOW OF PRICKLY PEAR CREEK								
A	0	346	463	2.4	3,832.2	3,832.2	3,832.6	0.4
B	400	463	250	4.4	3,834.5	3,834.5	3,835.0	0.5
C	1,150	294	409	2.7	3,841.3	3,841.3	3,841.8	0.5
D	2,150	95	165	6.7	3,848.5	3,848.5	3,849.0	0.5
E	2,900	310	455	2.4	3,853.6	3,853.6	3,854.1	0.5
F	3,900	462	342	3.2	3,861.2	3,861.2	3,861.7	0.5

[1]Feet above downstream limit of detailed study

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

NORTH OVERFLOW OF PRICKLY PEAR CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
OROFINO GULCH								
A	170	42	46	3.1	4,218.2	4,218.2	4,218.7	0.5
B	425	32	36	4.0	4,223.1	4,223.1	4,223.4	0.3
C	605	25	37	3.8	4,226.8	4,226.8	4,227.2	0.4
D	800	20	27	5.2	4,232.1	4,232.1	4,232.5	0.4
E	865	10	19	7.5	4,235.4	4,235.4	4,235.5	0.1
F	900	32	5	3.4	4,242.0	4,242.0	4,242.0	0.0
G	935	75	263	0.5	4,242.0	4,242.0	4,242.0	0.0
H	1,030	31	27	5.3	4,243.6	4,243.6	4,243.6	0.0
I	1,280	31	34	4.1	4,253.4	4,253.4	4,253.4	0.0
J	1,480	12	17	8.5	4,263.5	4,263.5	4,263.5	0.0
K	1,710	17	28	5.0	4,275.1	4,275.1	4,275.1	0.0
L	1,920	13	20	7.1	4,283.0	4,283.0	4,283.0	0.0
M	2,135	23	30	4.7	4,294.0	4,294.0	4,294.0	0.0

[1]Feet above confluence with Last Chance Gulch

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

OROFINO GULCH

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
PRICKLY PEAR CREEK								
A	1,500	76	325	4.8	3,671.7	3,671.7	3,671.7	0.0
B	2,950	81	411	3.8	3,675.4	3,675.4	3,675.7	0.3
C	3,695	60	305	5.1	3,676.5	3,676.5	3,677.0	0.5
D	5,390	255	736	2.1	3,679.3	3,679.3	3,679.8	0.5
E	6,865	235	720	2.2	3,681.5	3,681.5	3,681.8	0.3
F	7,120	551	1,161	1.3	3,682.6	3,682.6	3,682.9	0.3
G	7,170	531	502	3.1	3,682.8	3,682.8	3,683.1	0.3
H	7,425	522	1,060	1.5	3,683.5	3,683.5	3,683.8	0.3
I	7,720	44	286	5.2	3,683.8	3,683.8	3,684.1	0.3
J	9,465	266	679	2.2	3,686.5	3,686.5	3,686.8	0.3
K	11,580	135	324	4.6	3,690.3	3,690.3	3,690.6	0.3
L	12,690	400	846	1.7	3,693.6	3,693.6	3,693.9	0.3
M	14,000	193	383	3.7	3,696.4	3,696.4	3,696.7	0.3
N	15,375	564	636	2.2	3,700.5	3,700.5	3,700.8	0.3
O	16,830	371	464	3.0	3,703.9	3,703.9	3,704.2	0.3
P	17,820	342	919	1.5	3,707.4	3,707.4	3,707.9	0.5
Q	20,100	289[2]	261	5.4	3,709.9	3,709.9	3,709.9	0.0
R	21,800	364[2]	866	1.6	3,714.2	3,714.2	3,714.7	0.5
S	23,250	193[2]	228	6.1	3,717.5	3,717.5	3,718.0	0.5
T	24,430	286	484	2.9	3,722.7	3,722.7	3,723.2	0.5
U	25,800	57	197	7.1	3,728.1	3,728.1	3,728.6	0.5
V	27,150	571	705	2.0	3,733.6	3,733.6	3,734.1	0.5

[1]Feet above confluence with Tenmile Creek [2]This width excludes islands

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

PRICKLY PEAR CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
PRICKLY PEAR CREEK (continued)								
W	27,305	255	192	7.3	3,735.7	3,735.7	3,735.7	0.0
X	27,335	255	741	1.9	3,736.8	3,736.8	3,736.8	0.0
Y	27,630	485	430	3.3	3,737.1	3,737.1	3,737.2	0.1
Z	28,890	346	331	4.2	3,741.8	3,741.8	3,741.9	0.1
AA	29,705	158	277	5.0	3,746.5	3,746.5	3,747.0	0.5
AB	31,335	355	545	2.6	3,753.1	3,753.1	3,753.6	0.5
AC	32,450	296	238	5.9	3,759.4	3,759.4	3,759.9	0.5
AD	33,090	170	381	3.7	3,763.8	3,763.8	3,764.3	0.5
AE	33,780	348	317	4.4	3,767.9	3,767.9	3,767.9	0.0
AF	34,220	81	310	4.5	3,772.2	3,772.2	3,772.2	0.0
AG	34,970	224	314	4.5	3,774.5	3,774.5	3,775.0	0.5
AH	35,715	111	282	5.0	3,779.5	3,779.5	3,779.5	0.0
AI	36,550	131	207	6.8	3,786.0	3,786.0	3,786.5	0.5
AJ	36,800	107	264	5.3	3,789.0	3,789.0	3,789.1	0.1
AK	36,935	73	217	6.4	3,789.8	3,789.8	3,789.8	0.0
AL	37,525	51	208	6.7	3,794.0	3,794.0	3,794.0	0.0
AM	38,200	37	137	10.2	3,800.1	3,800.1	3,800.4	0.3
AN	38,450	86	487	2.9	3,802.4	3,802.4	3,802.8	0.4
AO	38,500	145	695	1.5	3,802.6	3,802.6	3,802.9	0.3
AP	39,230	114[2]	164	6.4	3,804.0	3,804.0	3,804.1	0.1
AQ	39,835	127	239	4.4	3,808.7	3,808.7	3,809.1	0.4

[1]Feet above confluence with Tenmile Creek [2]This width excludes islands

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

PRICKLY PEAR CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
PRICKLY PEAR CREEK (continued)								
AR	40,490	165	256	4.1	3,812.9	3,812.9	3,812.9	0.0
AS	41,050	74	192	5.5	3,816.3	3,816.3	3,816.6	0.3
AT	41,950	205	247	4.3	3,823.2	3,823.2	3,823.7	0.5
AU	43,000	76	224	4.7	3,830.1	3,830.1	3,830.6	0.5
AV	43,750	132	169	3.3	3,834.5	3,834.5	3,835.0	0.5
AW	44,550	50	103	5.3	3,840.6	3,840.6	3,840.9	0.3
AX	44,900	198	195	2.8	3,843.1	3,843.1	3,843.6	0.5
AY	45,075	156	158	3.8	3,846.4	3,846.4	3,846.5	0.1
AZ	45,800	132	180	3.3	3,852.6	3,852.6	3,852.8	0.2
BA	46,350	170	226	4.9	3,856.2	3,856.2	3,856.7	0.5
BB	47,150	81	248	4.4	3,861.4	3,861.4	3,861.8	0.4
BC	47,925	346[2]	604	3.6	3,866.1	3,866.1	3,866.6	0.5
BD	48,730	89	323	6.8	3,871.5	3,871.5	3,871.5	0.0
BE	49,020	144	457	4.8	3,873.4	3,873.4	3,873.5	0.1
BF	49,450	370	789	2.8	3,877.2	3,877.2	3,877.7	0.5
BG	49,680	312	468	4.7	3,877.8	3,877.8	3,877.9	0.1
BH	49,850	65	237	9.2	3,881.0	3,881.0	3,881.3	0.3
BI	50,130	443	1,426	1.5	3,882.9	3,882.9	3,883.2	0.3
BJ	50,400	64	231	9.5	3,883.8	3,883.8	3,883.8	0.0
BK	50,600	77	329	6.7	3,886.0	3,886.0	3,886.0	0.0
BL	50,700	87	375	5.8	3,886.8	3,886.8	3,886.8	0.0

[1]Feet above confluence with Tenmile Creek [2]This width excludes islands

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

PRICKLY PEAR CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
PRICKLY PEAR CREEK (continued)								
BM	51,020	150	349	6.3	3,888.3	3,888.3	3,888.3	0.0
BN	51,650	81	309	7.1	3,893.6	3,893.6	3,893.9	0.3
BO	52,390	73	297	7.4	3,899.8	3,899.8	3,899.9	0.1
BP	53,190	158	418	5.2	3,907.1	3,907.1	3,907.1	0.0
BQ	53,450	282	470	4.7	3,920.8	3,920.8	3,920.8	0.0
BR	55,340	340	507	4.3	3,923.9	3,923.9	3,924.4	0.5
BS	56,715	565	1,003	2.2	3,931.5	3,931.5	3,932.0	0.5
BT	58,115	163	400	5.5	3,937.6	3,937.6	3,937.9	0.3

[1]Feet above confluence with Tenmile Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

PRICKLY PEAR CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Silver Creek								
A	27	6	5	3.6	3,695.0	3,688.9[4]	3,689.0[4]	0.1
B	220	18	33	0.5	3,696.2	3,696.2	3,696.2	0.0
C	426	441	318	0.1	3,700.9	3,698.3[4]	3,698.3[4]	0.0
D	2,190	50	50	2.2	3,703.3	3,703.3	3,703.3	0.0
E	3,384	449	601	0.2	3,713.3	3,713.3	3,713.3	0.0
F	4,183	200[2]	130	4.6	3,717.1	3,717.1	3,717.5	0.4
G	6,310	75	123	5.4	3,730.9	3,730.9	3,731.3	0.4
H	8,232	300[2]	205	3.2	3,746.9	3,746.9	3,747.1	0.2
I	9,447	490	134	4.9	3,758.3	3,758.3	3,758.6	0.3
J	10,522	270	404	1.6	3,771.1	3,771.1	3,771.6	0.5
K	11,397	340[3]	164	4.0	3,778.2	3,778.2	3,778.3	0.1
L	12,217	421	368	1.8	3,787.5	3,787.5	3,787.8	0.3
M	13,002	240	161	4.1	3,795.6	3,795.6	3,795.8	0.2
N	14,157	300	271	2.4	3,811.2	3,811.2	3,811.3	0.1
O	15,642	60	108	6.1	3,829.8	3,829.8	3,830.0	0.2

[1] Stream Distance in Feet Above Limit of Detailed Study [2]This Width Includes Islands [3]This Width Excludes Islands
4 Elevation computed without consideration of Flooding Controlled by D2 Ditch

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

SILVER CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Silver Creek Overflow (Ryanns Lane)								
A	360	61	49	2.6	3,709.6	3,709.6	3,709.7	0.1
B	470	181	448	0.3	3,712.7	3,712.7	3,712.7	0.0
C	598	100	129	1.0	3,713.1	3,713.1	3,713.2	0.1
D	712	100	126	3.6	3,713.1	3,713.1	3,713.3	0.2

[1] Stream Distance in Feet Above Limit of Detailed Study

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

SILVER CREEK OVERFLOW (RYANNS LANE)

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Silver Creek Overflow (D2 Ditch)								
A	13	23	66	9.7	3,685.4	3,685.4	3,685.4	0.0
B	372	33	352	1.8	3,695.0	3,695.0	3,695.0	0.0
C	695	63	685	0.9	3,700.9	3,700.9	3,701.3	0.4
D	1,787	39	263	2.4	3,700.9	3,700.9	3,701.3	0.4
E	3,021	22	157	2.7	3,706.7	3,706.7	3,707.0	0.3
F	3,426	59	301	1.4	3,710.8	3,710.8	3,710.8	0.0
G	5,162	19	33	2.8	3,711.8	3,711.8	3,711.8	0.0

[1] Stream Distance in Feet Above the Limit of Detailed Study

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

SILVER CREEK OVERFLOW (D2 DITCH)

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
SOUTH BRAID OF PRICKLY PEAR CREEK								
A	900	23	56	8.9	3,837.7	3,837.7	3,837.7	0.0
B	1,720	54	157	3.2	3,843.2	3,843.2	3,843.7	0.5
C	1,990	13	63	7.9	3,845.7	3,845.7	3,845.7	0.0
D	2,290	136	269	1.9	3,847.6	3,847.6	3,848.1	0.5
E	2,386	102	165	3.0	3,849.3	3,849.3	3,849.3	0.0
F	2,866	140	101	5.0	3,852.6	3,852.6	3,852.8	0.2

[1]Feet above Cross Section AU of Prickly Pear Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

SOUTH BRAID OF PRICKLY PEAR CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
TENMILE CREEK								
A	1,268	73	214	4.2	3,671.4	3,671.4	3,671.4	0.0
B	2,349	60	196	4.6	3,674.6	3,674.6	3,674.6	0.0
C	4,484	214	504	1.8	3,682.4	3,682.4	3,682.8	0.4
D	5,646	52	177	5.0	3,685.2	3,685.2	3,685.3	0.1
E	6,557	65	203	4.4	3,687.9	3,687.9	3,687.9	0.0
F	7,552	71	183	4.9	3,691.7	3,691.7	3,692.0	0.3
G	8,964	38	153	5.8	3,697.8	3,697.8	3,697.8	0.0
H	9,852	71	227	3.9	3,700.9	3,700.9	3,700.9	0.0
I	10,936	141	224	4.0	3,704.0	3,704.0	3,704.1	0.1
J	12,199	262	393	2.3	3,708.7	3,708.7	3,708.7	0.0
K	13,293	268	304	2.9	3,713.0	3,713.0	3,713.4	0.4
L	14,043	219	294	3.0	3,717.0	3,717.0	3,717.1	0.1
M	14,748	141	325	2.7	3,719.6	3,719.6	3,719.7	0.1
N	15,712	186	196	4.5	3,724.6	3,724.6	3,724.8	0.2
O	16,290	234	343	2.6	3,729.0	3,729.0	3,729.4	0.4
P	16,990	91	244	3.6	3,731.4	3,731.4	3,731.9	0.5
Q	17,728	107	242	3.7	3,734.7	3,734.7	3,734.8	0.1
R	18,061	68	185	4.8	3,738.3	3,738.3	3,738.3	0.0
S	18,698	41	192	4.6	3,740.9	3,740.9	3,740.9	0.0
T	19,743	142	212	4.2	3,745.6	3,745.6	3,745.6	0.0
U	20,806	233	350	2.5	3,750.8	3,750.8	3,750.8	0.0
V	21,679	218	345	2.6	3,755.8	3,755.8	3,755.8	0.0

[1]Feet above Confluence with Prickly Pear Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

TENMILE CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
TENMILE CREEK (cont.)								
W	22,121	112	202	4.4	3,758.2	3,758.2	3,758.3	0.1
X	22,563	136	300	3.0	3,760.7	3,760.7	3,761.2	0.5
Y	22,724	122	225	4.0	3,761.4	3,761.4	3,761.9	0.5
Z	22,865	50	185	4.8	3,764.0	3,764.0	3,764.0	0.0
AA	23,371	200	563	1.6	3,767.1	3,767.1	3,767.1	0.0
AB	24,174	92	132	6.7	3,768.3	3,768.3	3,768.3	0.0
AC	25,608	96	200	4.7	3,776.8	3,776.8	3,777.1	0.3
AD	26,817	372	490	1.9	3,782.2	3,782.2	3,782.3	0.1
AE	27,456	116	186	5.0	3,784.3	3,784.3	3,784.5	0.2
AF	28,238	124	365	2.6	3,790.5	3,790.5	3,790.6	0.1
AG	28,509	74	222	4.2	3,790.9	3,790.9	3,791.0	0.1
AH	29,196	123	216	4.3	3,794.3	3,794.3	3,794.3	0.0
AI	30,019	110	158	5.9	3,798.4	3,798.4	3,798.4	0.0
AJ	31,135	215	346	2.7	3,807.0	3,807.0	3,807.0	0.0
AK	32,270	185	444	3.7	3,812.9	3,812.9	3,813.2	0.3
AL	33,149	481	1748	1.7	3,819.1	3,819.1	3,819.2	0.1
AM	35,144	630	851	3.4	3,826.6	3,826.6	3,826.9	0.3
AN	36,646	597	1,162	2.5	3,833.0	3,833.0	3,833.3	0.3
AO	38,521	227	453	6.4	3,843.0	3,843.0	3,843.1	0.1
AP	40,126	246	638	2.7	3,853.0	3,853.0	3,853.5	0.5
AQ	44,137	143	393	4.4	3,884.1	3,884.1	3,884.5	0.4
AR	45,314	117	331	5.2	3,892.9	3,892.9	3,893.1	0.2

[1]Feet above Confluence with Prickly Pear Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

TENMILE CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
TENMILE CREEK (cont.)								
AS	46,560	200	373	4.6	3,904.6	3,904.6	3,905.0	0.4
AT	47,350	65	335	5.2	3,913.2	3,913.2	3,913.7	0.5
AU	48,362	351	681	2.5	3,920.7	3,920.7	3,921.2	0.5
AV	48,925	428	692	2.5	3,925.4	3,925.4	3,925.7	0.3
AW	50,104	246	500	3.5	3,936.9	3,936.9	3,937.3	0.4
AX	50,819	601	903	1.9	3,944.4	3,944.4	3,944.7	0.3
AY	51,849	135	378	4.6	3,956.6	3,956.6	3,957.0	0.4
AZ	52,404	91	316	5.5	3,962.0	3,962.0	3,962.0	0.0
BA	53,211	53	266	6.5	3,969.8	3,969.8	3,969.8	0.0
BB	54,582	115	242	6.7	3,985.8	3,985.8	3,986.1	0.3
BC	54,741	276	597	2.5	3,989.1	3,989.1	3,989.6	0.5
BD	55,384	152	340	4.8	3,993.0	3,993.0	3,993.5	0.5
BE	56,830	73	242	6.7	4,010.4	4,010.4	4,010.6	0.2
BF	57,855	228	480	3.4	4,019.1	4,019.1	4,019.6	0.5
BG	59,222	105	364	4.5	4,032.4	4,032.4	4,032.4	0.0
BH	59,598	33	164	9.9	4,036.2	4,036.2	4,036.2	0.0
BI	60,010	45	226	7.2	4,041.4	4,041.4	4,041.4	0.0
BJ	60,412	72	376	4.3	4,044.8	4,044.8	4,044.8	0.0
BK	60,896	79	283	5.7	4,046.6	4,046.6	4,046.6	0.0
BL	61,724	51	197	8.2	4,056.7	4,056.7	4,056.8	0.1
BM	62,167	75	269	6.0	4,061.3	4,061.3	4,061.8	0.5
BN	62,782	49	201	8.1	4,069.1	4,069.1	4,069.1	0.0

[1]Feet above Confluence with Prickly Pear Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

TENMILE CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
TENMILE CREEK (cont.)								
BO	63,994	222	432	3.8	4,080.0	4,080.0	4,080.5	0.5
BP	65,168	145	323	5.0	4,092.6	4,092.6	4,092.9	0.3
BQ	65,573	149	401	4.1	4,095.9	4,095.9	4,096.1	0.2
BR	65,900	126	242	6.7	4,098.9	4,098.9	4,099.1	0.2
BS	66,502	180	274	5.9	4,104.1	4,104.1	4,104.3	0.2
BT	67,581	162	387	4.2	4,113.8	4,113.8	4,114.2	0.4
BU	68,151	186	316	5.1	4,119.1	4,119.1	4,119.1	0.0
BV	69,210	78	247	6.6	4,130.5	4,130.5	4,131.0	0.5
BW	69,746	110	262	6.2	4,136.4	4,136.4	4,136.6	0.2
BX	71,108	62	191	8.5	4,150.8	4,150.8	4,150.8	0.0
BY	71,268	200	408	4.0	4,153.6	4,153.6	4,153.8	0.2
BZ	72,394	66	192	8.4	4,164.0	4,164.0	4,164.5	0.5
CA	73,333	47	175	9.3	4,173.5	4,173.5	4,173.6	0.1
CB	74,314	51	179	9.1	4,183.2	4,183.2	4,183.2	0.0

[1]Feet above Confluence with Prickly Pear Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

FLOODWAY DATA

TENMILE CREEK

5.0 INSURANCE APPLICATION

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

Zone A

Zone A is the flood insurance risk 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 BFEs or base flood depths are shown within this zone.

Zone AE

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

Zone AO

Zone AO is the flood insurance risk 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 base flood depths derived from the detailed hydraulic analyses are shown within this zone.

Zone X

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

Zone D

Zone D is the flood insurance risk 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 risk zones as described in Section 5.0 and, in the 1-percent annual chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use the zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent annual chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The current FIRM presents flooding information for the entire geographic area of Lewis and Clark County. Previously, separate FIRMs were prepared for each identified flood prone incorporated community and for the unincorporated areas of the County. Historical data relating to the maps prepared for each community are presented in Table 5.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDAY MAP REVISION DATE	INITIAL FIRM EFFECTIVE DATE	FIRM REVISION DATE
East Helena, City of	April 5, 1974	None	June 4, 1980	September 27, 1985
Helena, City of	April 12, 1974	March 28, 1975	April 15, 1981	None
Lewis and Clark County (Unincorporated Areas)	December 27, 1974	September 13, 1977	April 1, 1981	September 4, 1985 June 17, 2002

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

A flood drainage study prepared in 1982 for Lewis and Clark County (References 10) involved hydrologic and hydraulic analysis of Prickly Pear Creek. Results in the drainage study were used as the basis for the revised hydrologic analysis and for description of flood problems in this Flood Insurance Study.

The revised hydrologic and hydraulic analysis along Tenmile Creek was completed by the USGS in September, 2006 (Reference 33). The USACE HEC-RAS computer program was used to perform the revised hydraulic analysis. Flood profiles were revised for Tenmile Creek. This new study starts at the confluence of Tenmile Creek with Prickly Pear Creek and ends at Highway 12, a reach of 14 miles. As a result, the 1- and 0.2-percent-annual-chance floodplain and floodway boundaries were revised.

A revised hydraulic analysis for a portion of Silver Creek was also completed by the USGS in September, 2006 (Reference 28). This study was based on the same discharge values used for Silver Creek in the FIS for the unincorporated areas of Lewis and Clark County, Montana, dated September 4, 1985. The USACE HEC-RAS computer program was used to perform the revised hydraulic analysis. Flood profiles were revised for Silver Creek. This new study starts at the ditch just downstream of Interstate 15 and ends at Applegate Road, a reach of 3 miles. As a result, the 1- and 0.2-percent-annual-chance floodplain and floodway boundaries were revised.

A revision of the floodway and floodplain for Silver Creek was performed by PBS&J, for the Montana Department of Natural Resources (DNRC). This study was completed in November 2010.

Previously Flood Insurance Studies have been prepared for the Cities of East Helena and Helena and Lewis and Clark County (Unincorporated Areas) and are in agreement with this study (References 1, 2 and 3).

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

Table 6 contains all Letters of Map Change (LOMCs) that have been incorporated into the FIS since the previous effective date.

Table 6 – Summary of LOMCs

Type of LOMC	Case Number	Effective Date	Project Identifier
LOMR	04-08-0351P	May 27, 2004	South Ridge
LOMR	07-08-0452P	July 30, 2007	Keir Lane Bridge

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Flood Insurance and Mitigation Division, FEMA, Denver Federal Center, Building 710, Box 25267, Denver, Colorado 80225-0267.

9.0 BIBLIOGRAPHY AND REFERENCES

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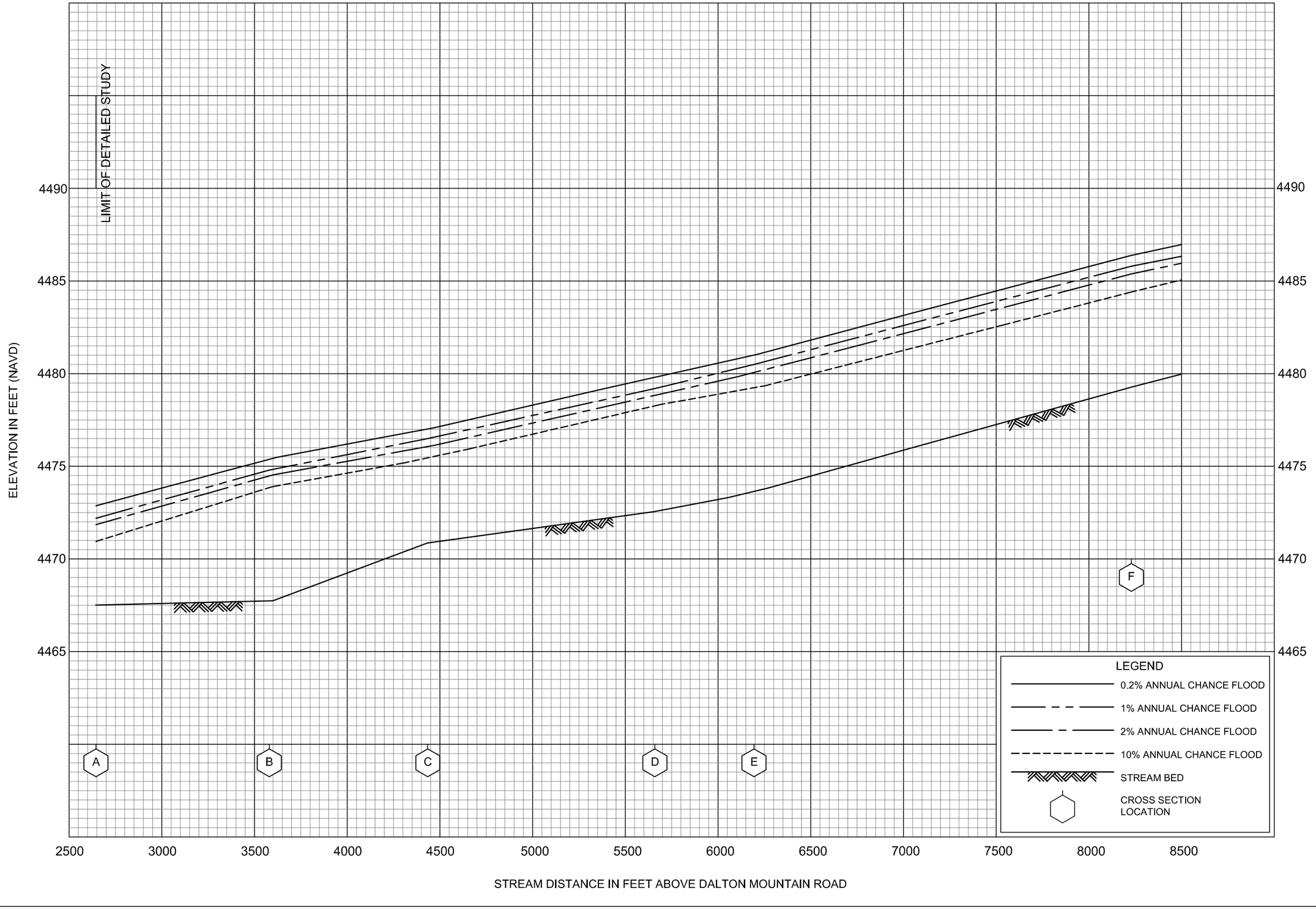


FLOOD PROFILES

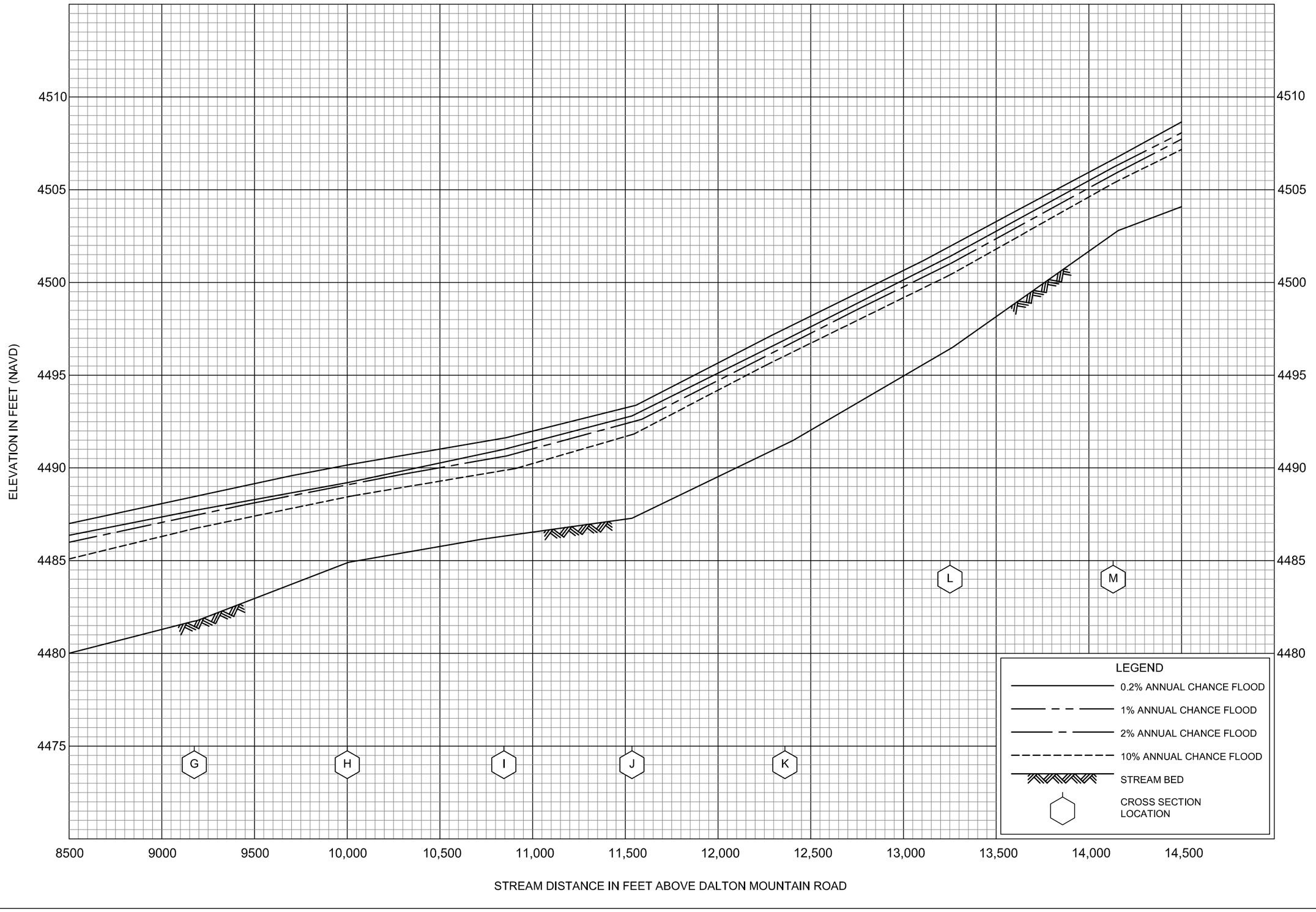
BLACKFOOT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

01P



FLOOD PROFILES

BLACKFOOT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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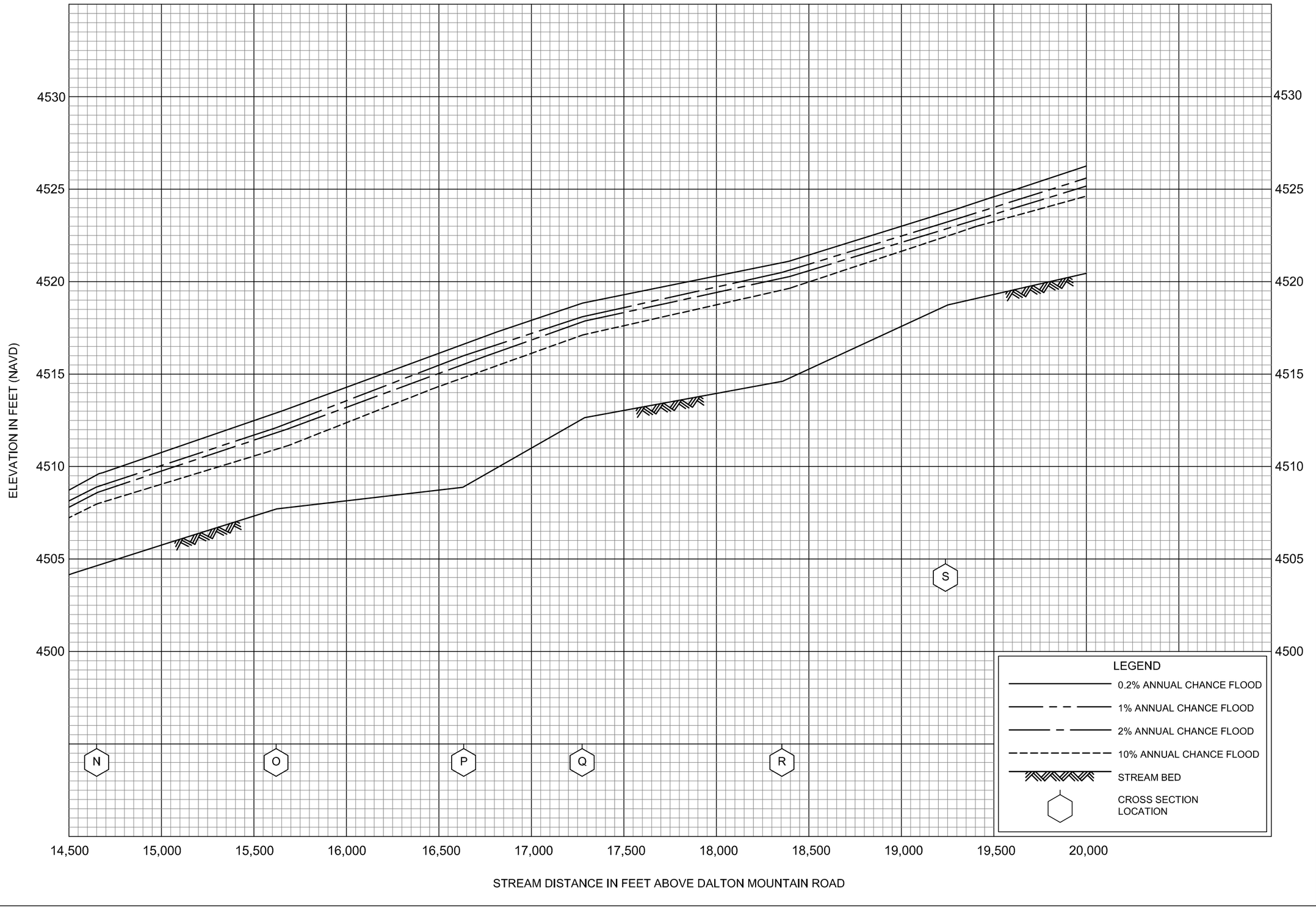


FLOOD PROFILES

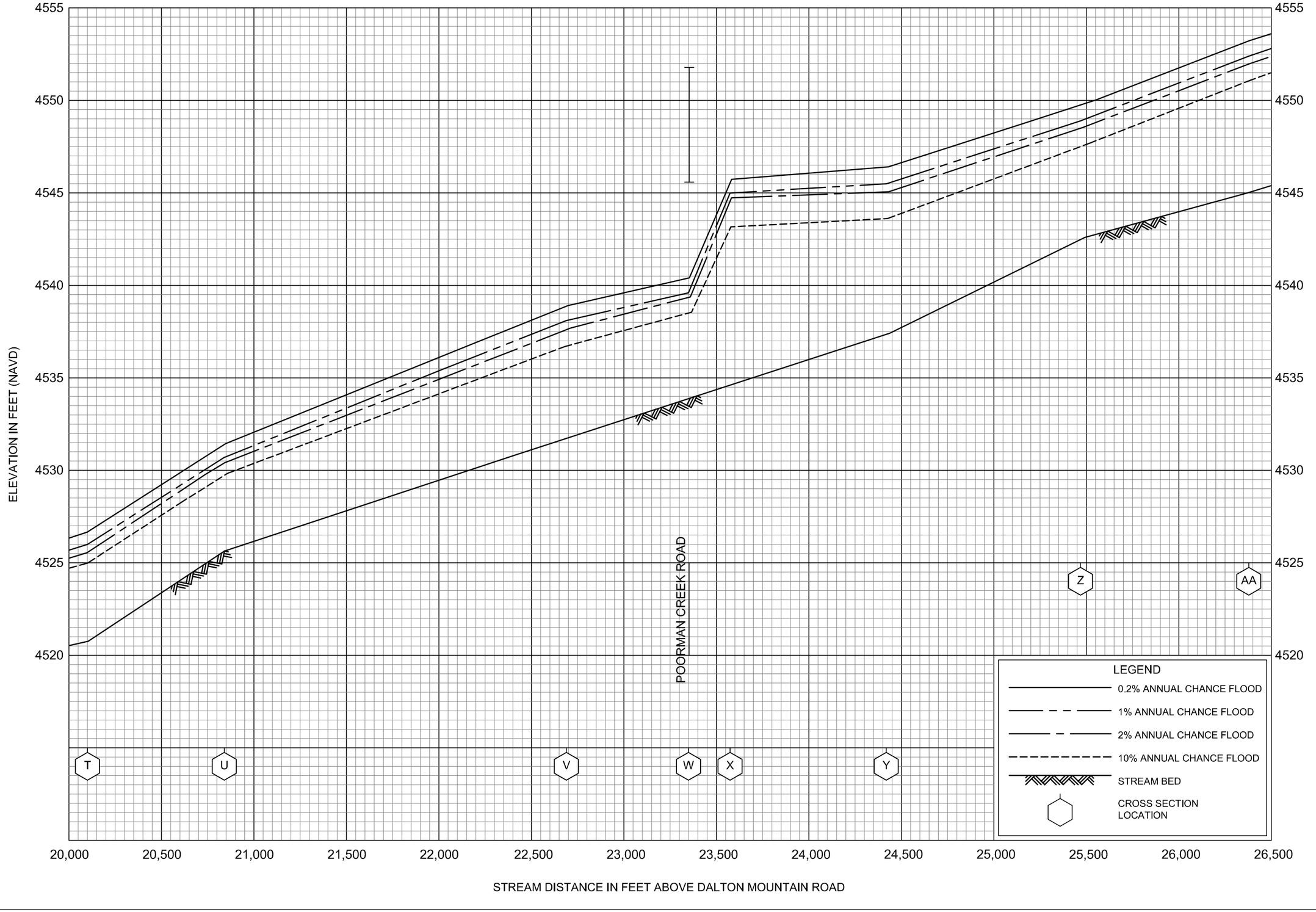
BLACKFOOT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

03P



FLOOD PROFILES

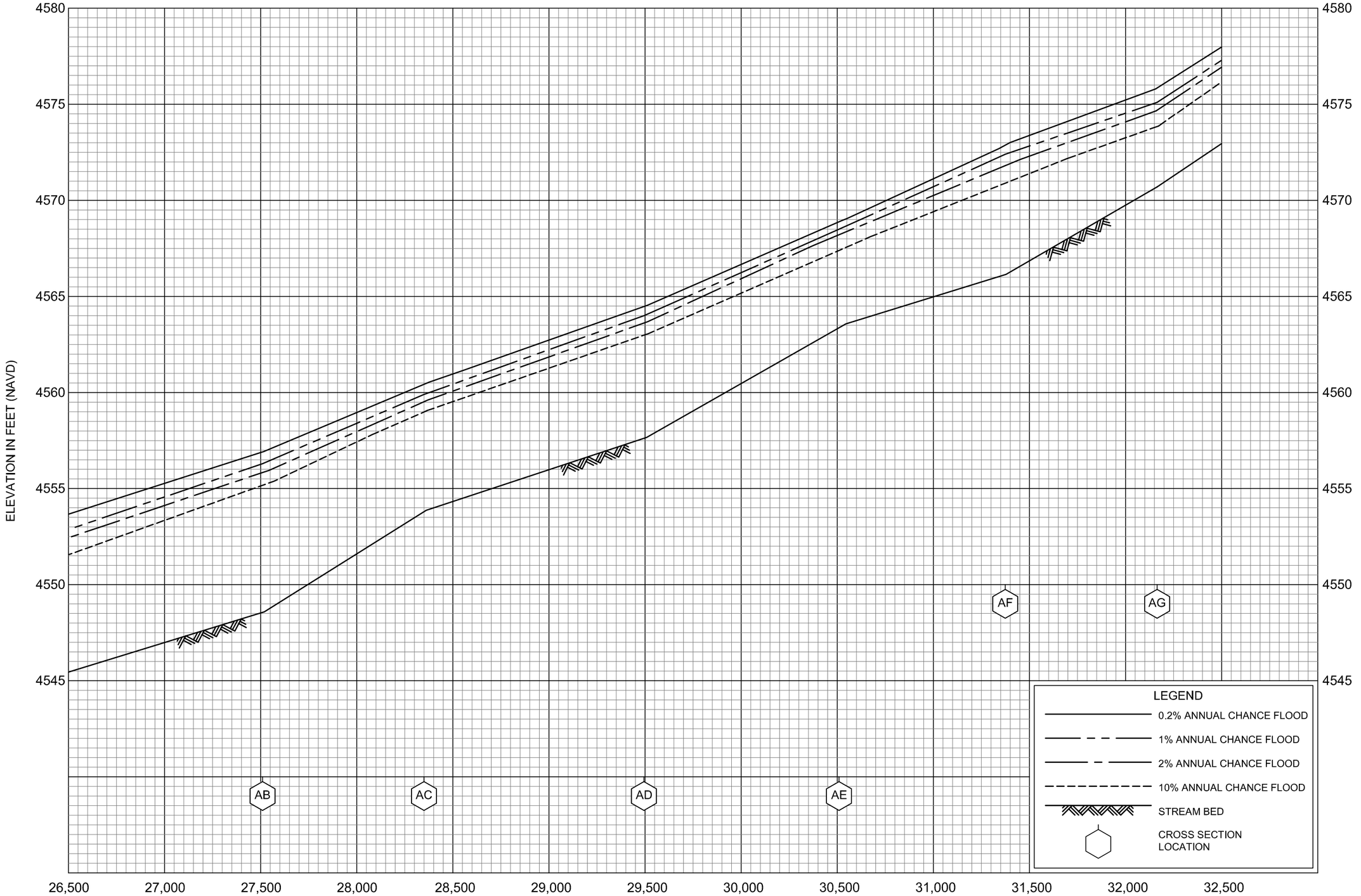
BLACKFOOT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

04P



FLOOD PROFILES

BLACKFOOT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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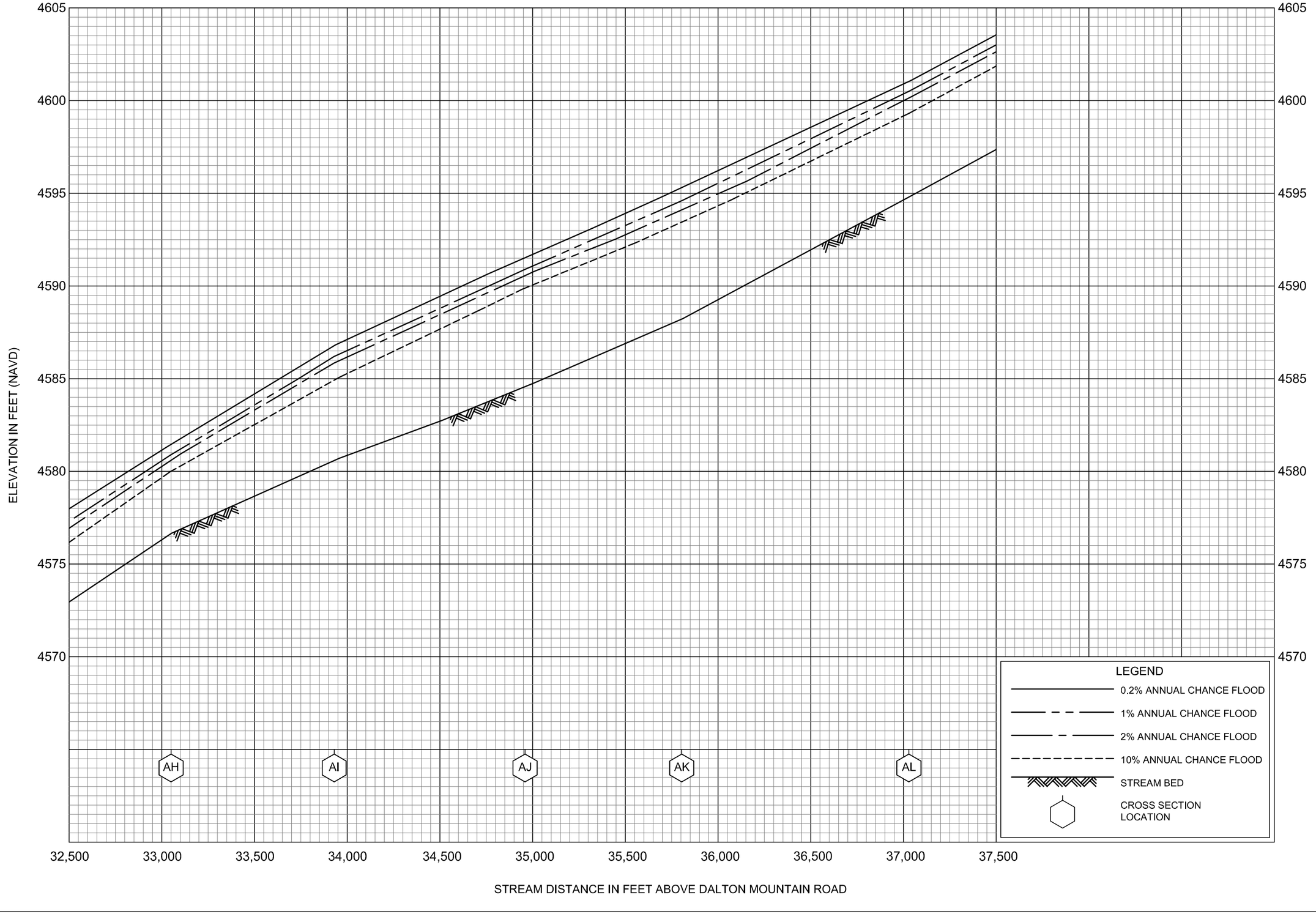

FLOOD PROFILES

BLACKFOOT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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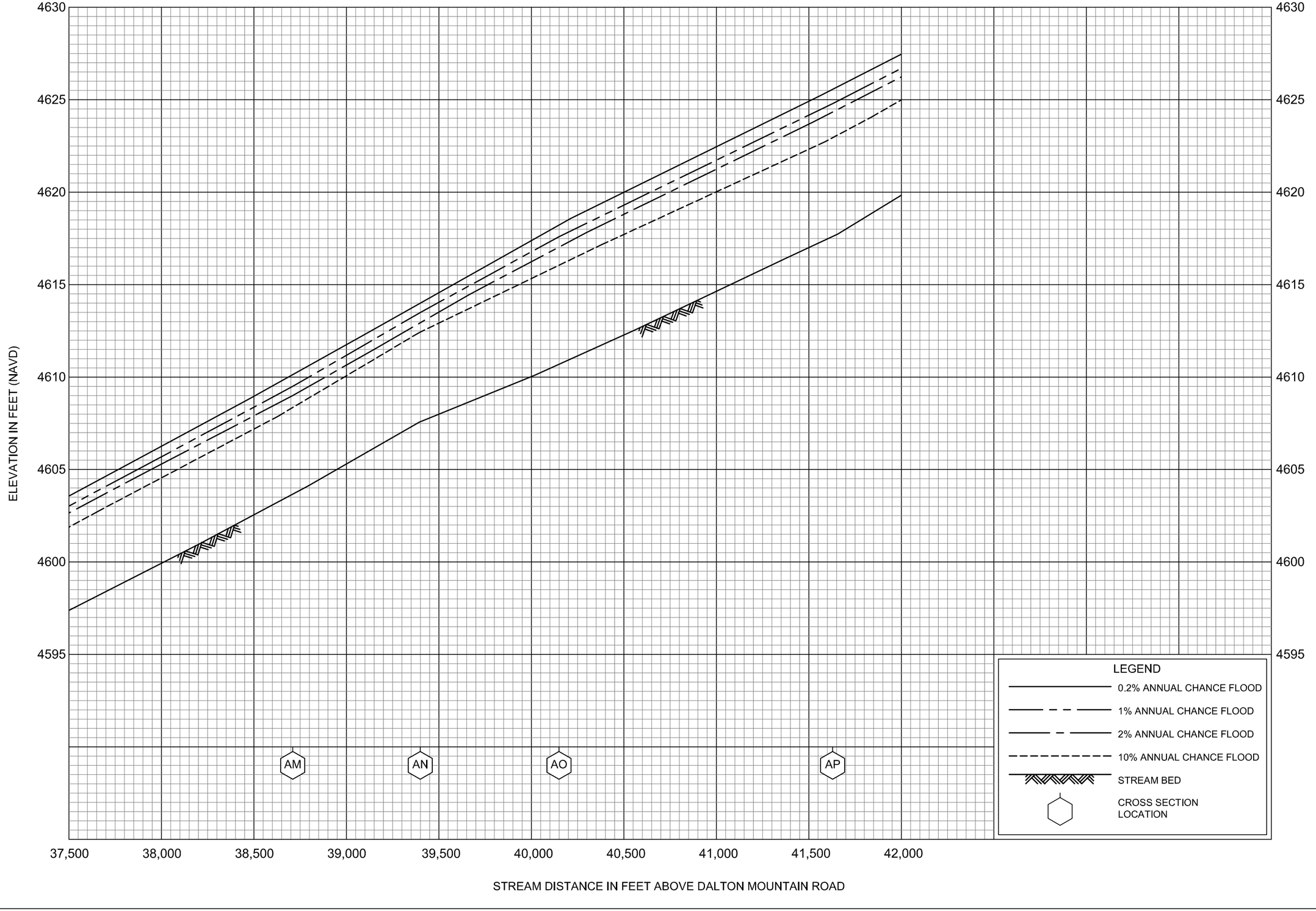

FLOOD PROFILES

BLACKFOOT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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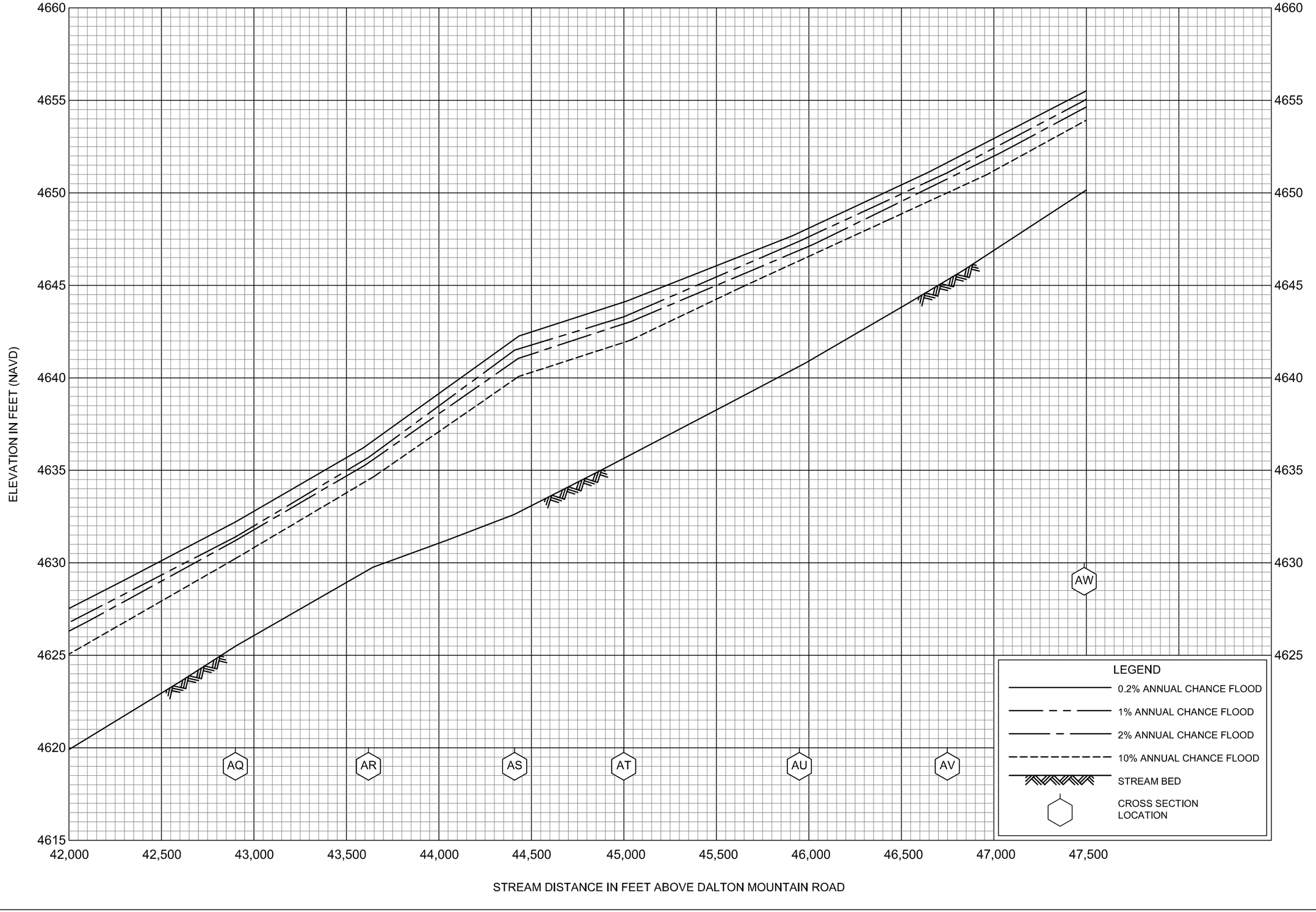

FLOOD PROFILES

BLACKFOOT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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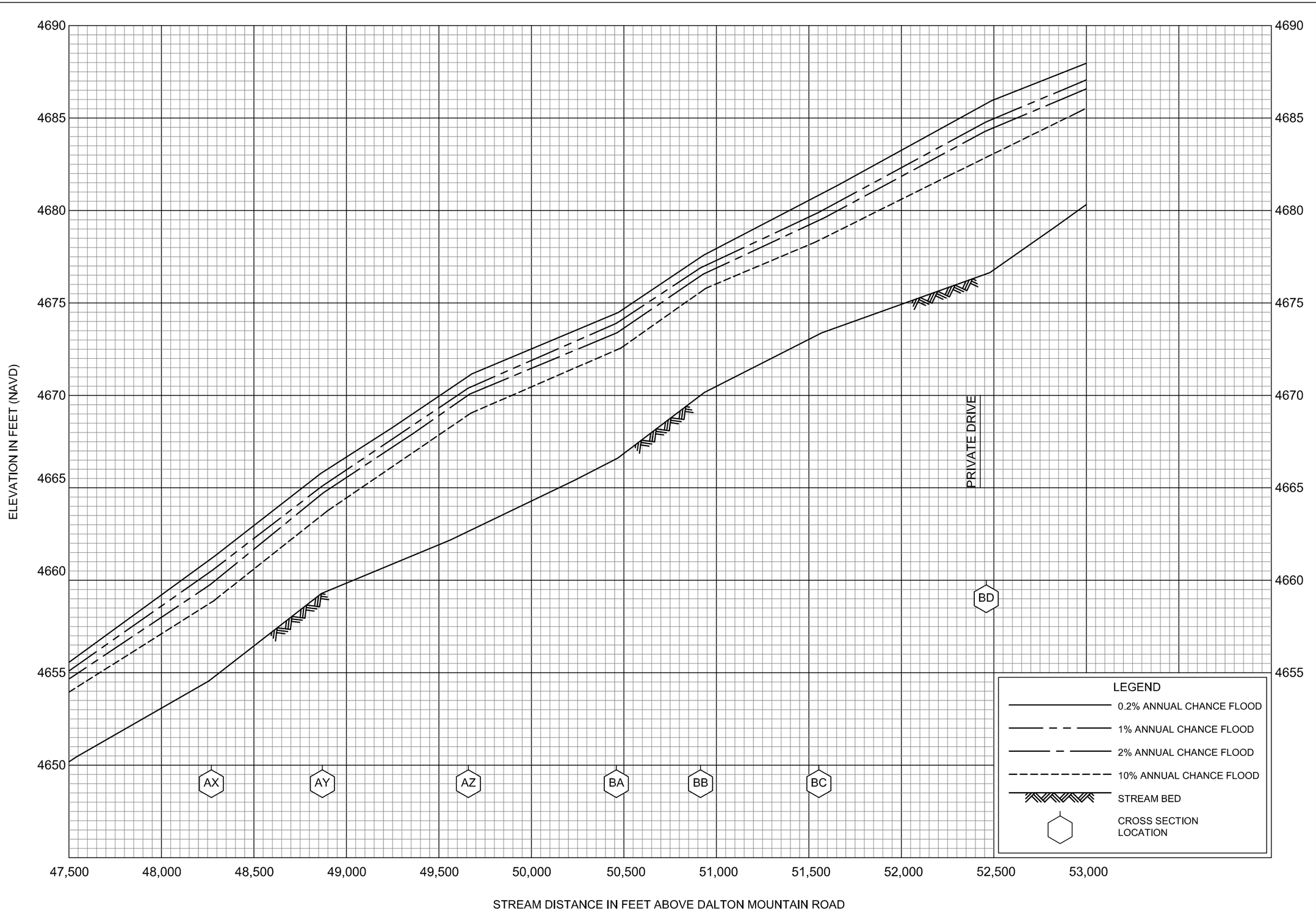

FLOOD PROFILES

BLACKFOOT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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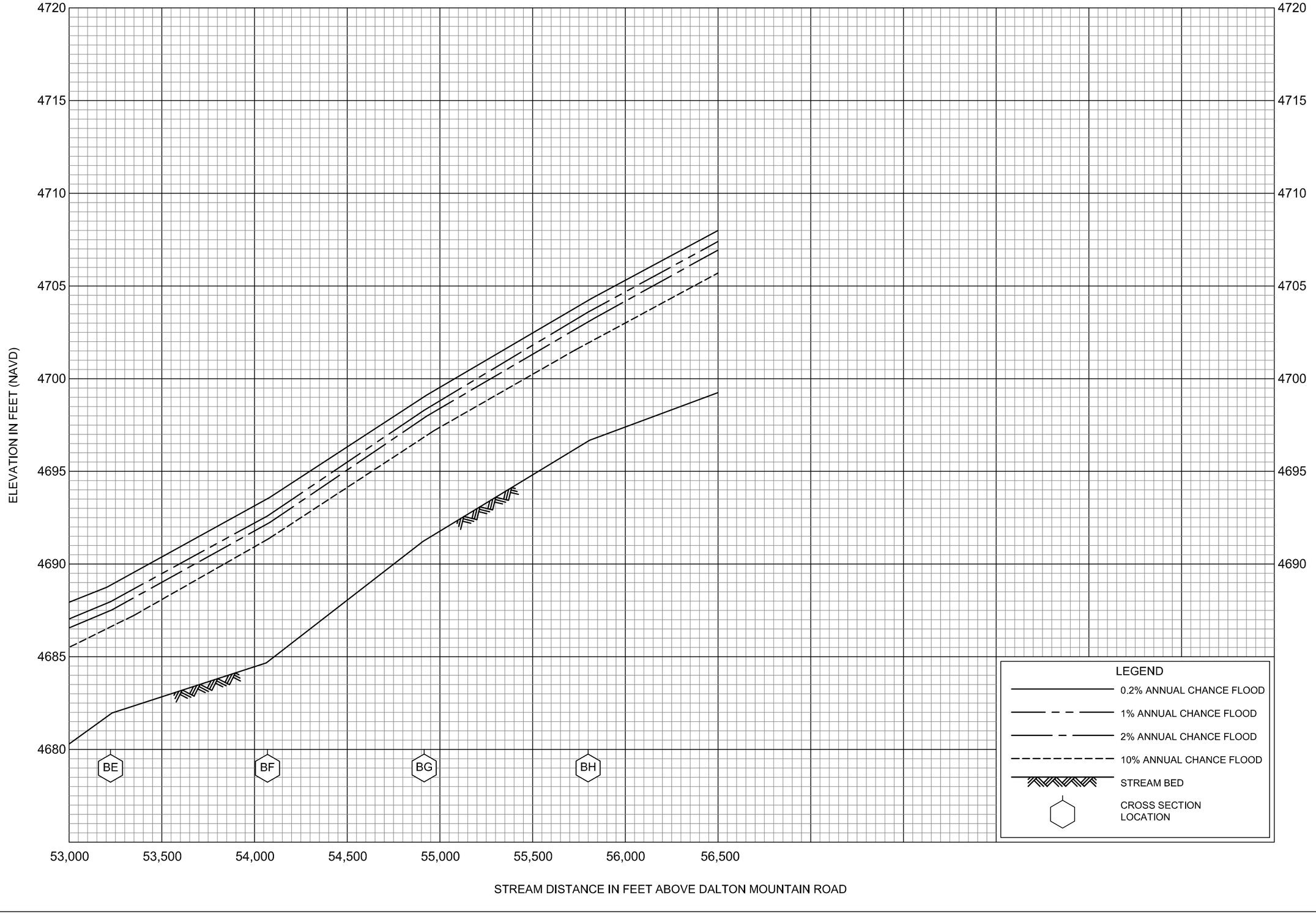

FLOOD PROFILES

BLACKFOOT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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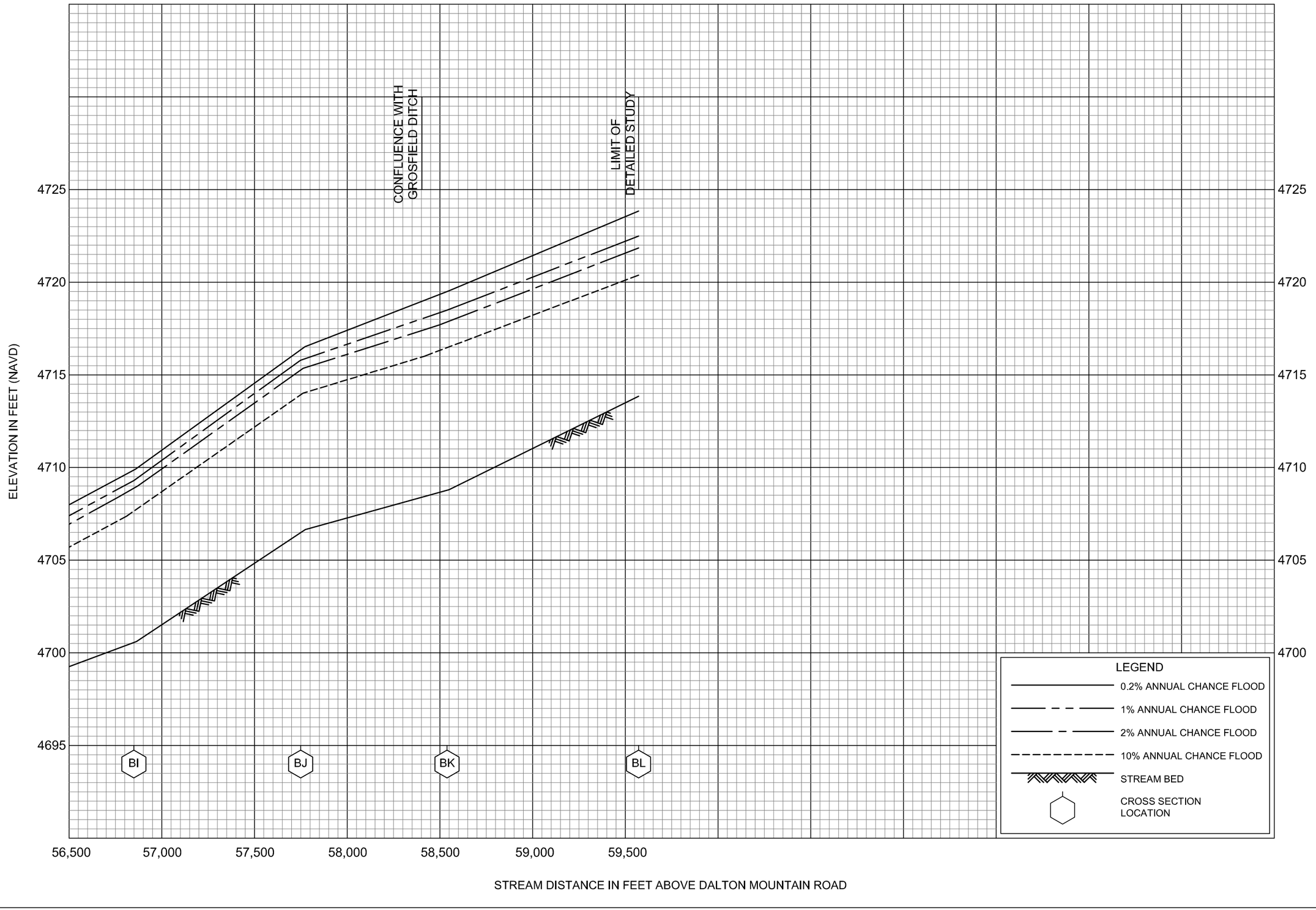

FLOOD PROFILES

BLACKFOOT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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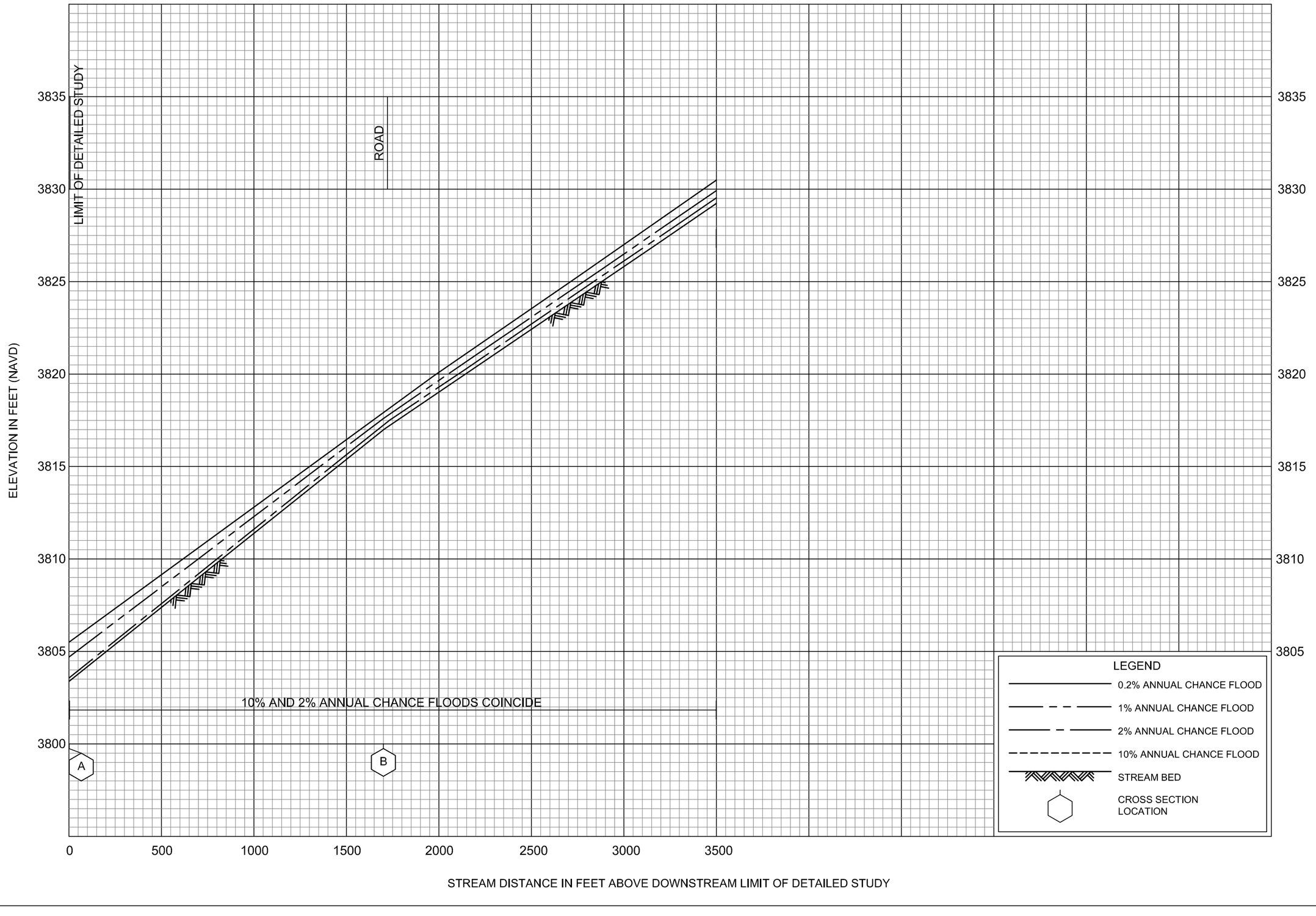

FLOOD PROFILES

EAST OVERFLOW OF PRICKLY PEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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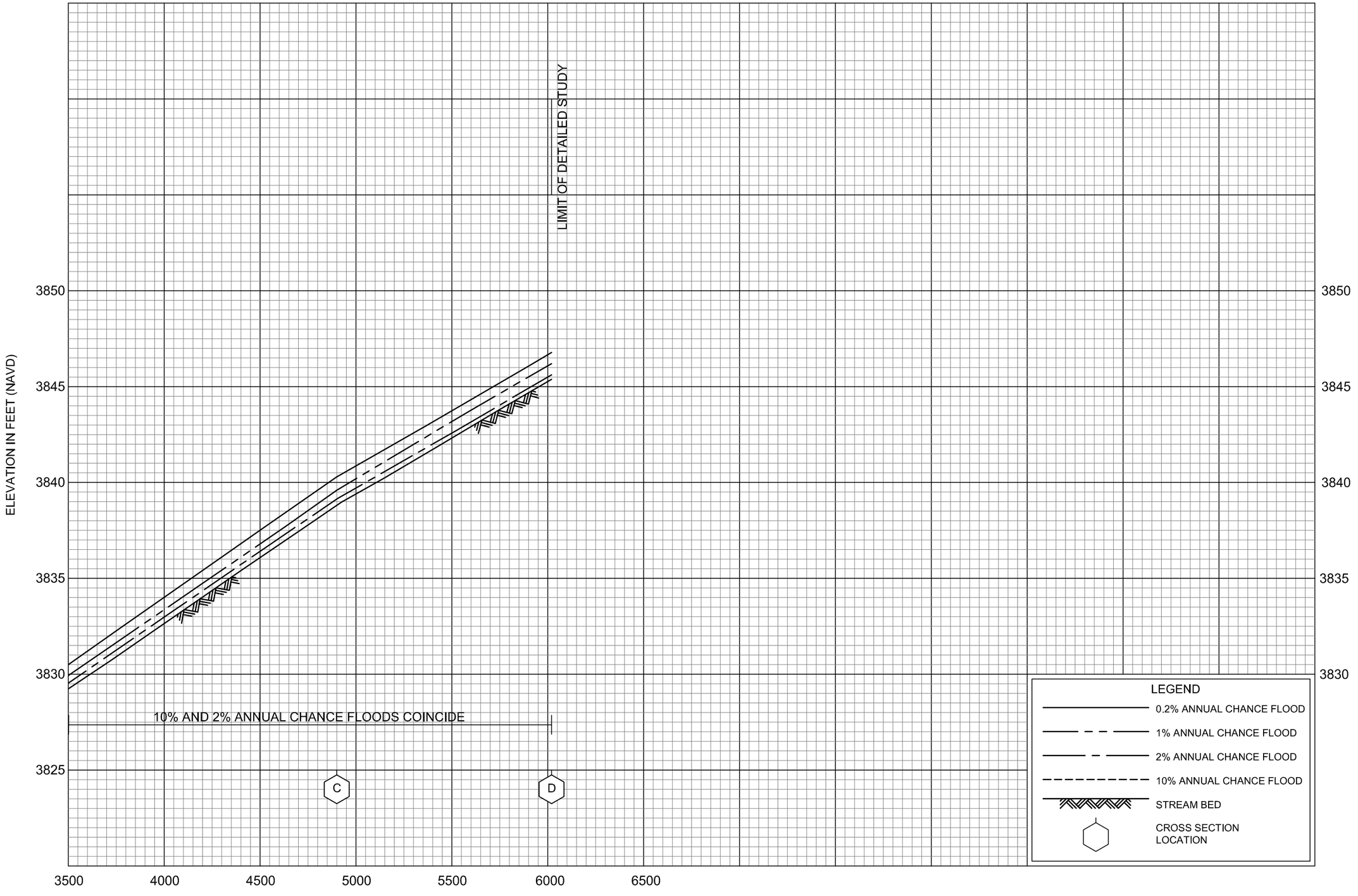

FLOOD PROFILES

EAST OVERFLOW OF PRICKLY PEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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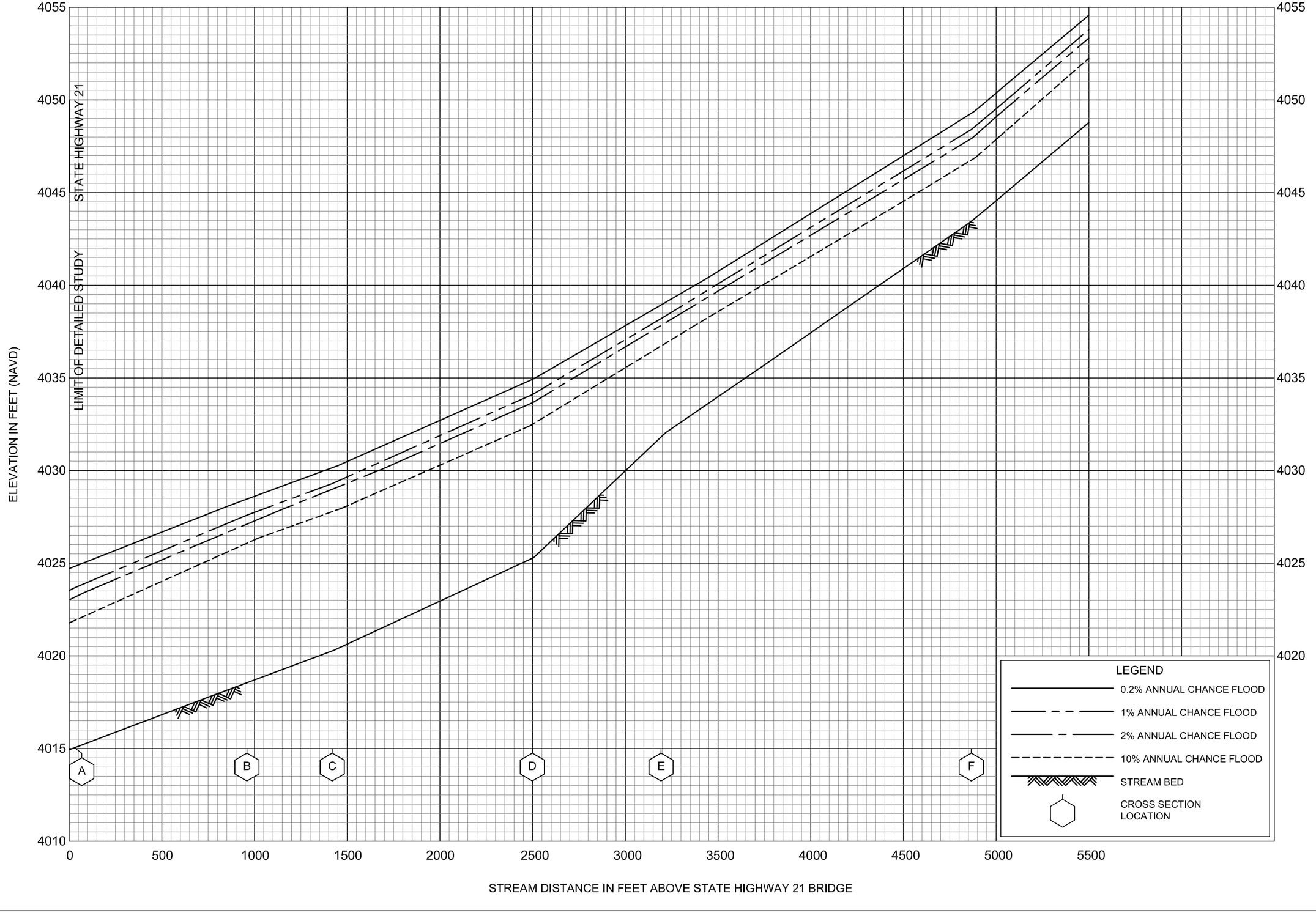


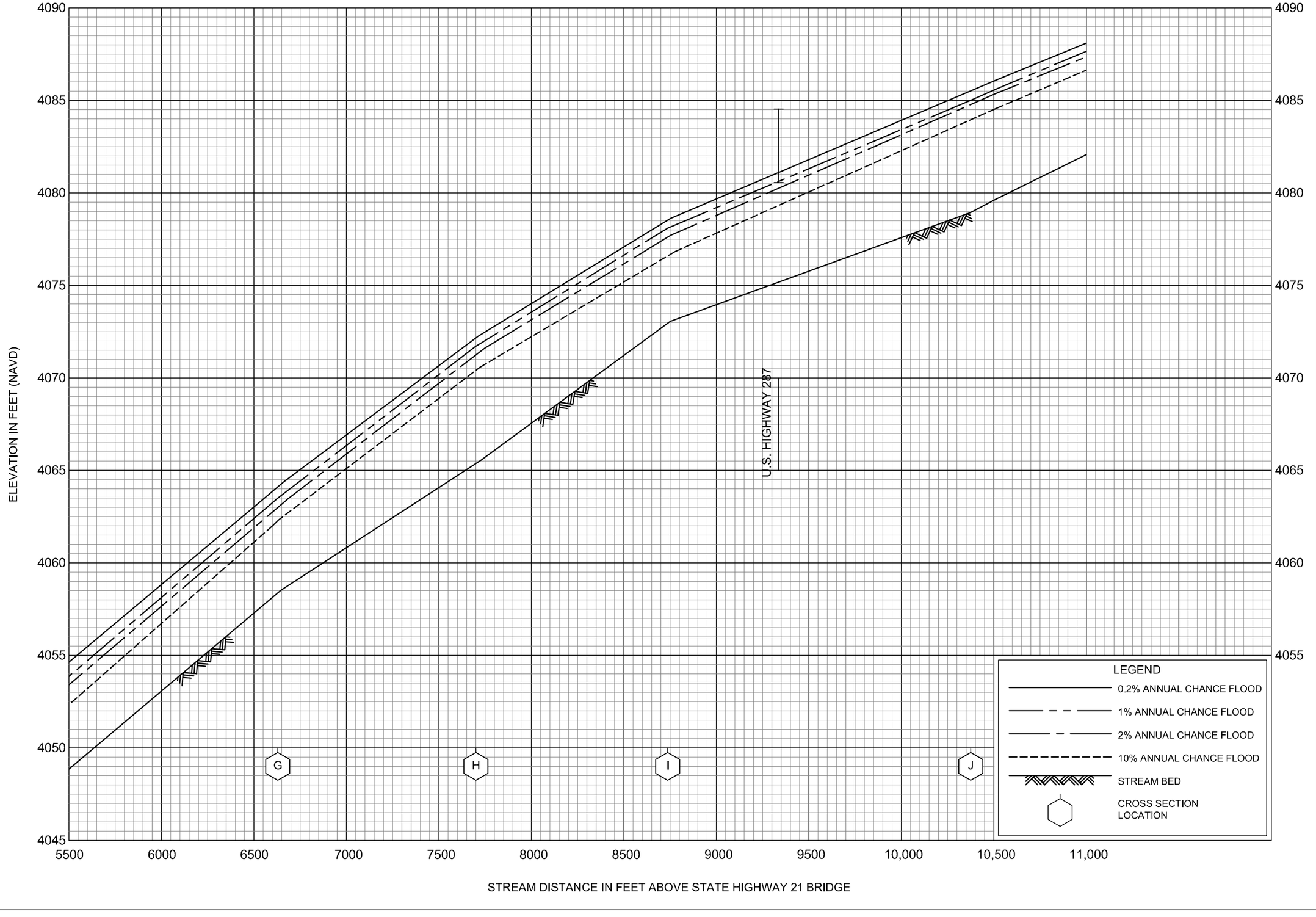
FLOOD PROFILES

ELK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS



FLOOD PROFILES

ELK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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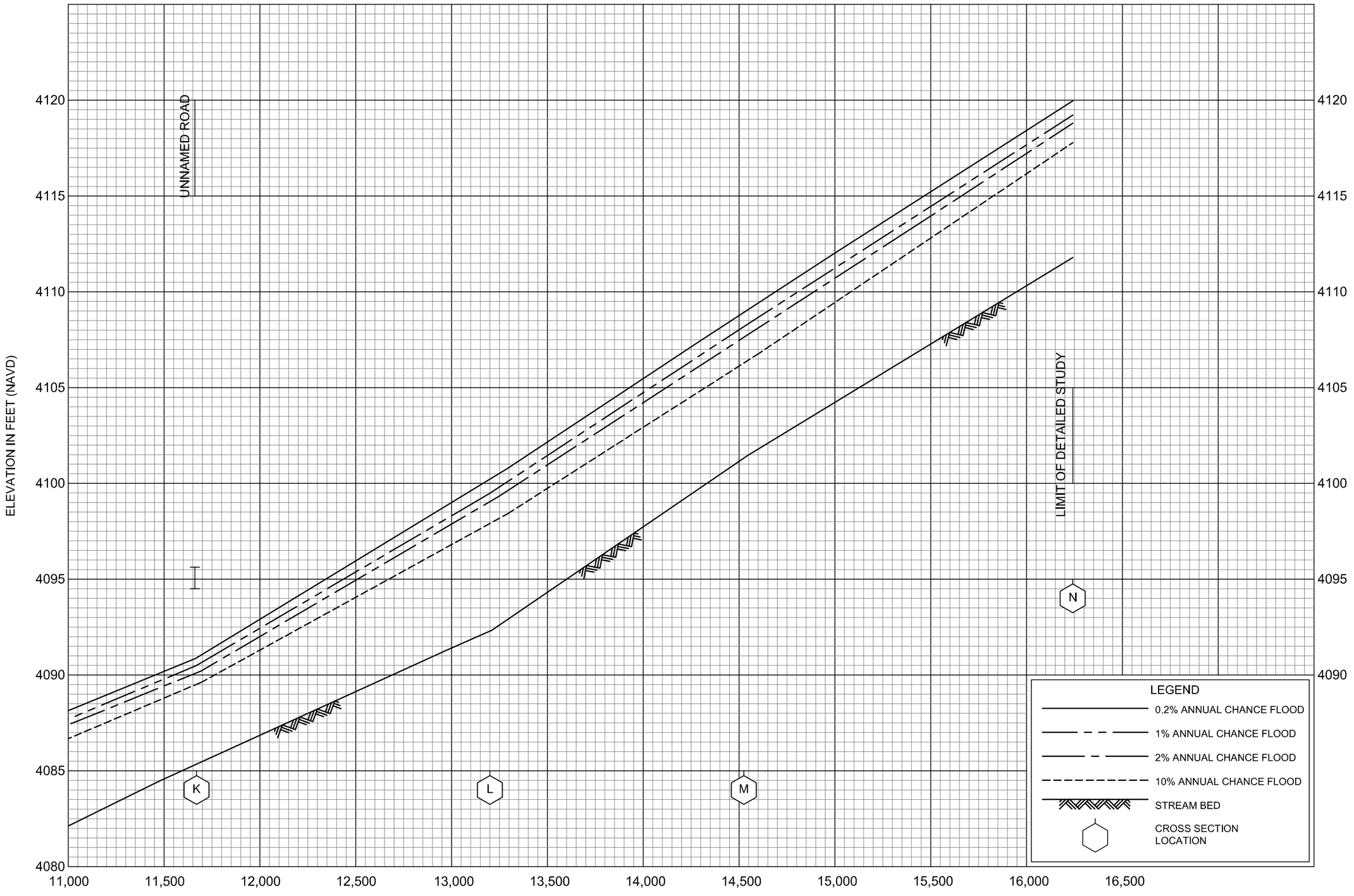

FLOOD PROFILES

ELK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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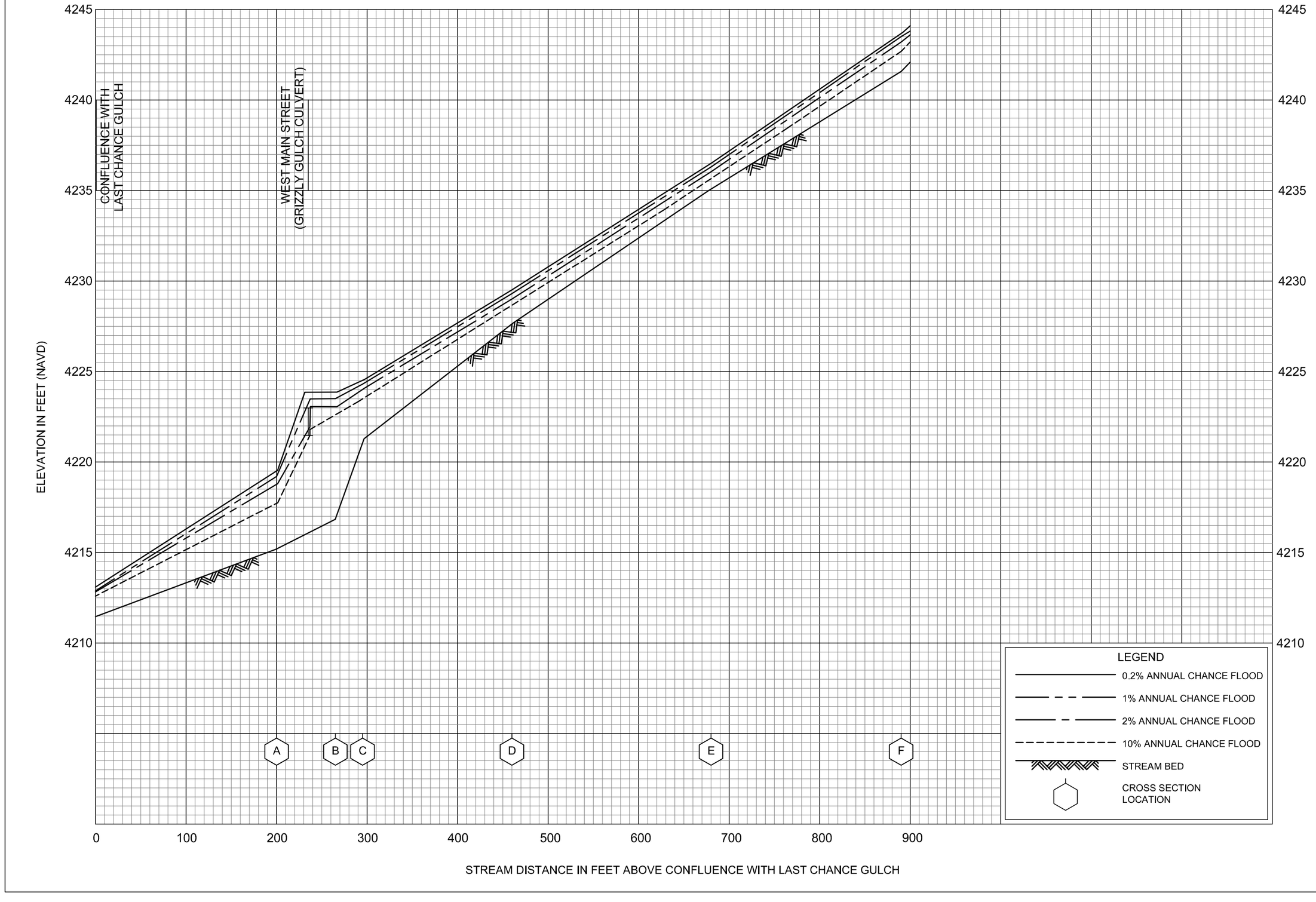

FLOOD PROFILES

GRIZZLY GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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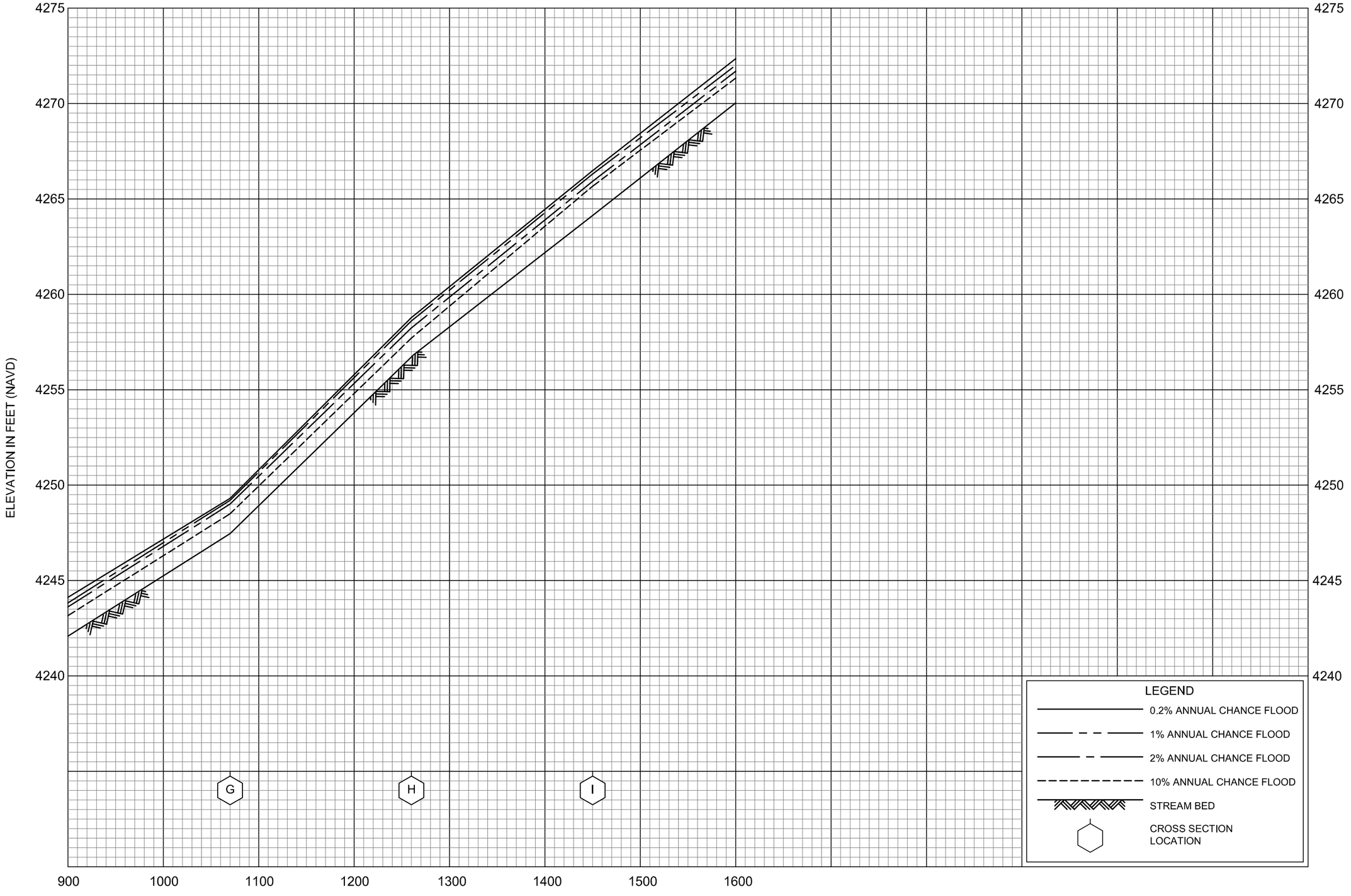

FLOOD PROFILES

GRIZZLY GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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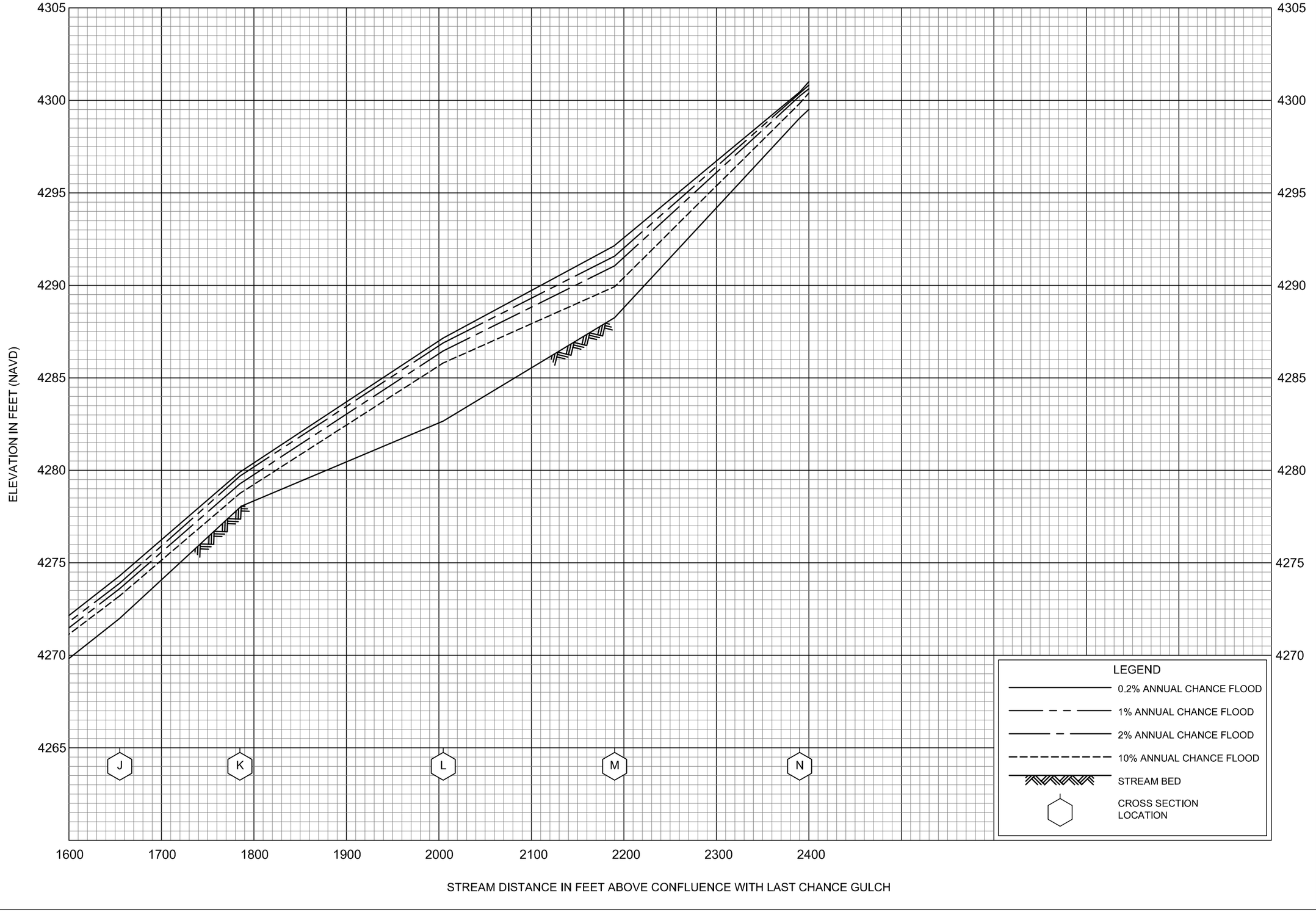


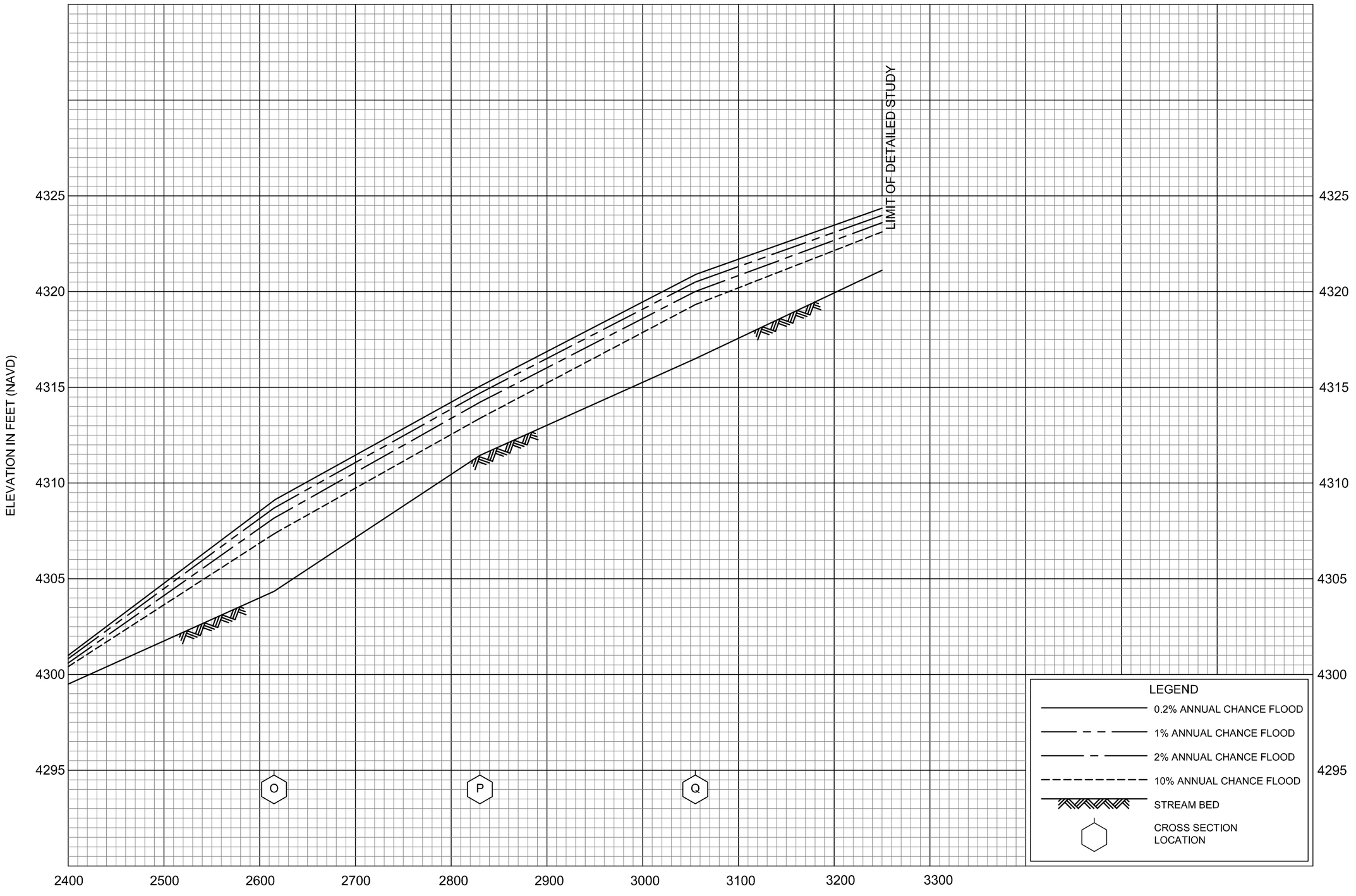
FLOOD PROFILES

GRIZZLY GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS



FLOOD PROFILES

GRIZZLY GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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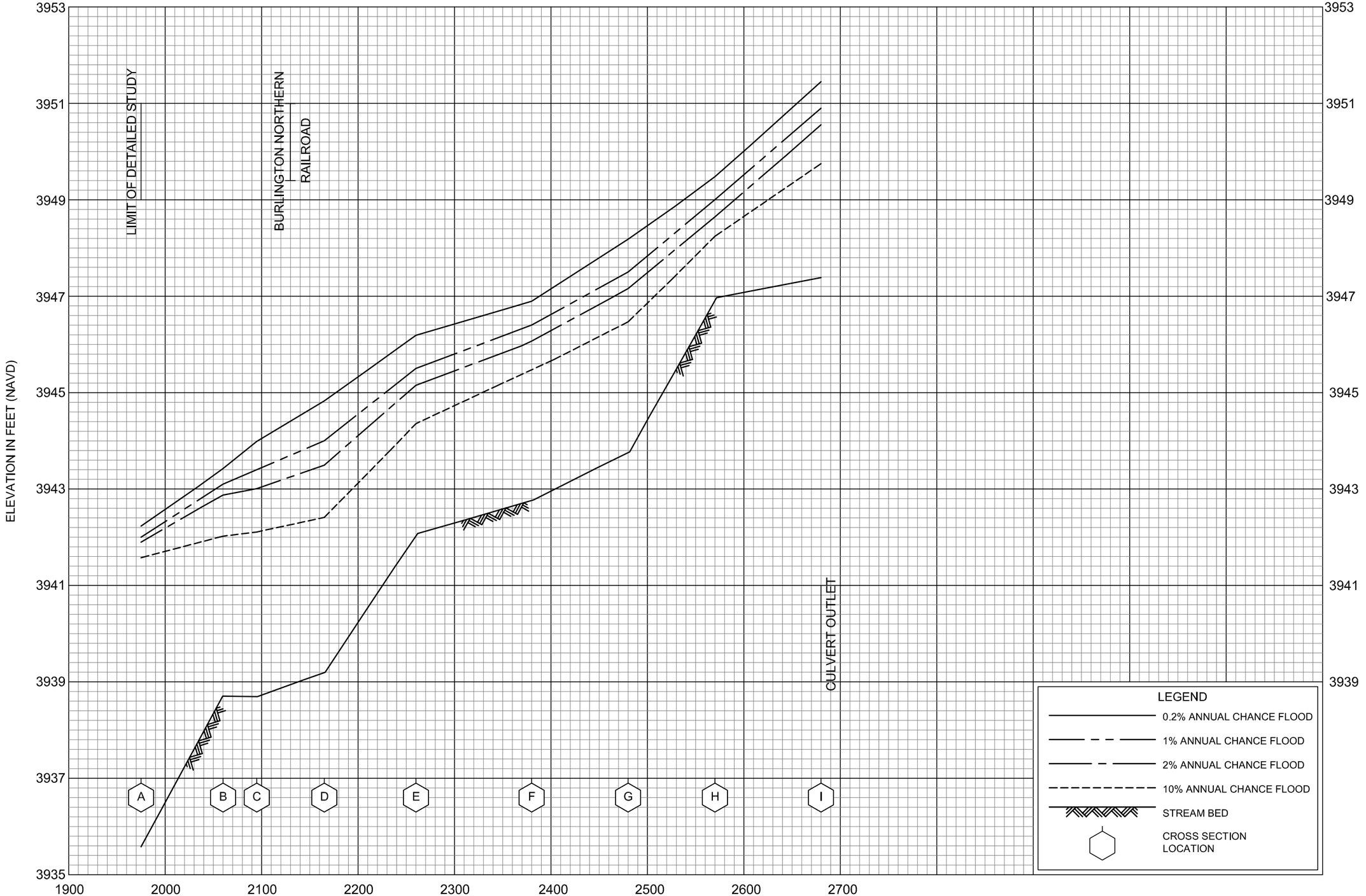

FLOOD PROFILES

LAST CHANCE GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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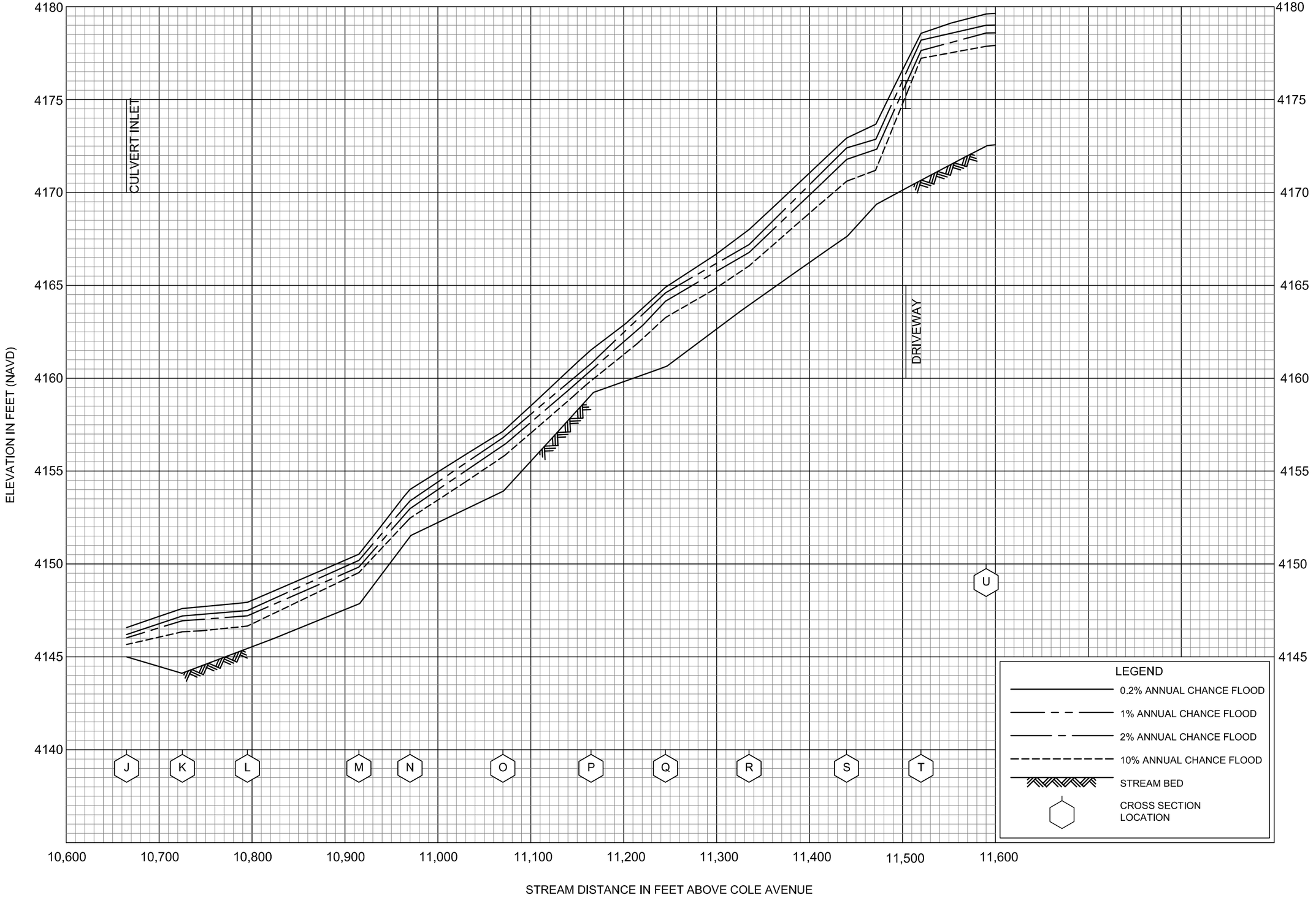


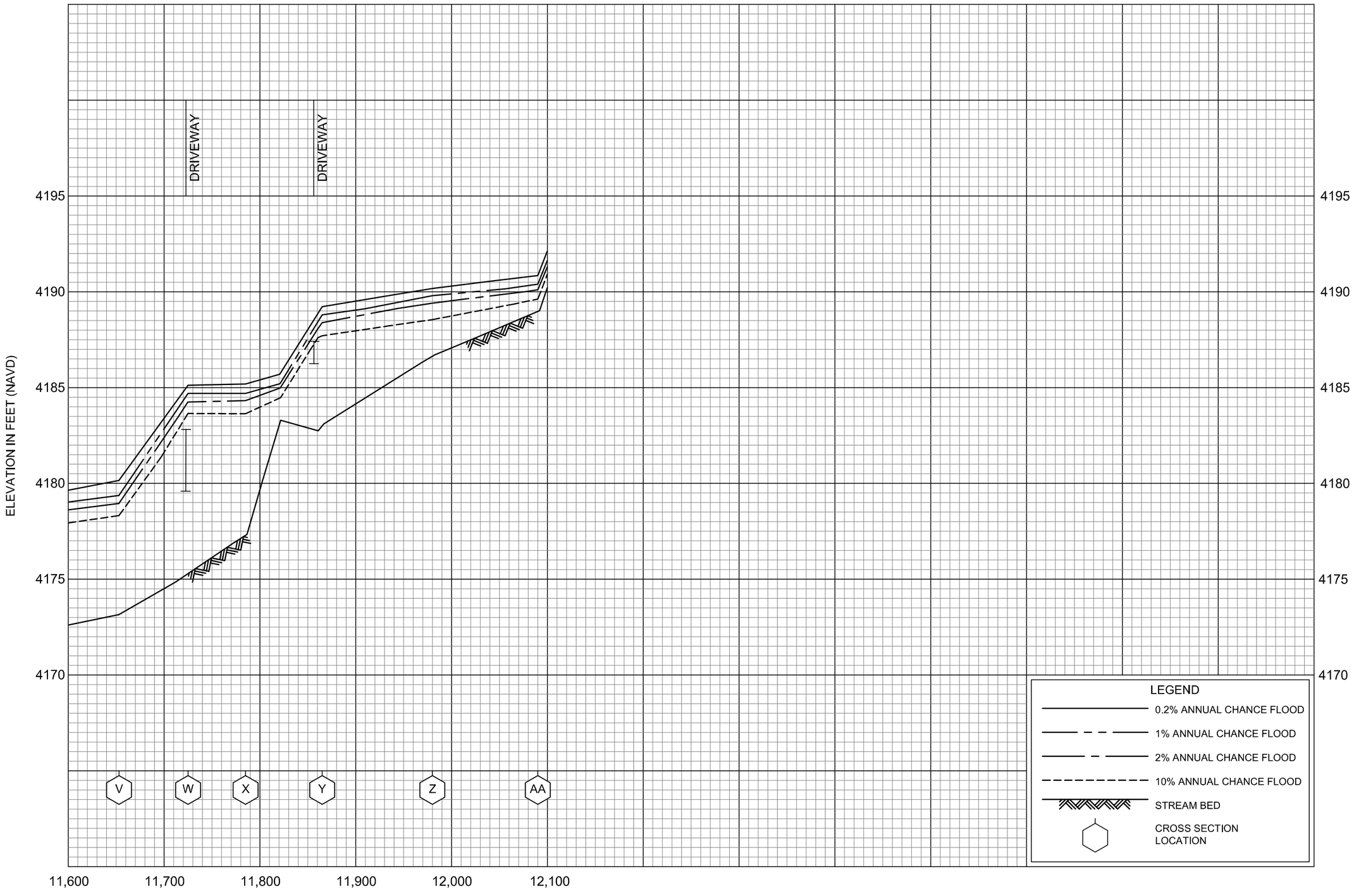
FLOOD PROFILES

LAST CHANCE GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS



FLOOD PROFILES

LAST CHANCE GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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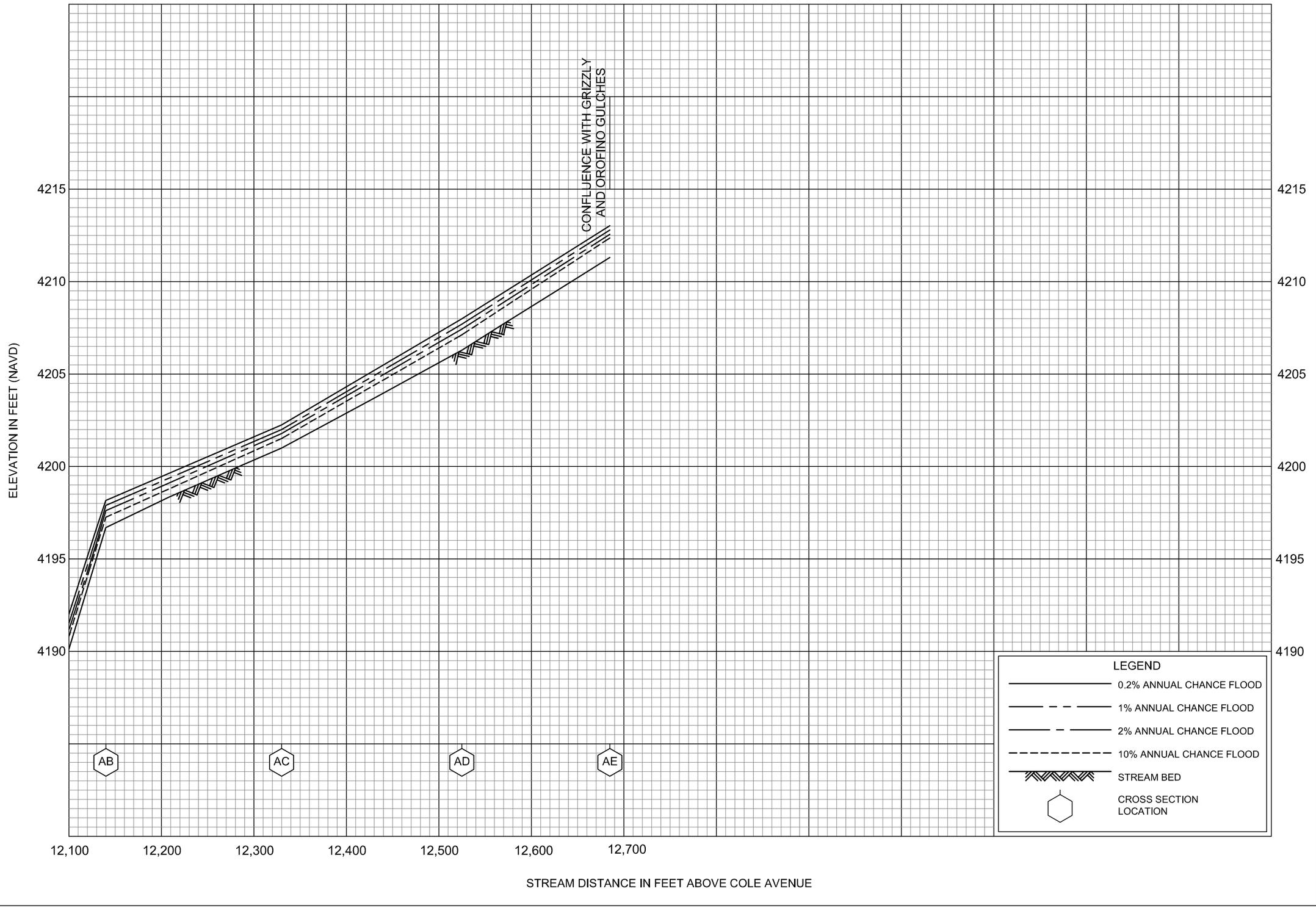

FLOOD PROFILES

LAST CHANCE GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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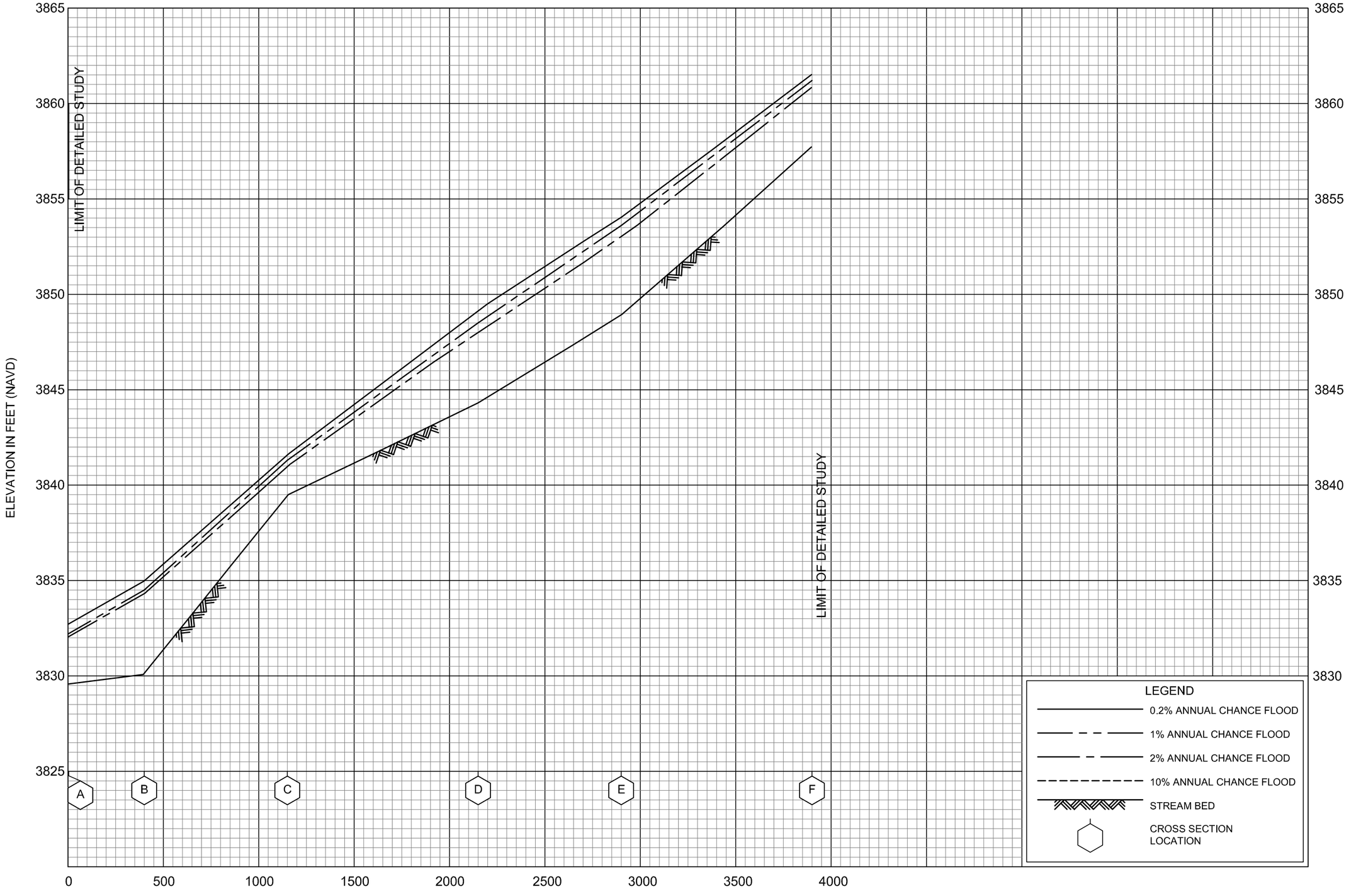


FLOOD PROFILES

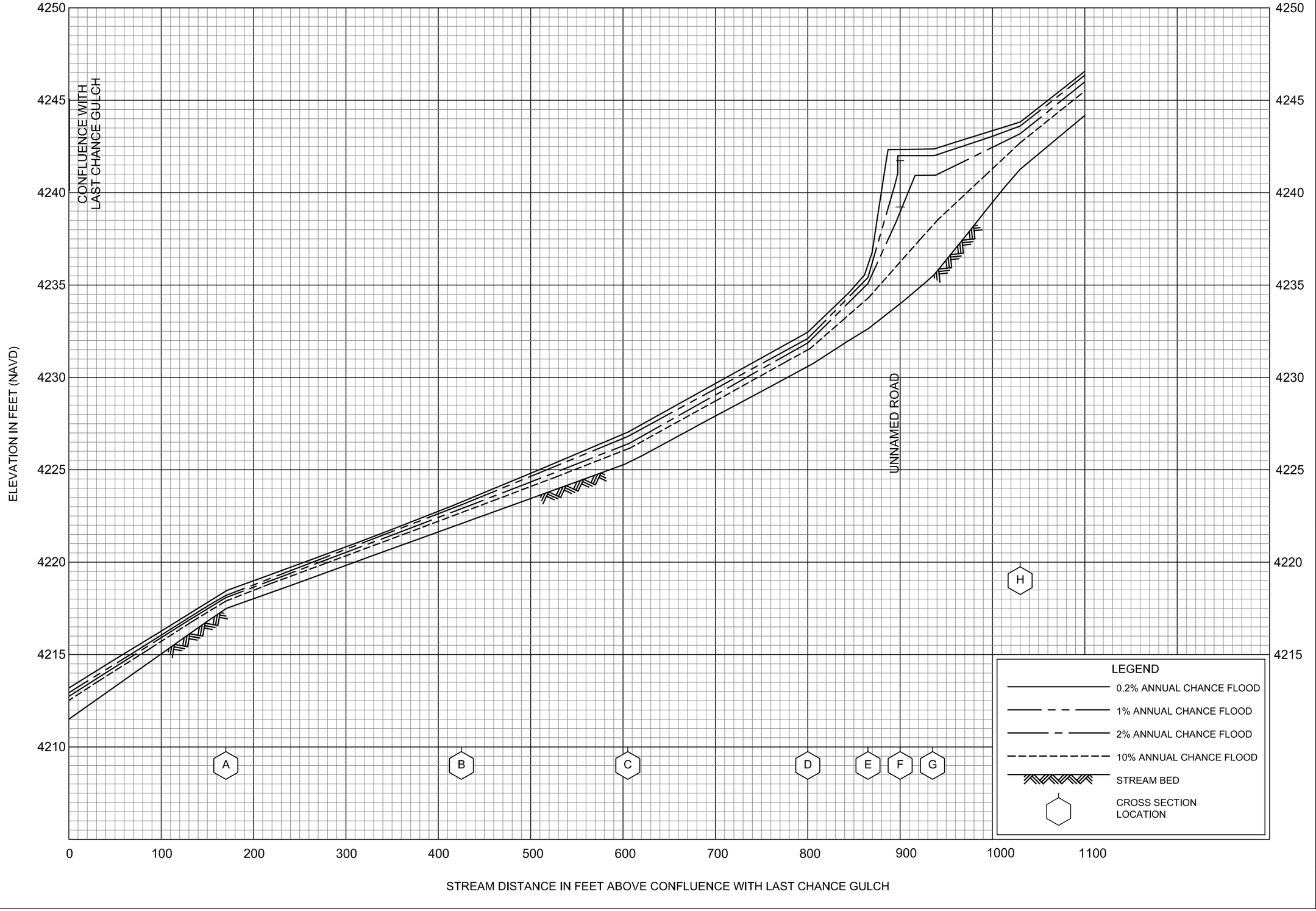
NORTH OVERFLOW OF PRICKLY PEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

25P



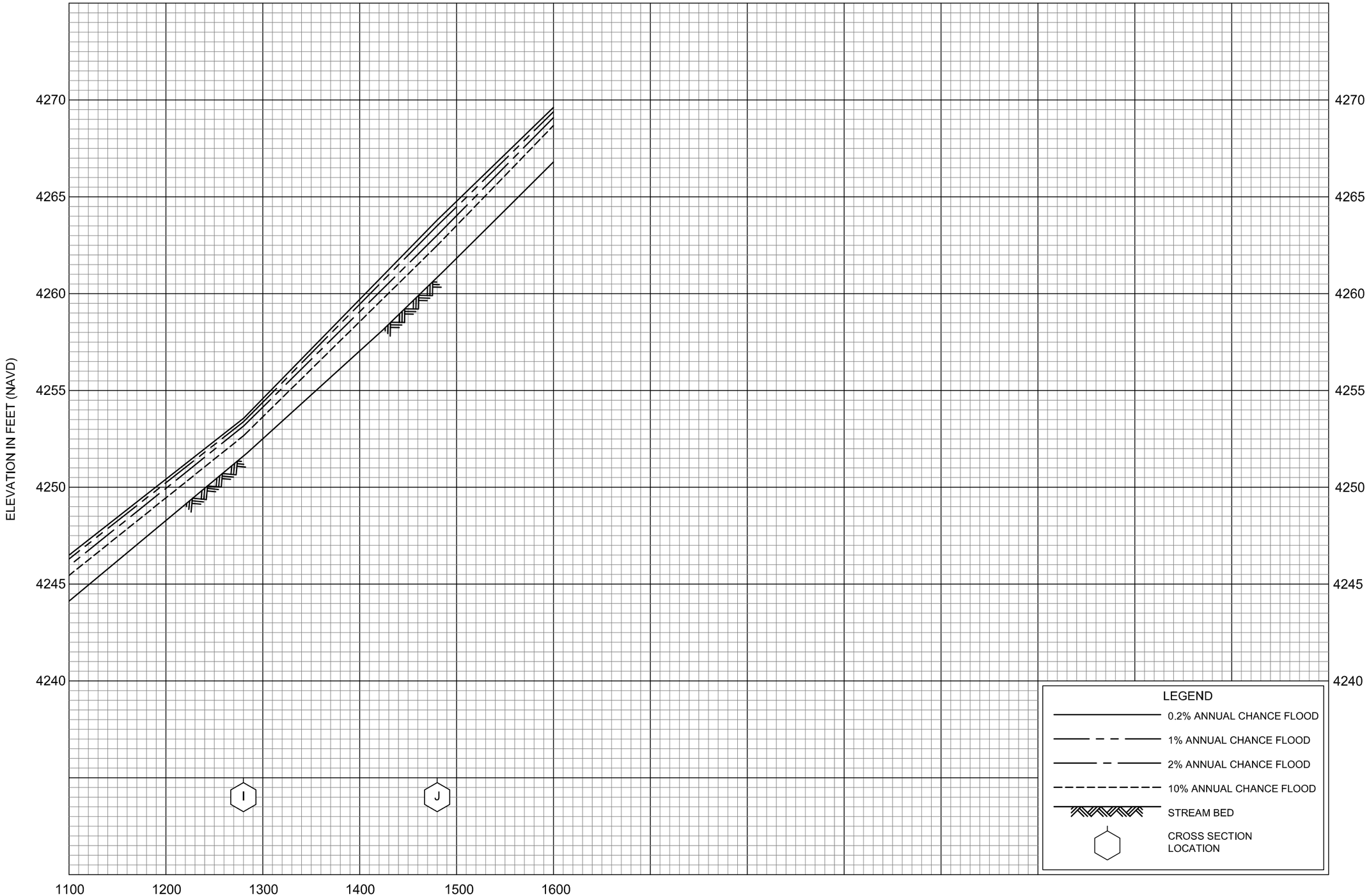
FLOOD PROFILES

OROFINO GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS



FLOOD PROFILES

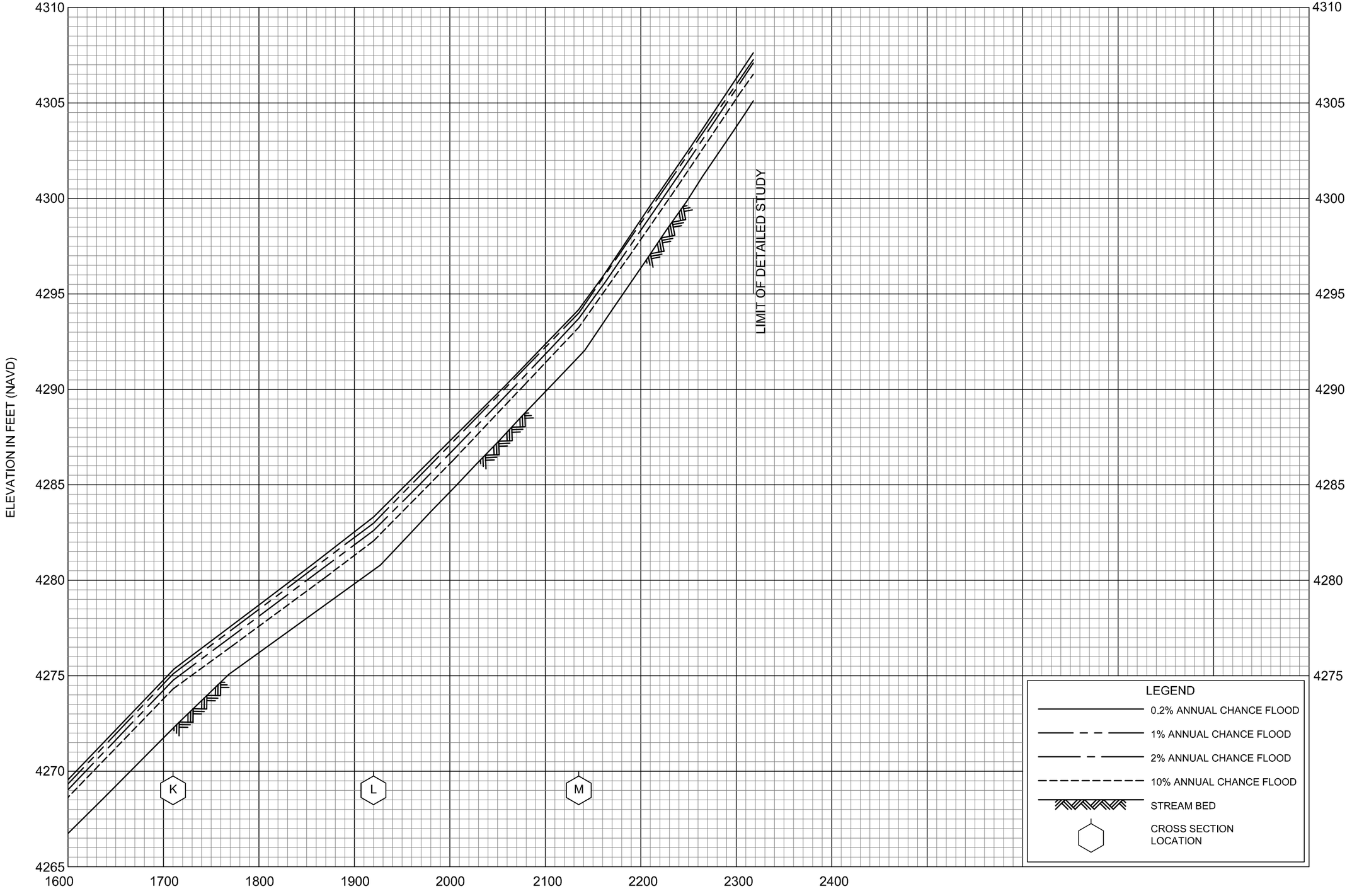
OROFINO GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

27P



FLOOD PROFILES

OROFINO GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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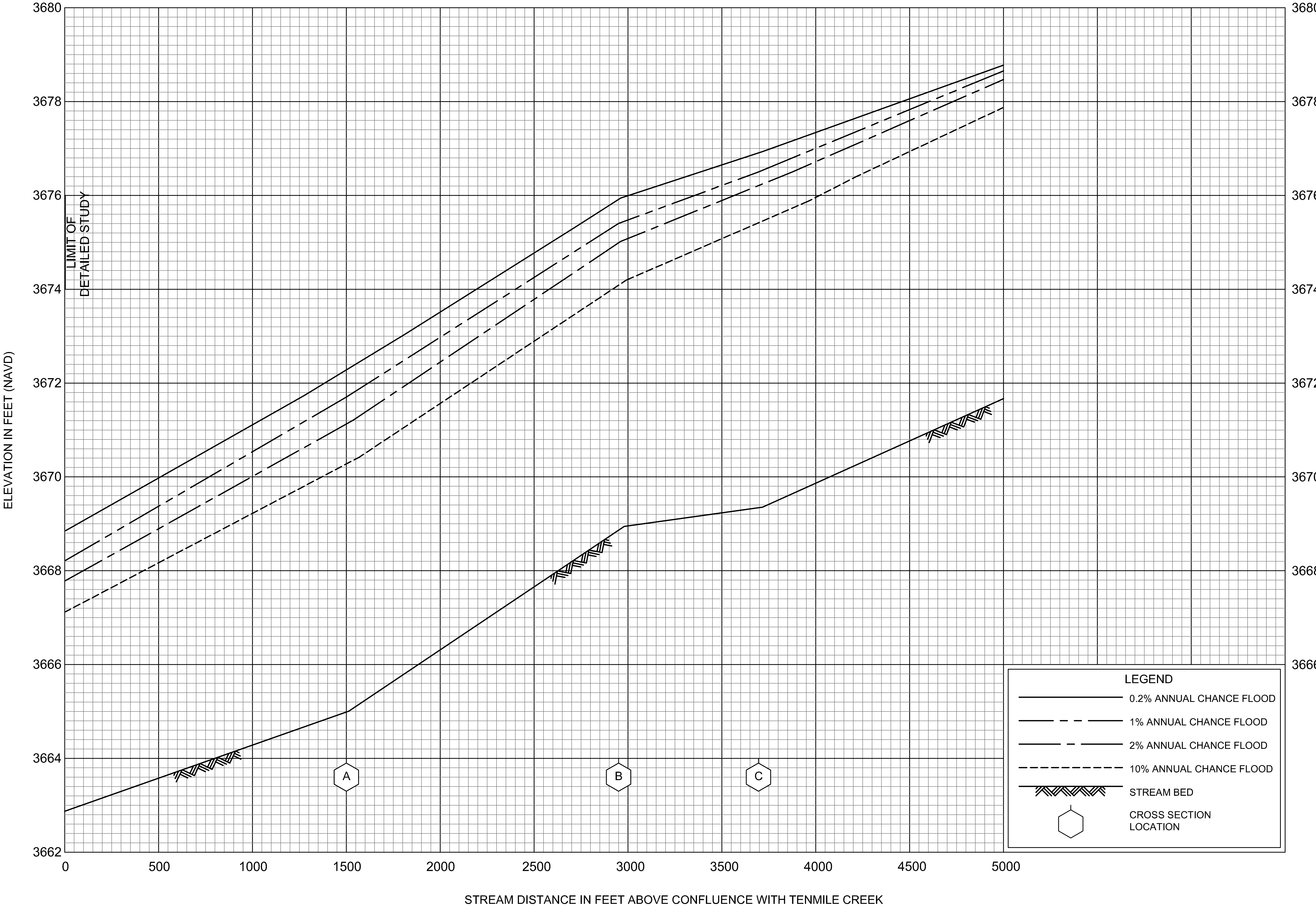


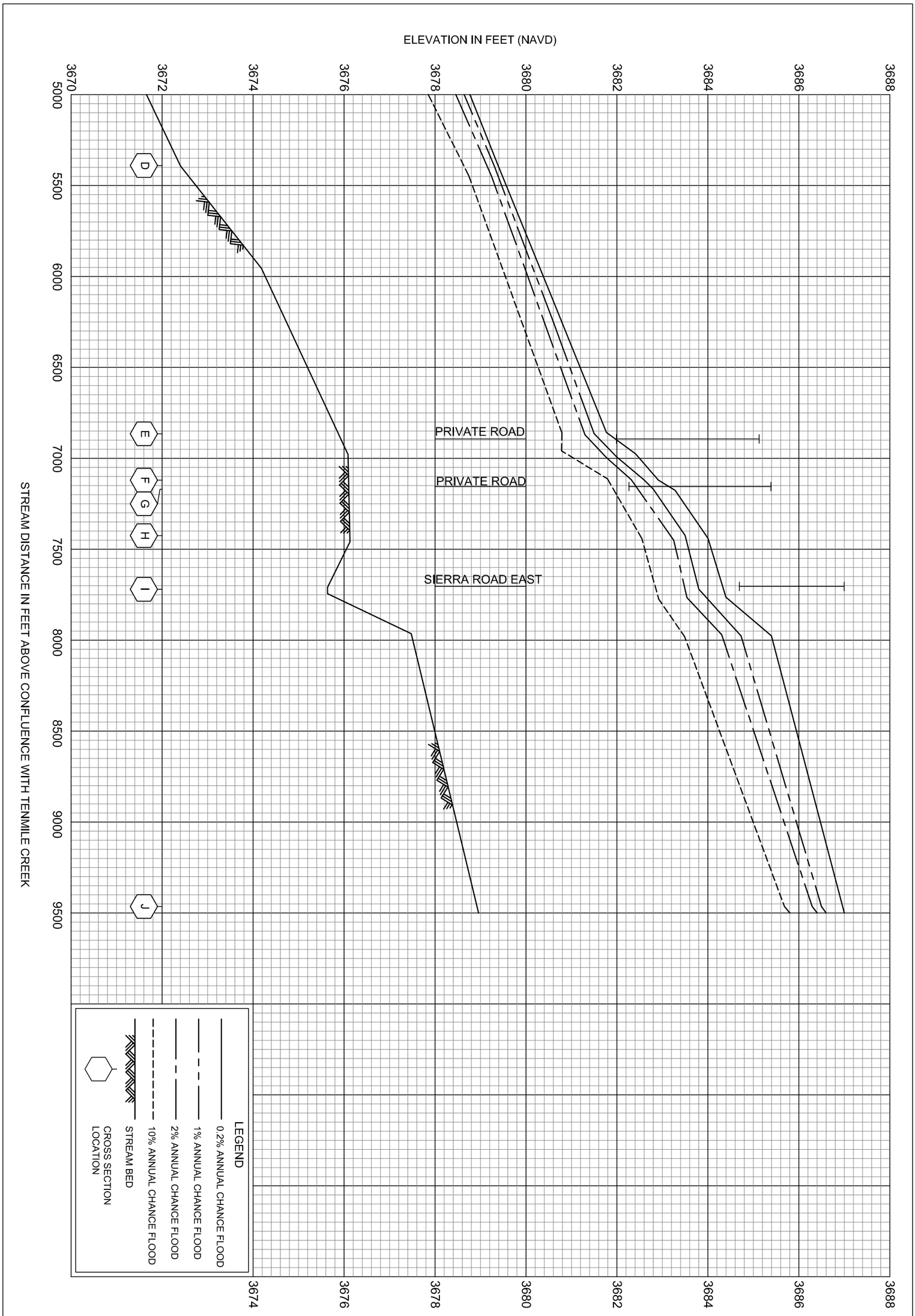
FLOOD PROFILES

PRICKLY PEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS



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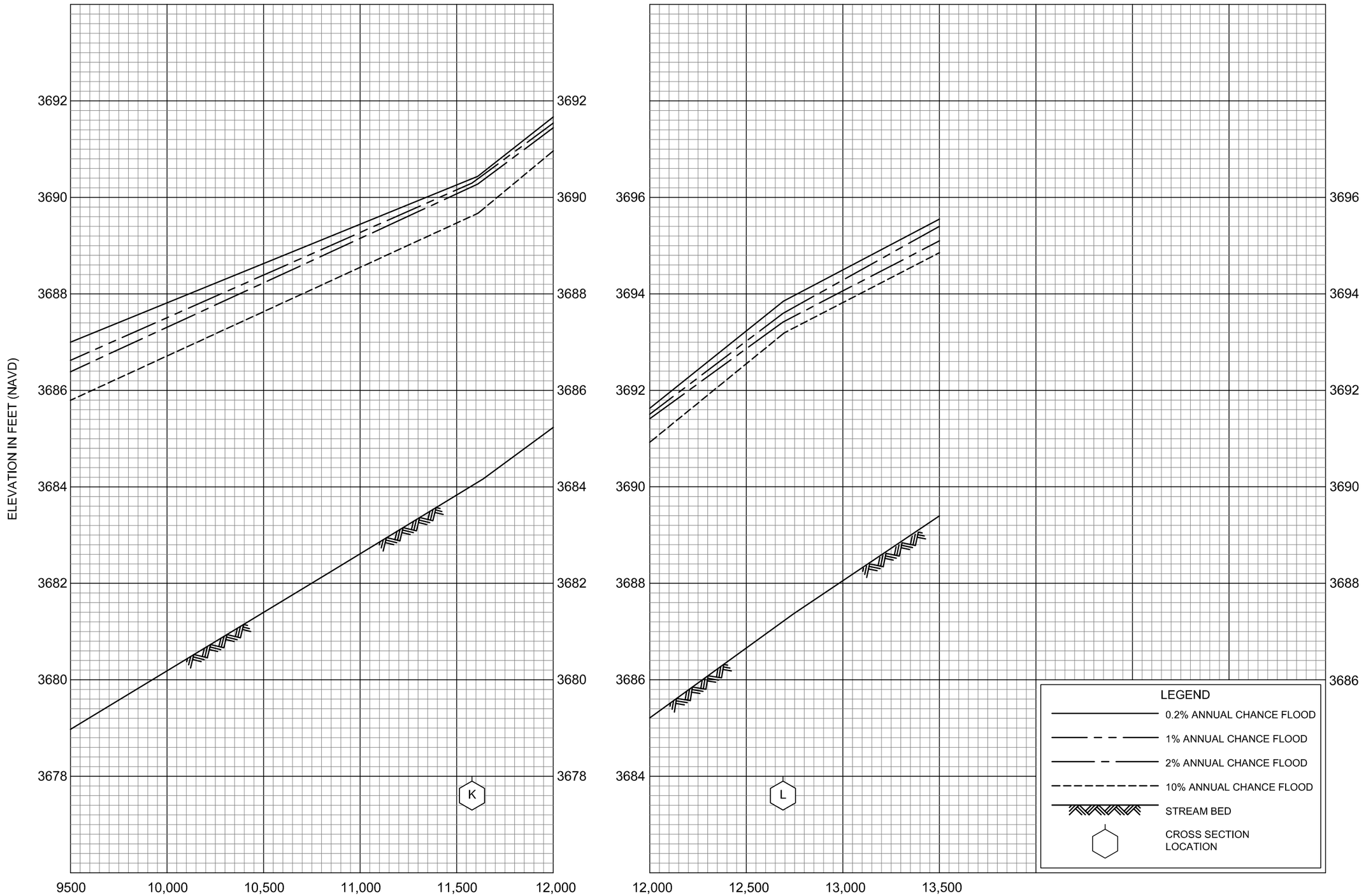
FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

FLOOD PROFILES

PRICKLY PEAR CREEK



FLOOD PROFILES

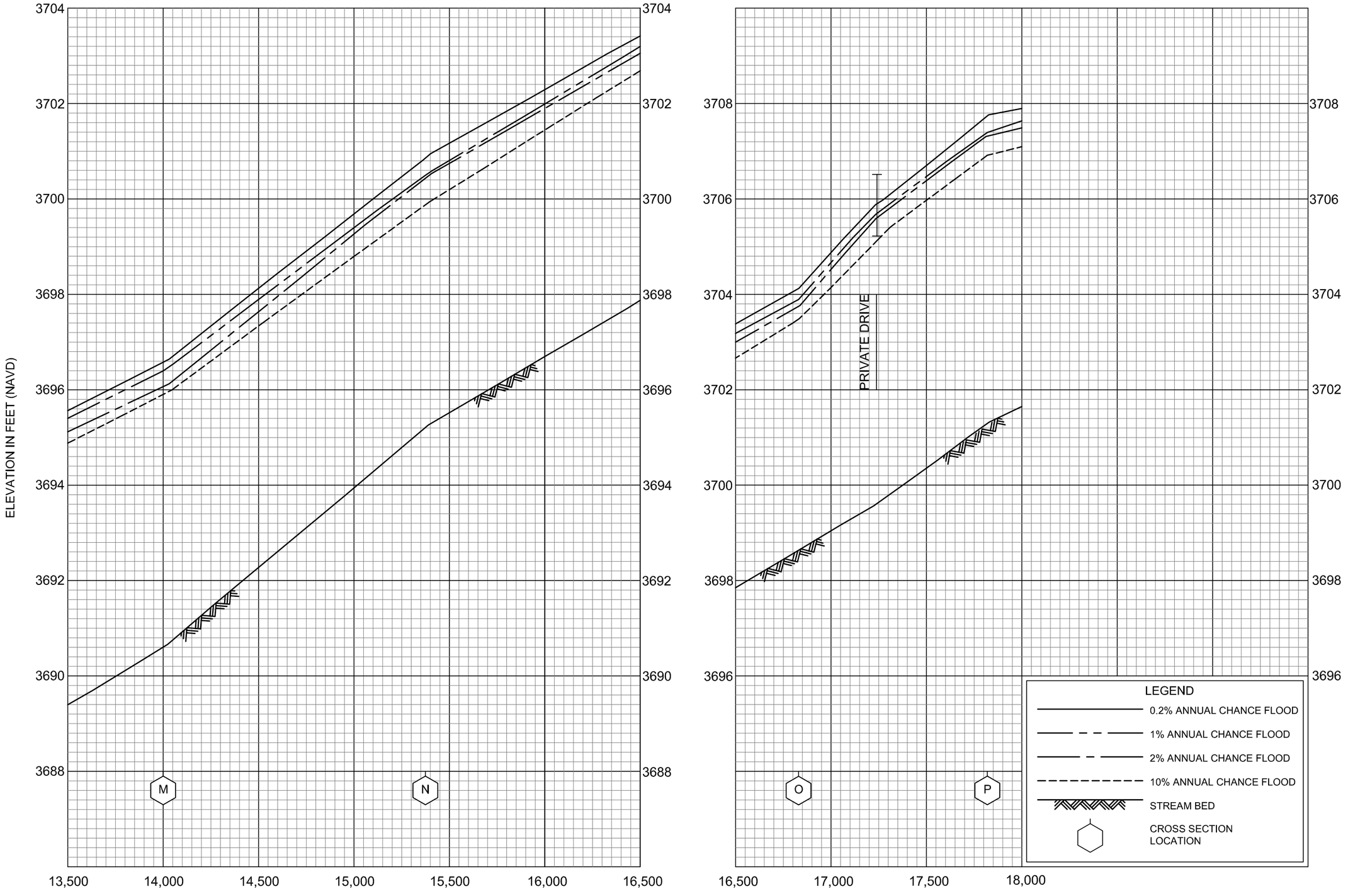
PRICKLY PEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

31P



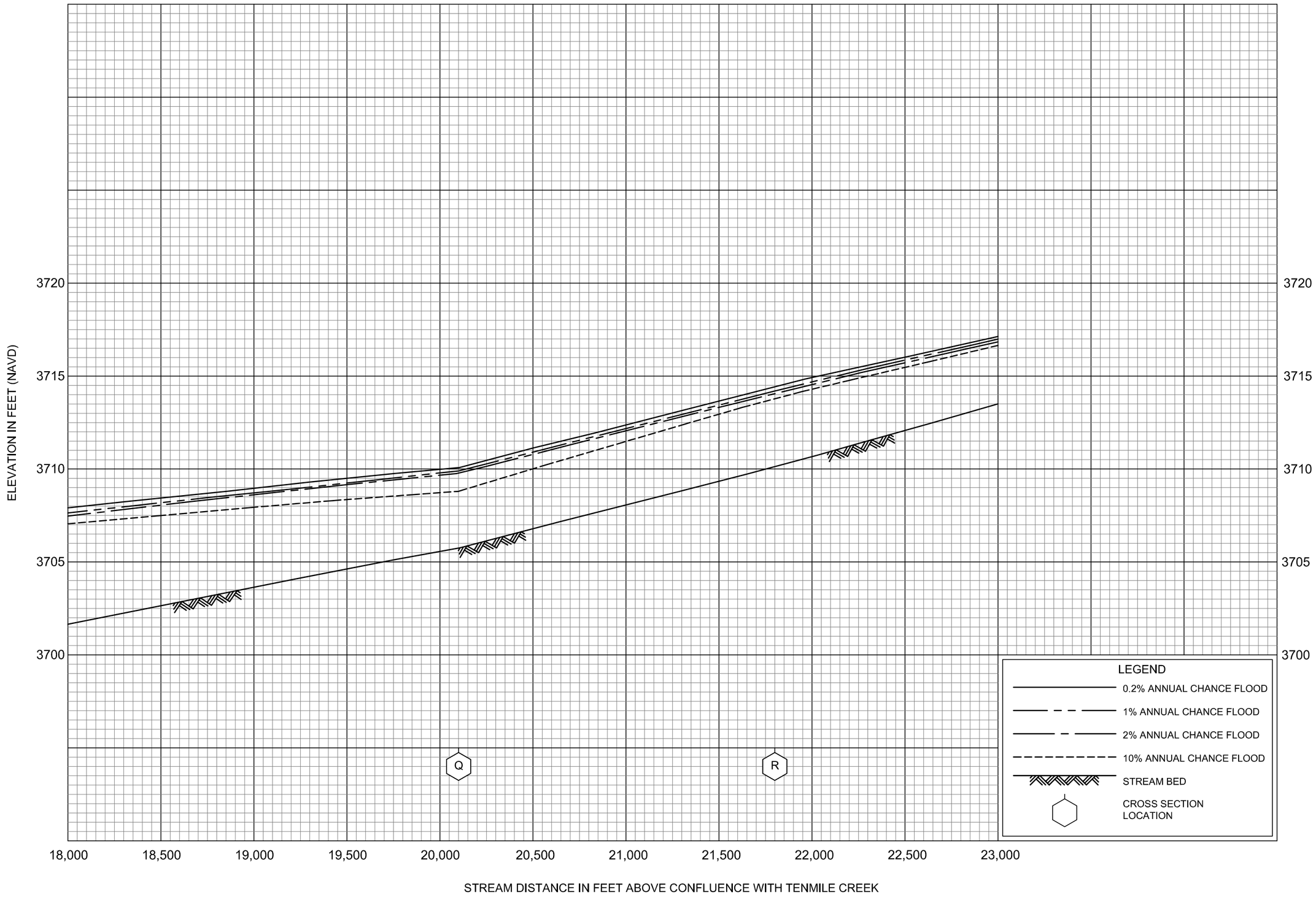
FLOOD PROFILES

PRICKLY PEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS



FLOOD PROFILES

PRICKLY PEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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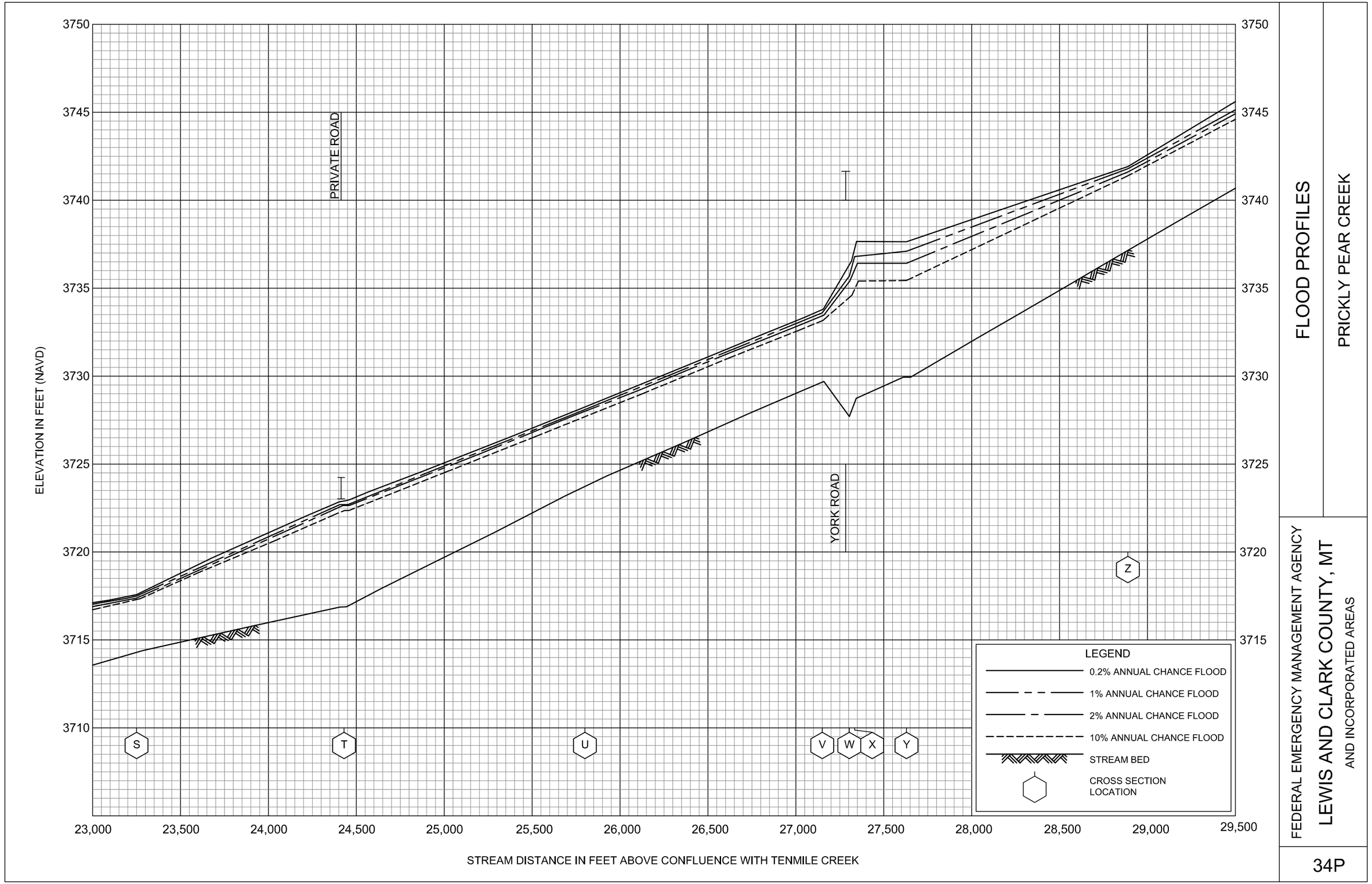

FLOOD PROFILES

PRICKLY PEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

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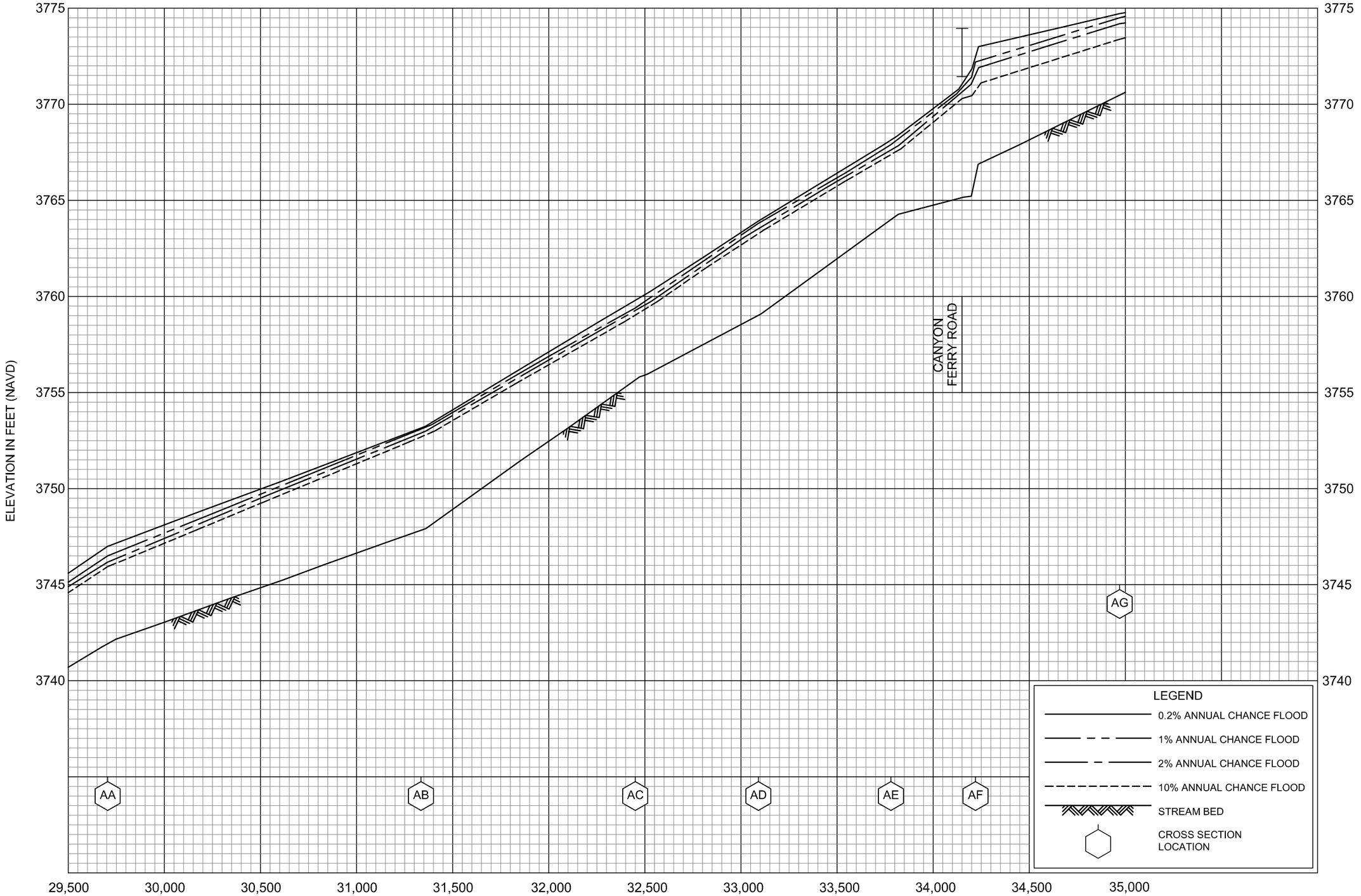

FLOOD PROFILES

PRICKLY PEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

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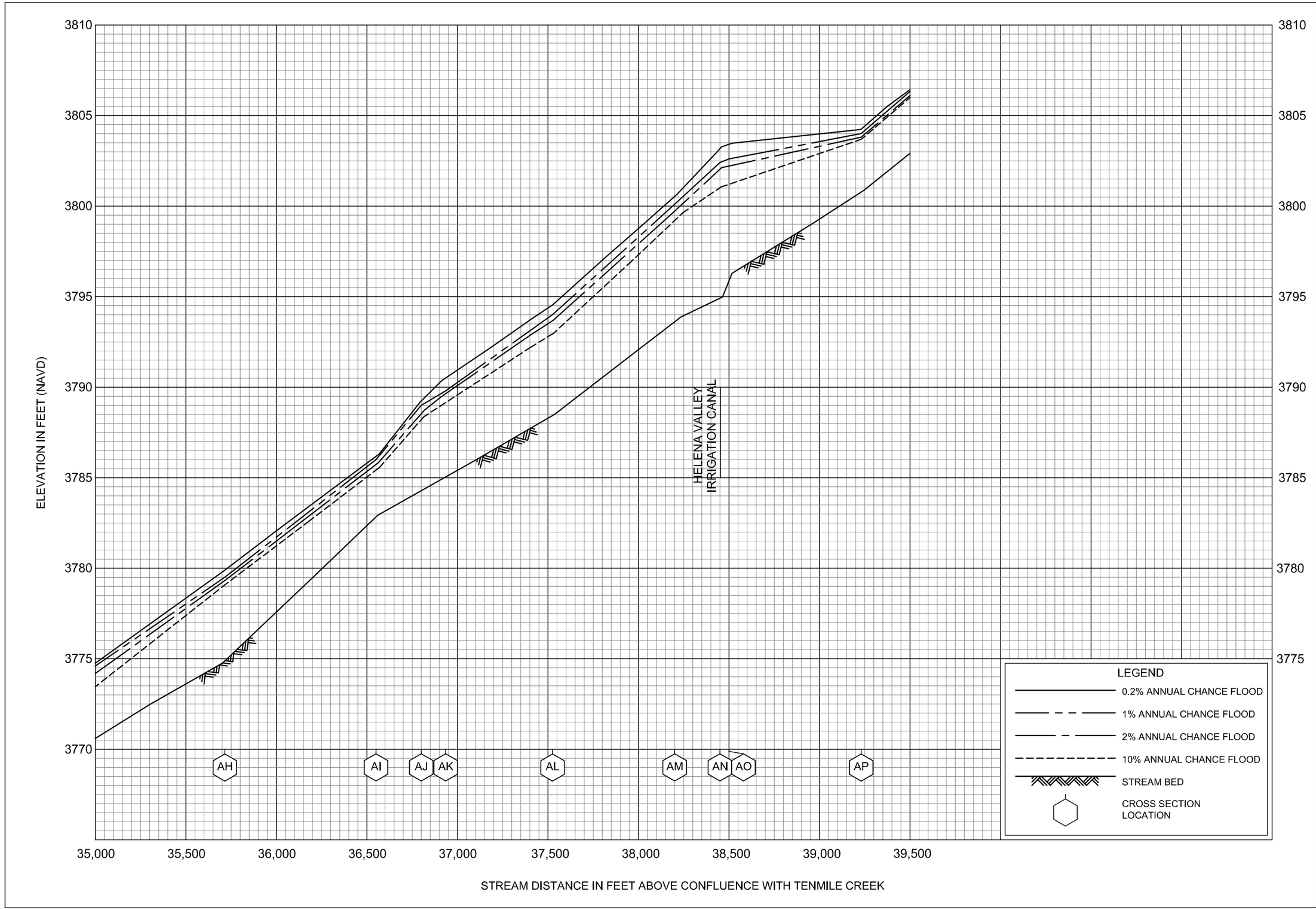


FLOOD PROFILES

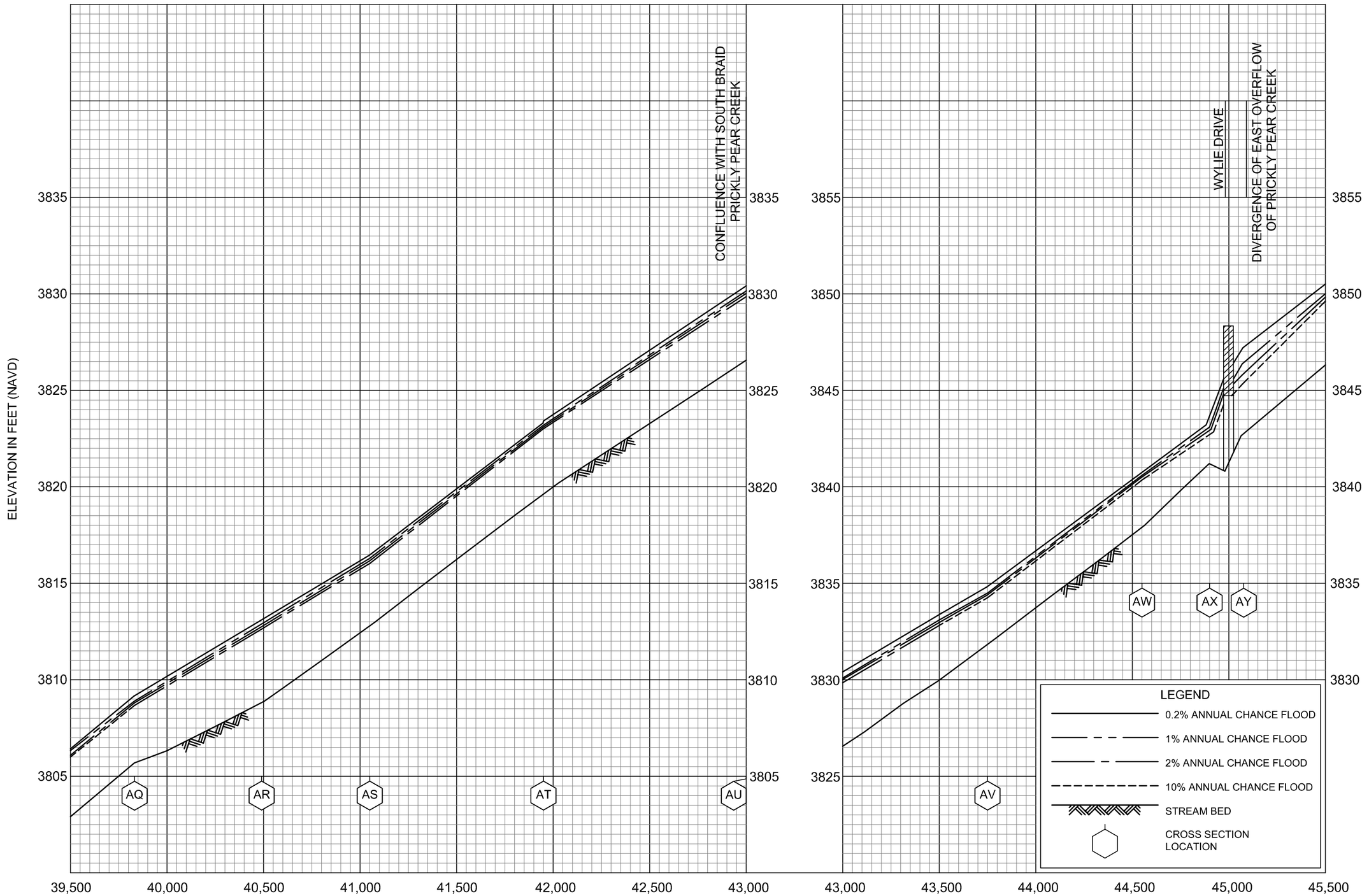
PRICKLY PEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

36P



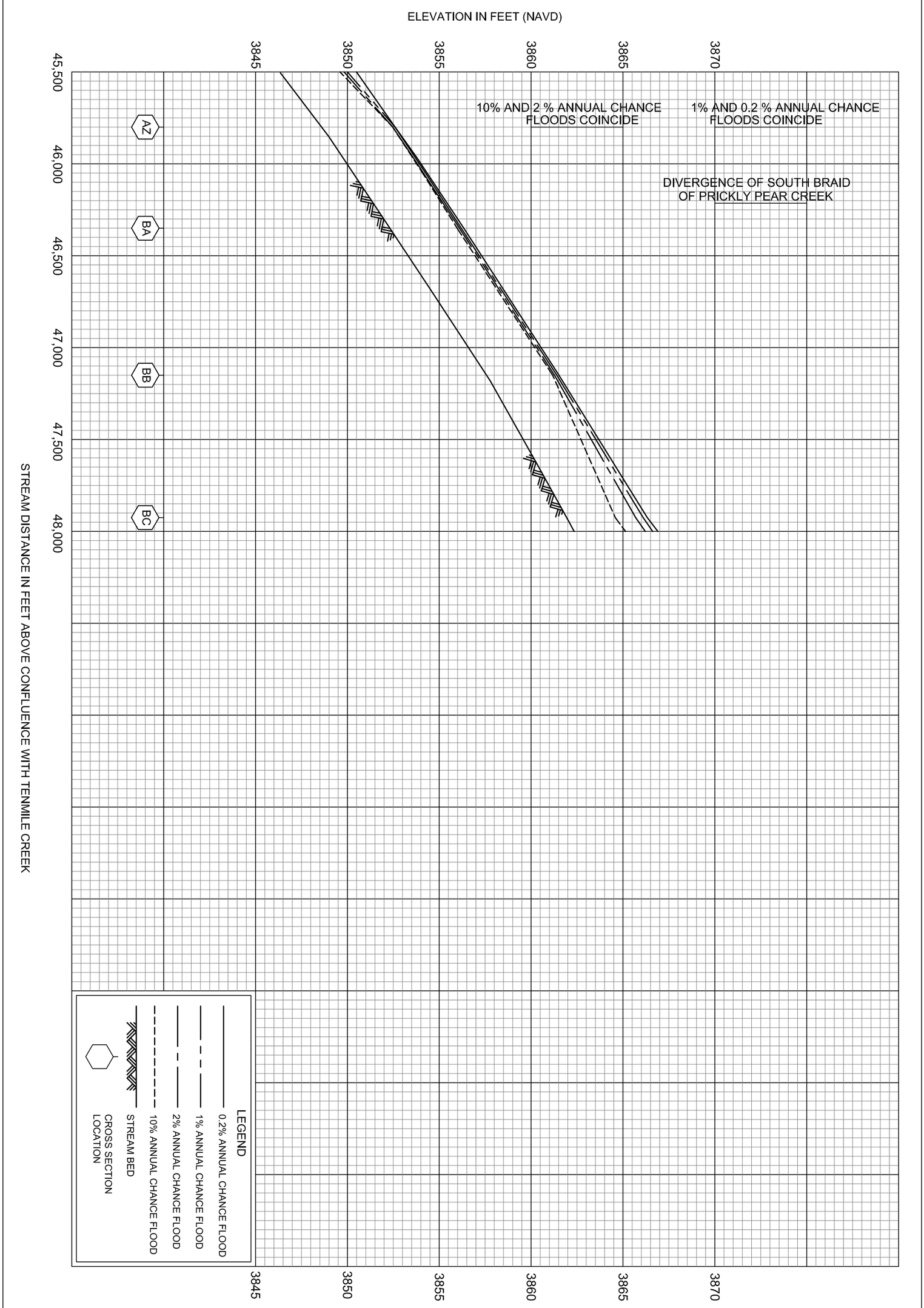
FLOOD PROFILES

PRICKLY PEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS



38P

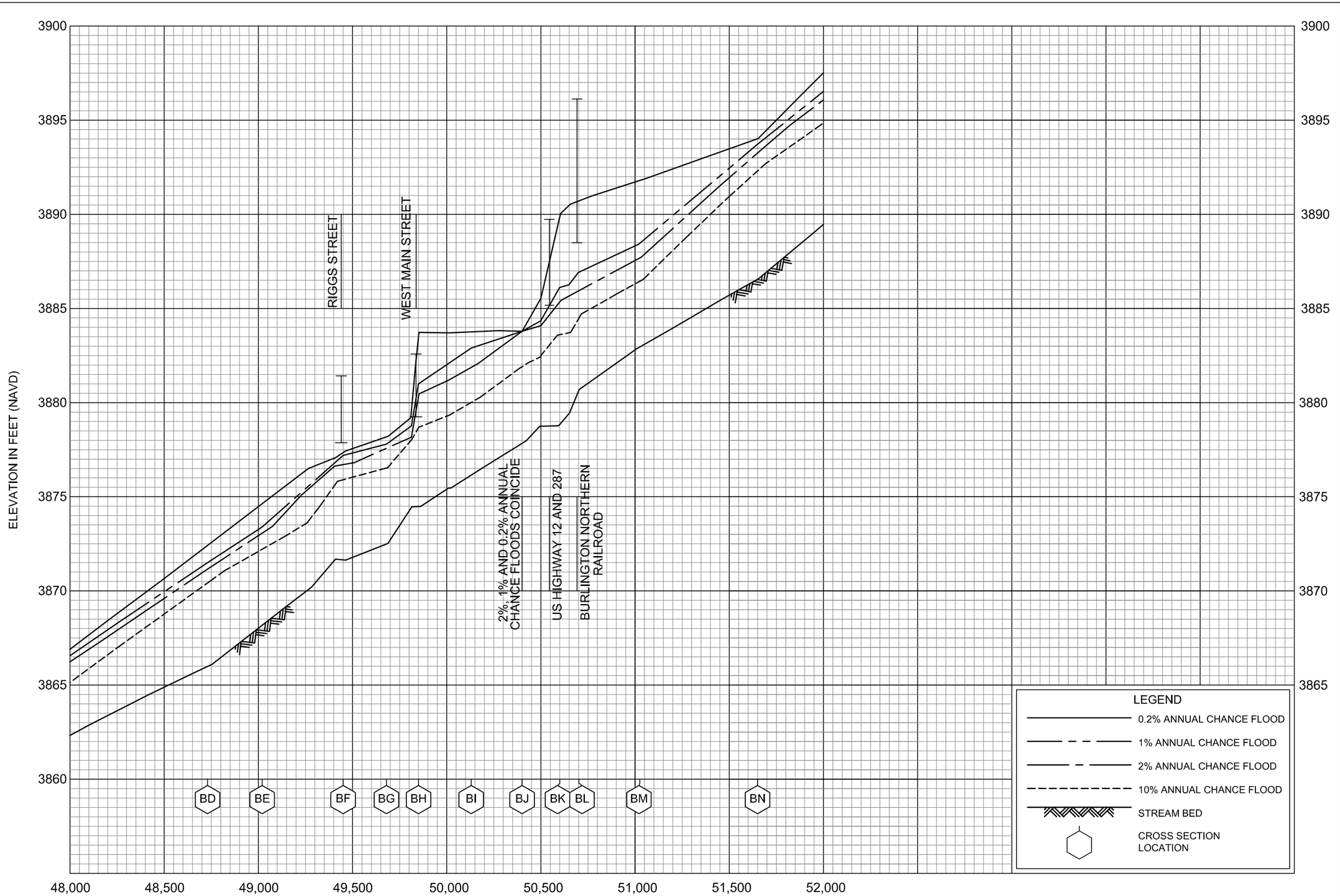
FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

FLOOD PROFILES

PRICKLY PEAR CREEK



FLOOD PROFILES

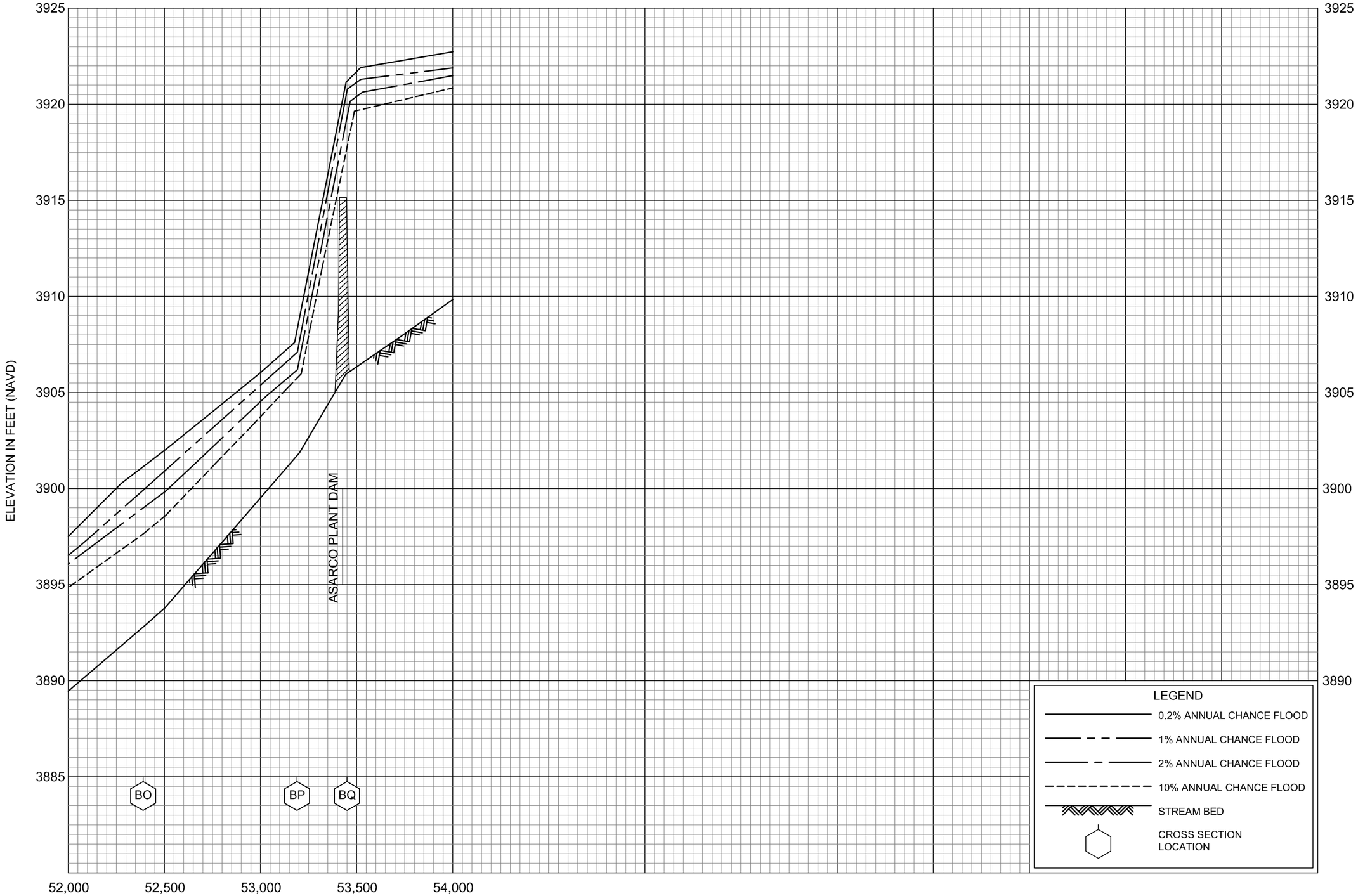
PRICKLY PEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

39P



FLOOD PROFILES

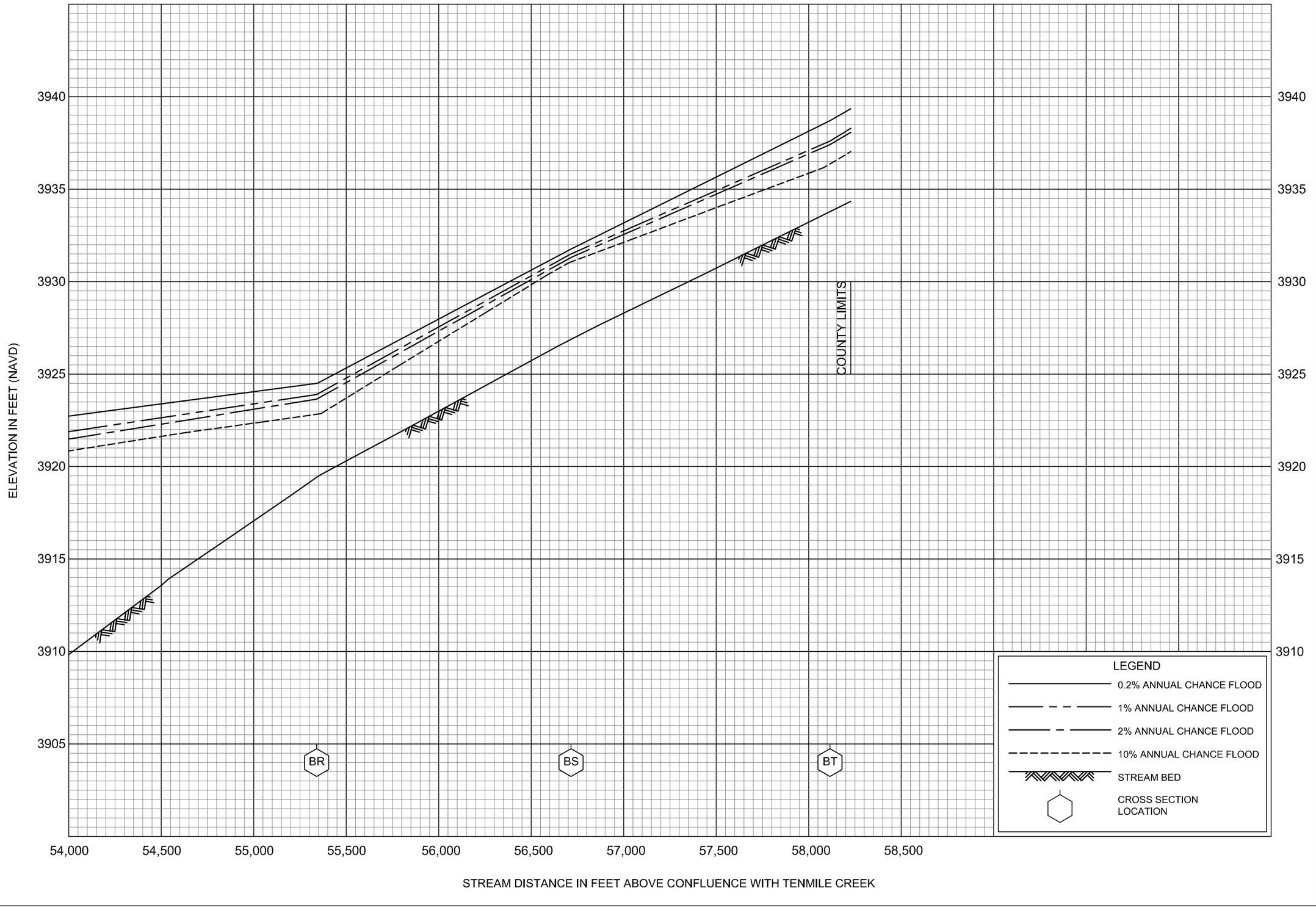
PRICKLY PEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

40P



FLOOD PROFILES

PRICKLY PEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

41P

FLOODING CONTROLLED BY D2 DITCH

FLOODING CONTROLLED BY D2 DITCH

UNNAMED CULVERT

INTERSTATE 15

NOTE: 0.2%, 2%, AND 10% ANNUAL CHANCE FLOOD PROFILES ARE TOO CLOSE TO THE 1% ANNUAL CHANCE FLOOD ELEVATION TO BE SHOWN SEPARATELY

ELEVATION IN FEET (NAVD)

3705
3700
3695
3690
3685

0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300

STREAM DISTANCE IN FEET ABOVE LIMIT OF DETAILED STUDY

A B C

LEGEND

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

FLOOD PROFILES

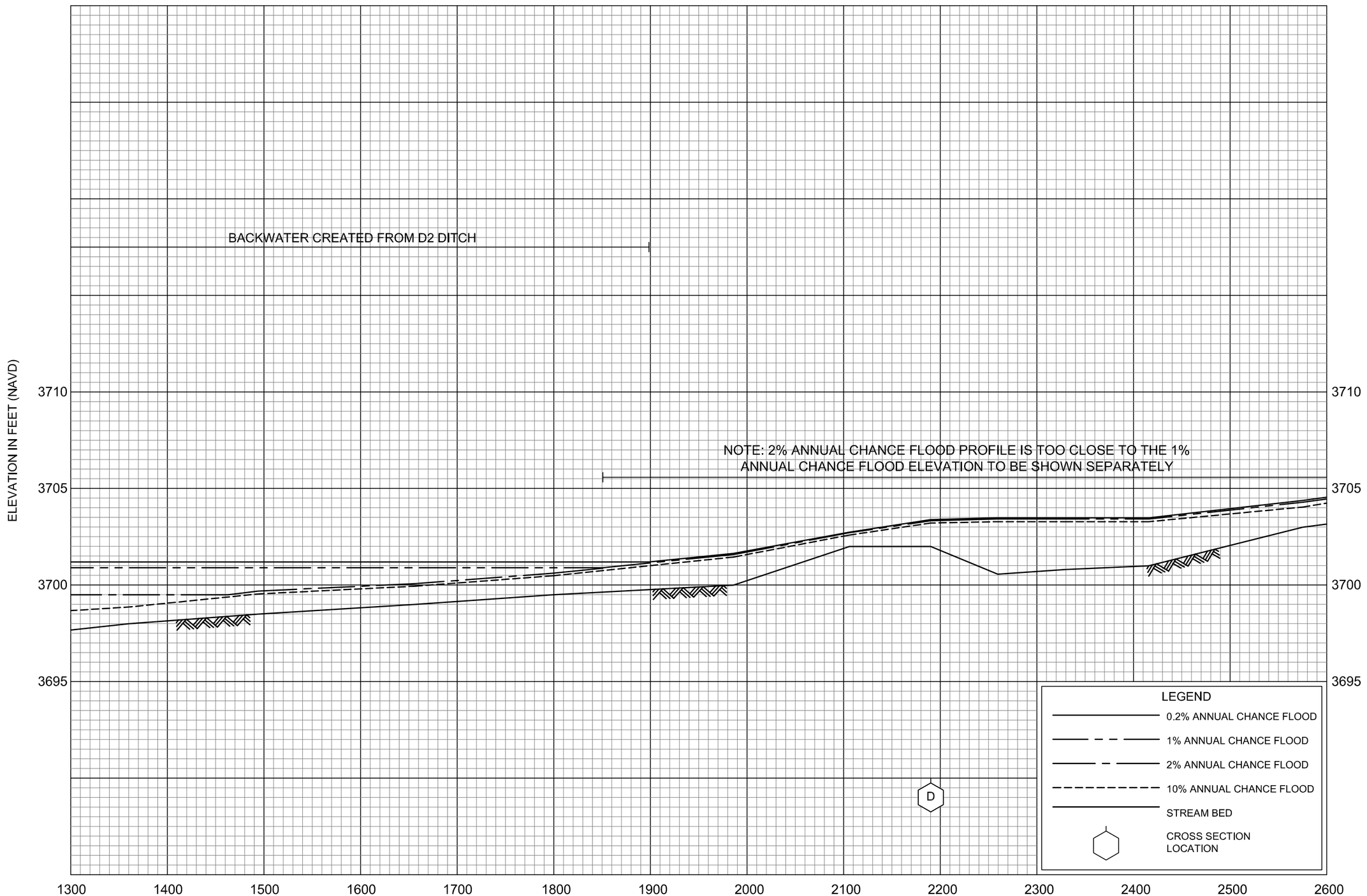
SILVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

42P



FLOOD PROFILES

SILVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

43P

NORTH MONTANA AVENUE

NOTE: 2% ANNUAL CHANCE FLOOD PROFILE IS TOO CLOSE TO THE 1% ANNUAL CHANCE FLOOD ELEVATION TO BE SHOWN SEPARATELY

ELEVATION IN FEET (NAVD)

3720
3715
3710
3705
3700

2600 2700 2800 2900 3000 3100 3200 3300 3400 3500 3600 3700 3800 3900

STREAM DISTANCE IN FEET ABOVE LIMIT OF DETAILED STUDY

E

LEGEND

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

FLOOD PROFILES

SILVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

44P

NOTE: 2% ANNUAL CHANCE FLOOD PROFILE IS TOO CLOSE TO THE 1% ANNUAL CHANCE FLOOD ELEVATION TO BE SHOWN SEPARATELY

ELEVATION IN FEET (NAVD)

3725
3720
3715
3710

3900 4000 4100 4200 4300 4400 4500 4600 4700 4800 4900 5000 5100 5200

STREAM DISTANCE IN FEET ABOVE LIMIT OF DETAILED STUDY

F

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

FLOOD PROFILES

SILVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

45P

NOTE: 2% ANNUAL CHANCE FLOOD PROFILE IS TOO CLOSE TO THE 1% ANNUAL CHANCE FLOOD ELEVATION TO BE SHOWN SEPARATELY

ELEVATION IN FEET (NAVD)

3735
3730
3725
3720

5200 5300 5400 5500 5600 5700 5800 5900 6000 6100 6200 6300 6400 6500

STREAM DISTANCE IN FEET ABOVE LIMIT OF DETAILED STUDY

G

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

FLOOD PROFILES

SILVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

46P

NOTE: 2% ANNUAL CHANCE FLOOD PROFILE IS TOO CLOSE TO THE 1% ANNUAL CHANCE FLOOD ELEVATION TO BE SHOWN SEPARATELY

ELEVATION IN FEET (NAVD)

3745
3740
3735
3730

6500 6600 6700 6800 6900 7000 7100 7200 7300 7400 7500 7600 7700 7800

STREAM DISTANCE IN FEET ABOVE LIMIT OF DETAILED STUDY

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

FLOOD PROFILES

SILVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

47P

NOTE: 2% ANNUAL CHANCE FLOOD PROFILE IS TOO CLOSE TO THE 1% ANNUAL CHANCE FLOOD ELEVATION TO BE SHOWN SEPARATELY

ELEVATION IN FEET (NAVD)

3760
3755
3750
3745
3740

7800 7900 8000 8100 8200 8300 8400 8500 8600 8700 8800 8900 9000 9100

STREAM DISTANCE IN FEET ABOVE LIMIT OF DETAILED STUDY

H

LEGEND

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

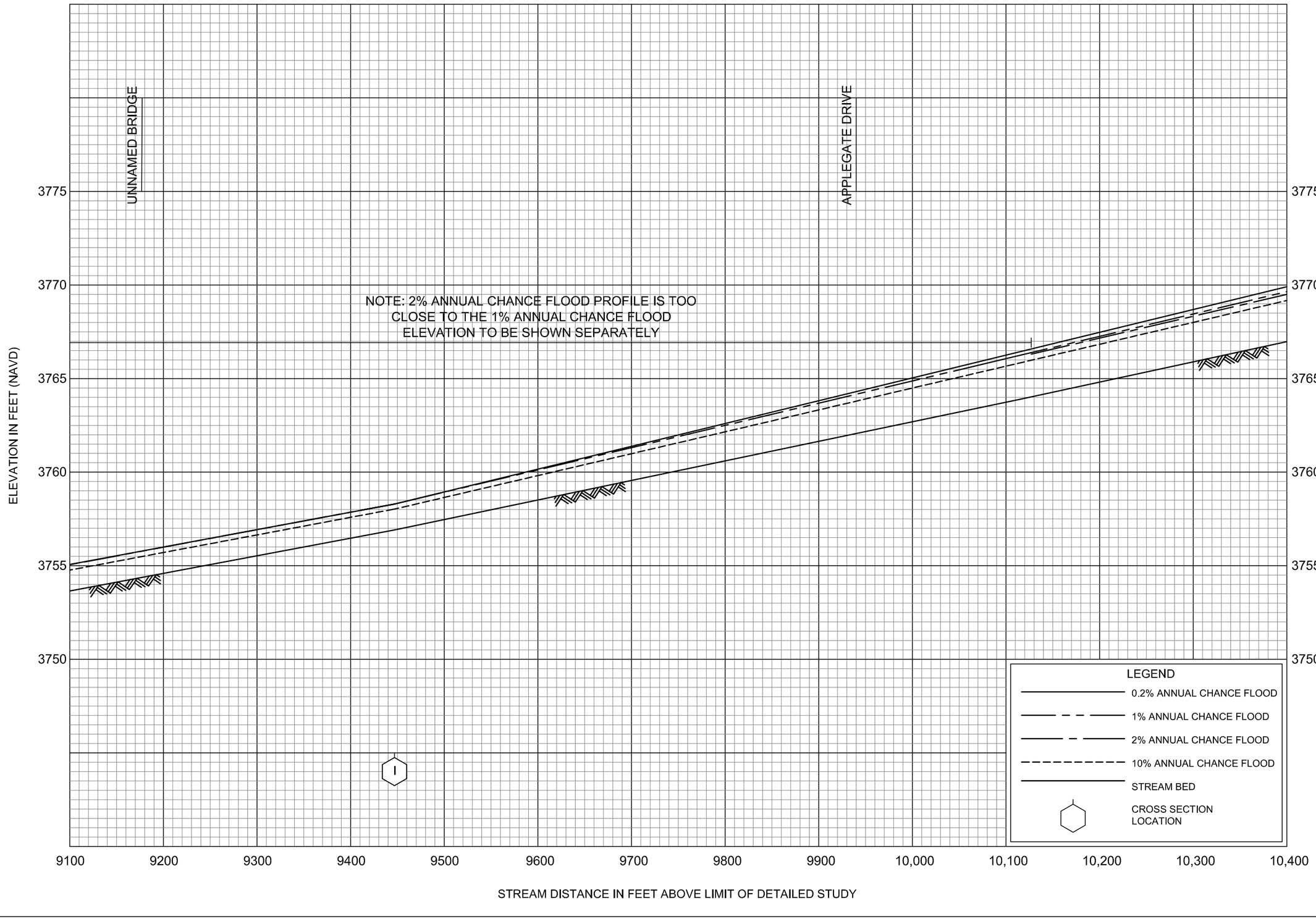
FLOOD PROFILES

SILVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS



FLOOD PROFILES

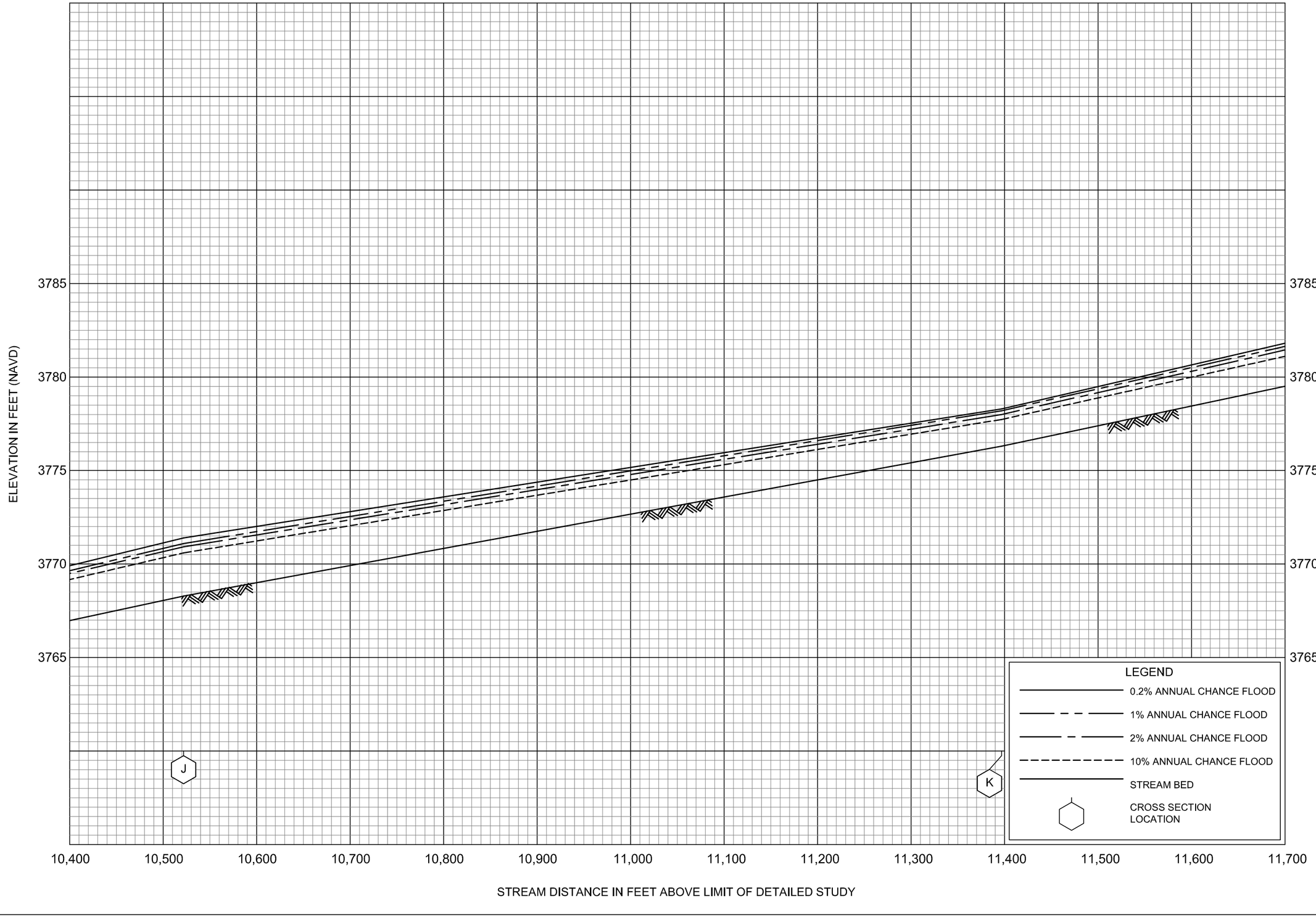
SILVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

49P



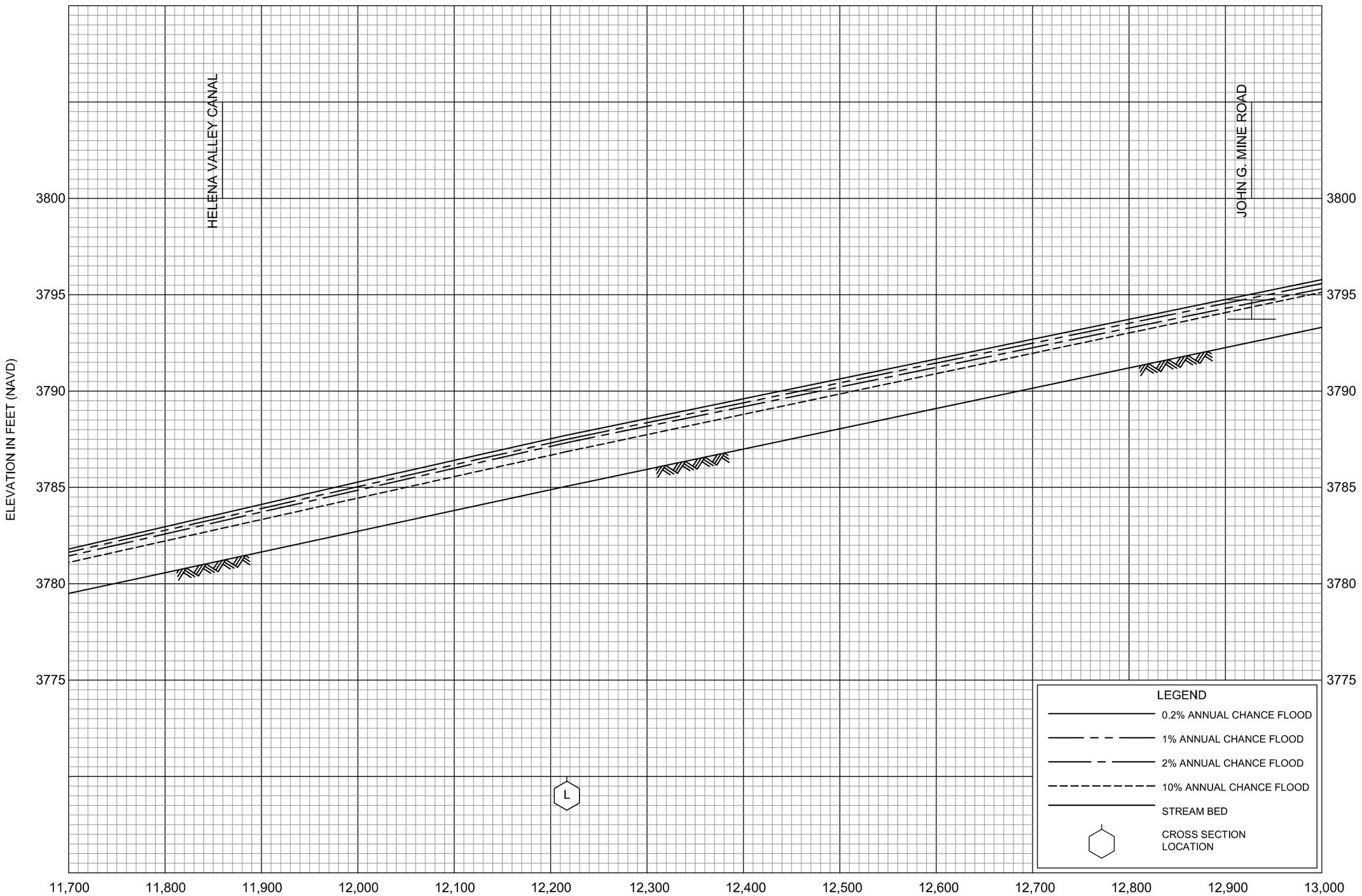
FLOOD PROFILES

SILVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS



FLOOD PROFILES

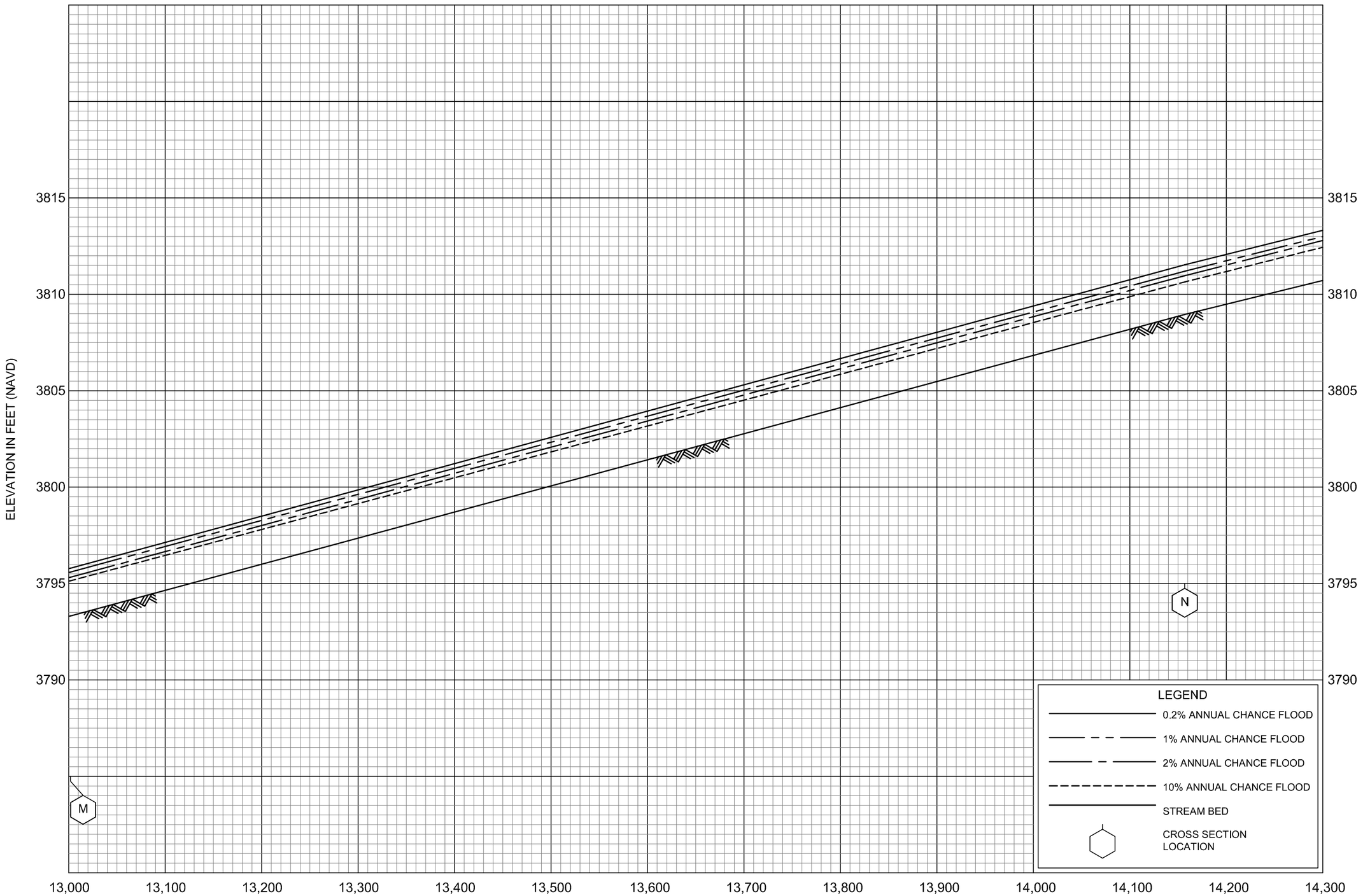
SILVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

51P



FLOOD PROFILES

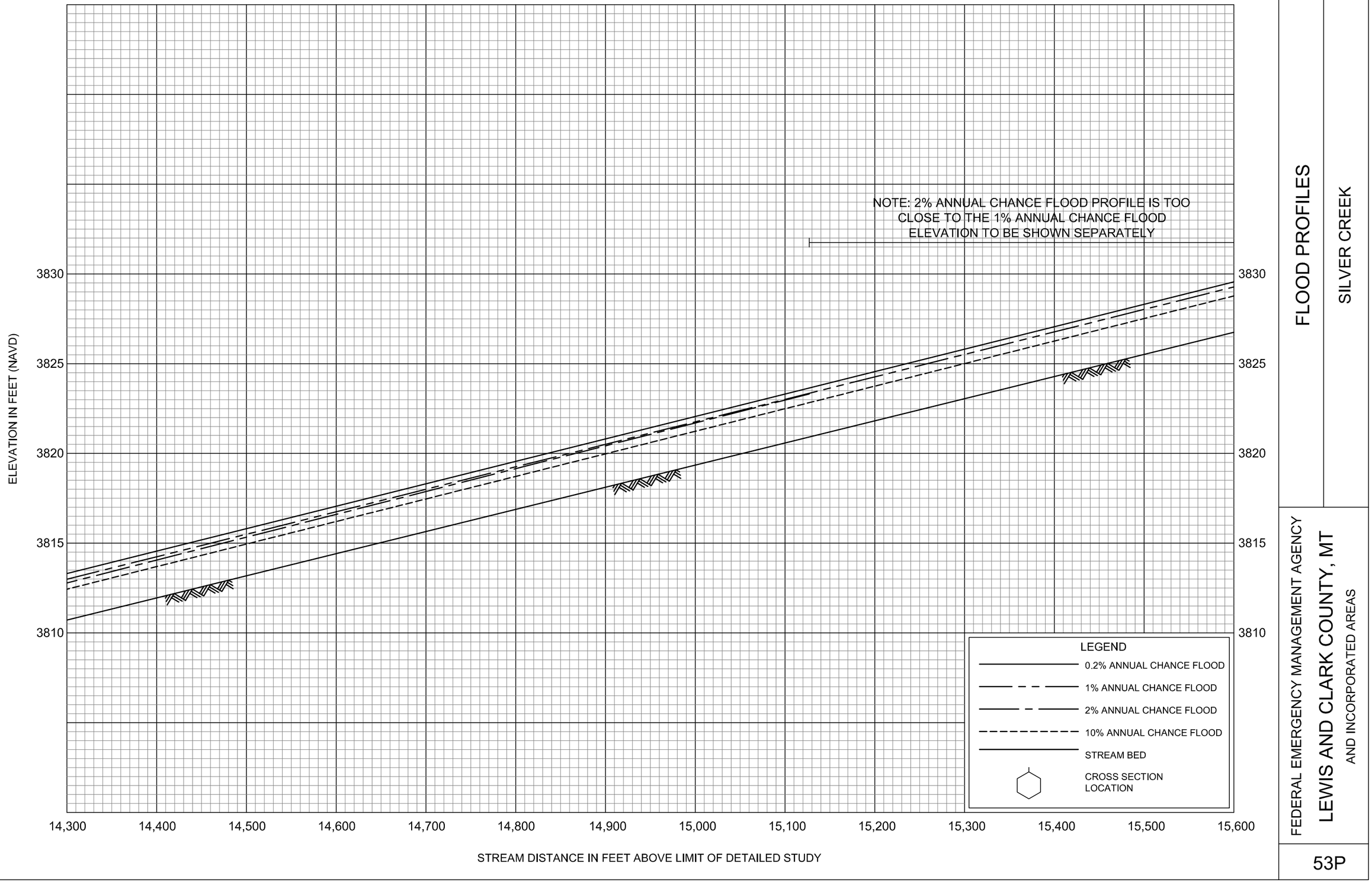
SILVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

52P



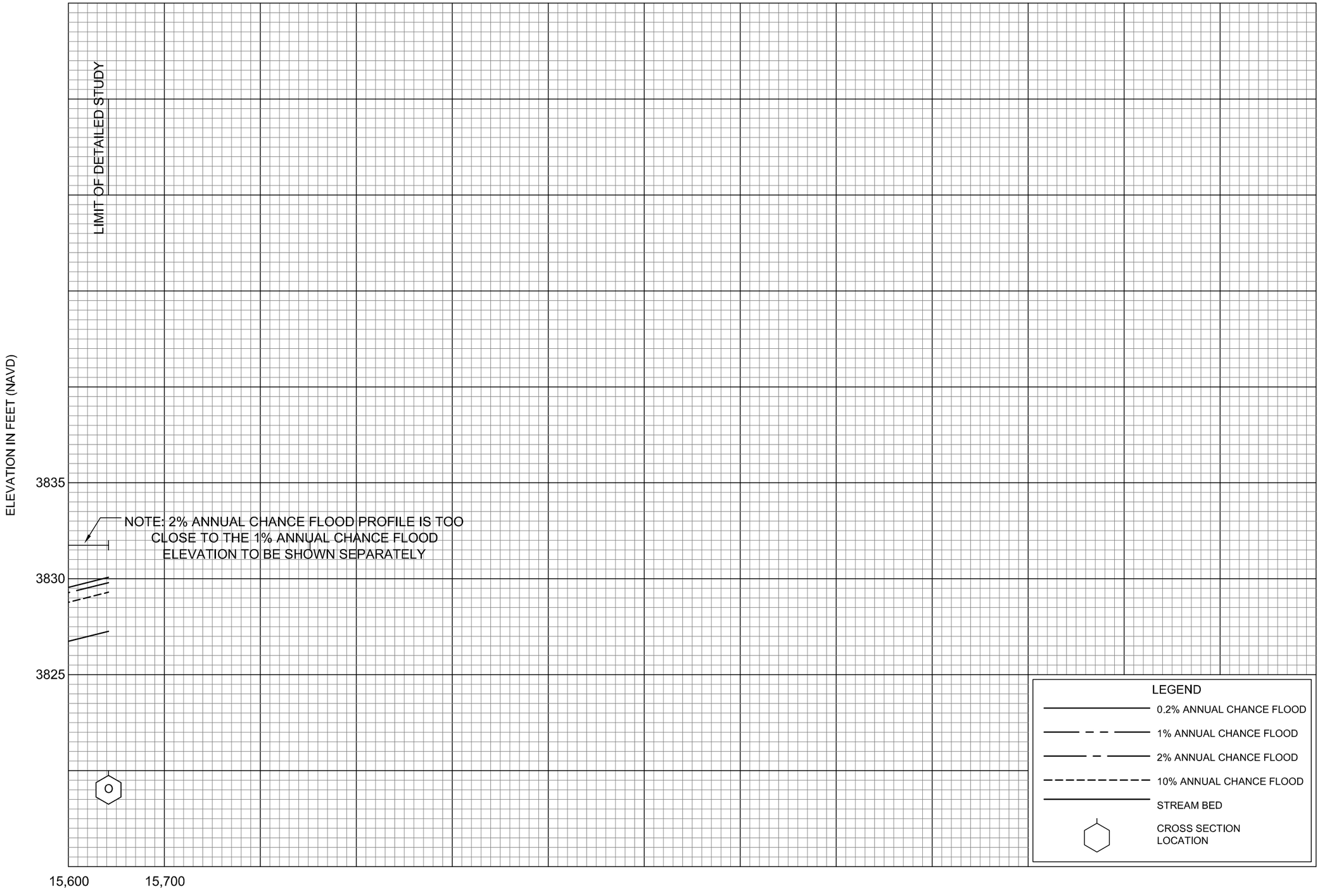
FLOOD PROFILES

SILVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS



FLOOD PROFILES

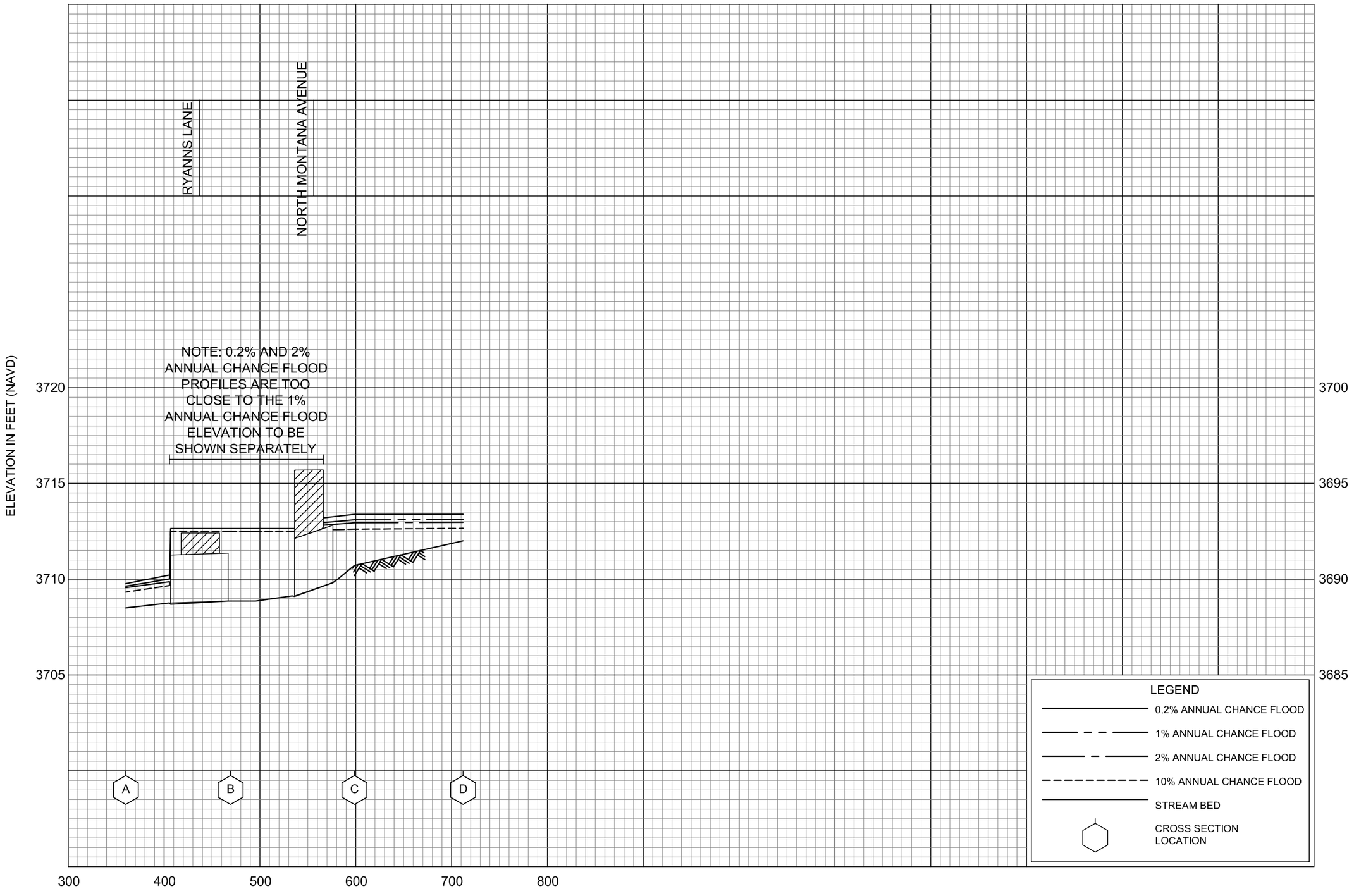
SILVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

54P



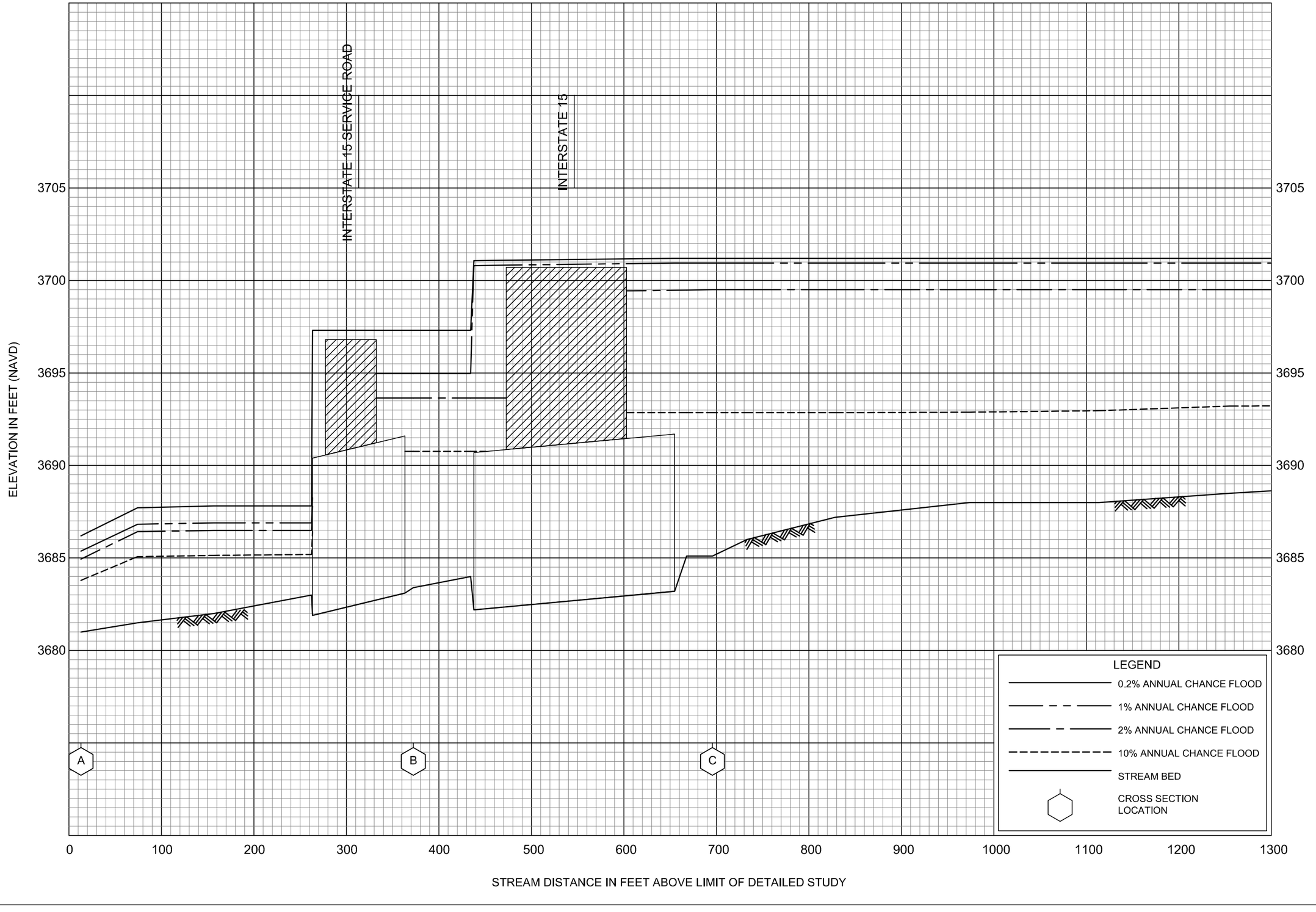
FLOOD PROFILES

SILVER CREEK OVERFLOW (RYANNS LANE)

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS



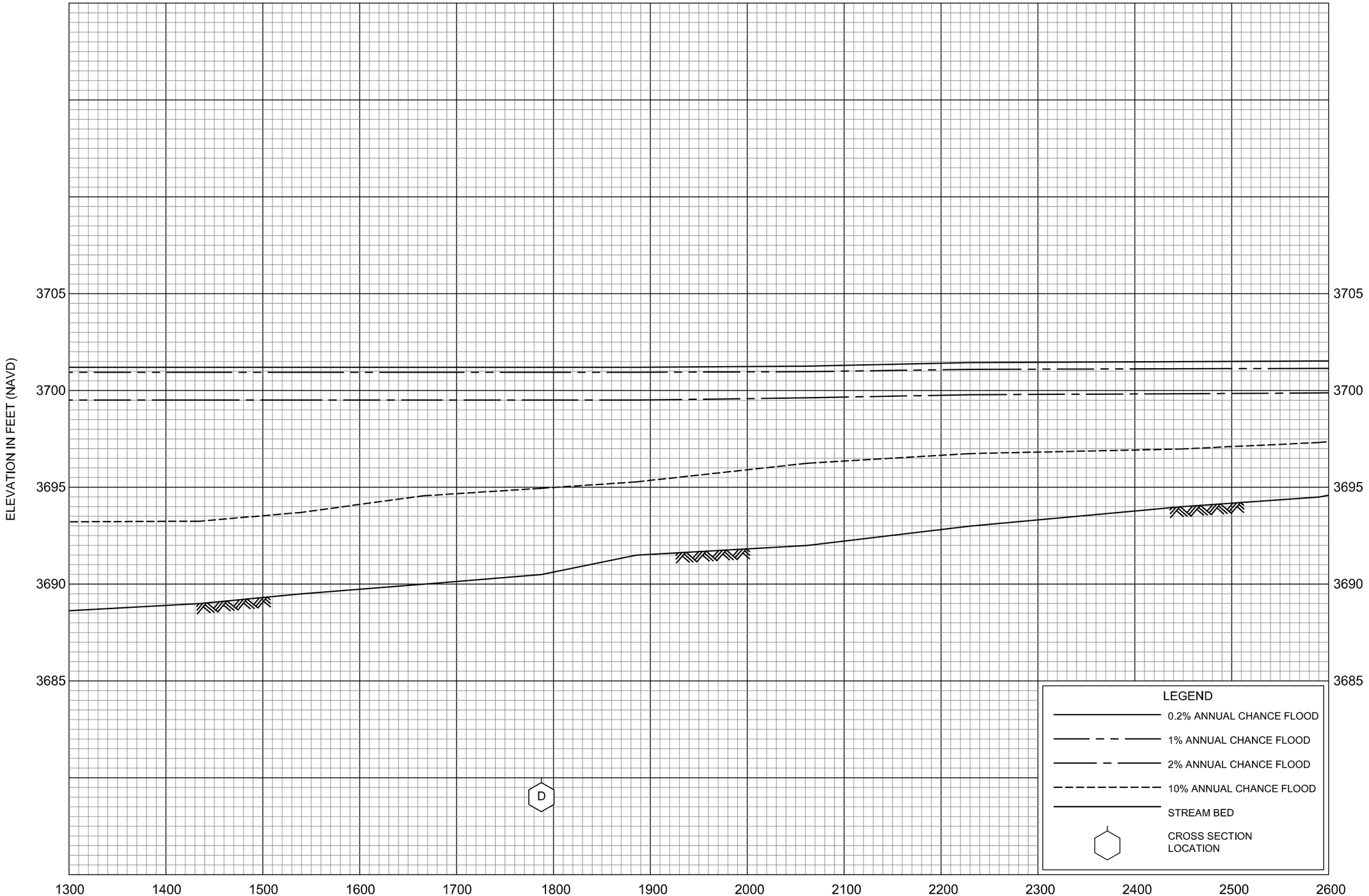
FLOOD PROFILES

SILVER CREEK OVERFLOW (D2 DITCH)

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS



FLOOD PROFILES

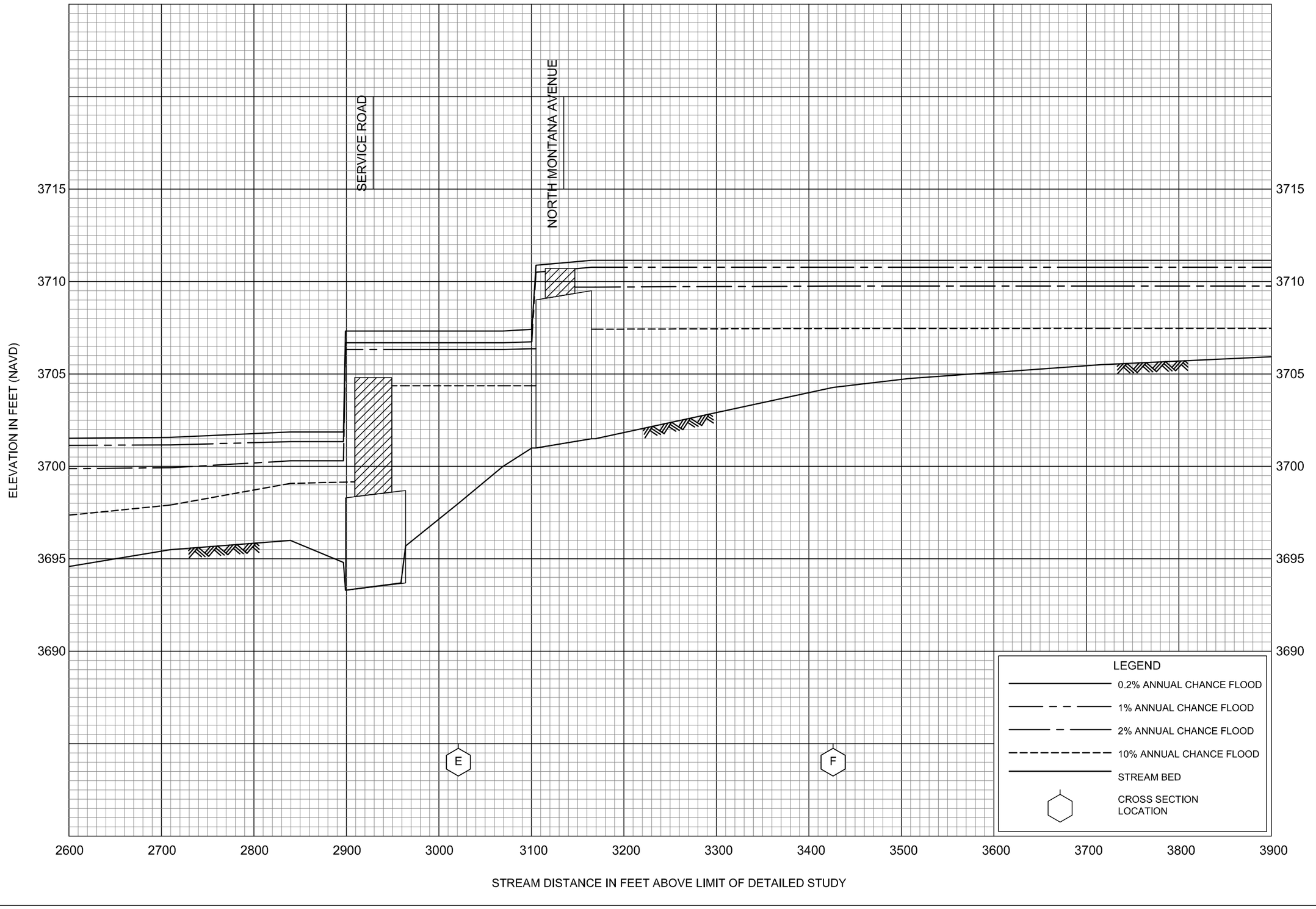
SILVER CREEK OVERFLOW (D2 DITCH)

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

57P



FLOOD PROFILES

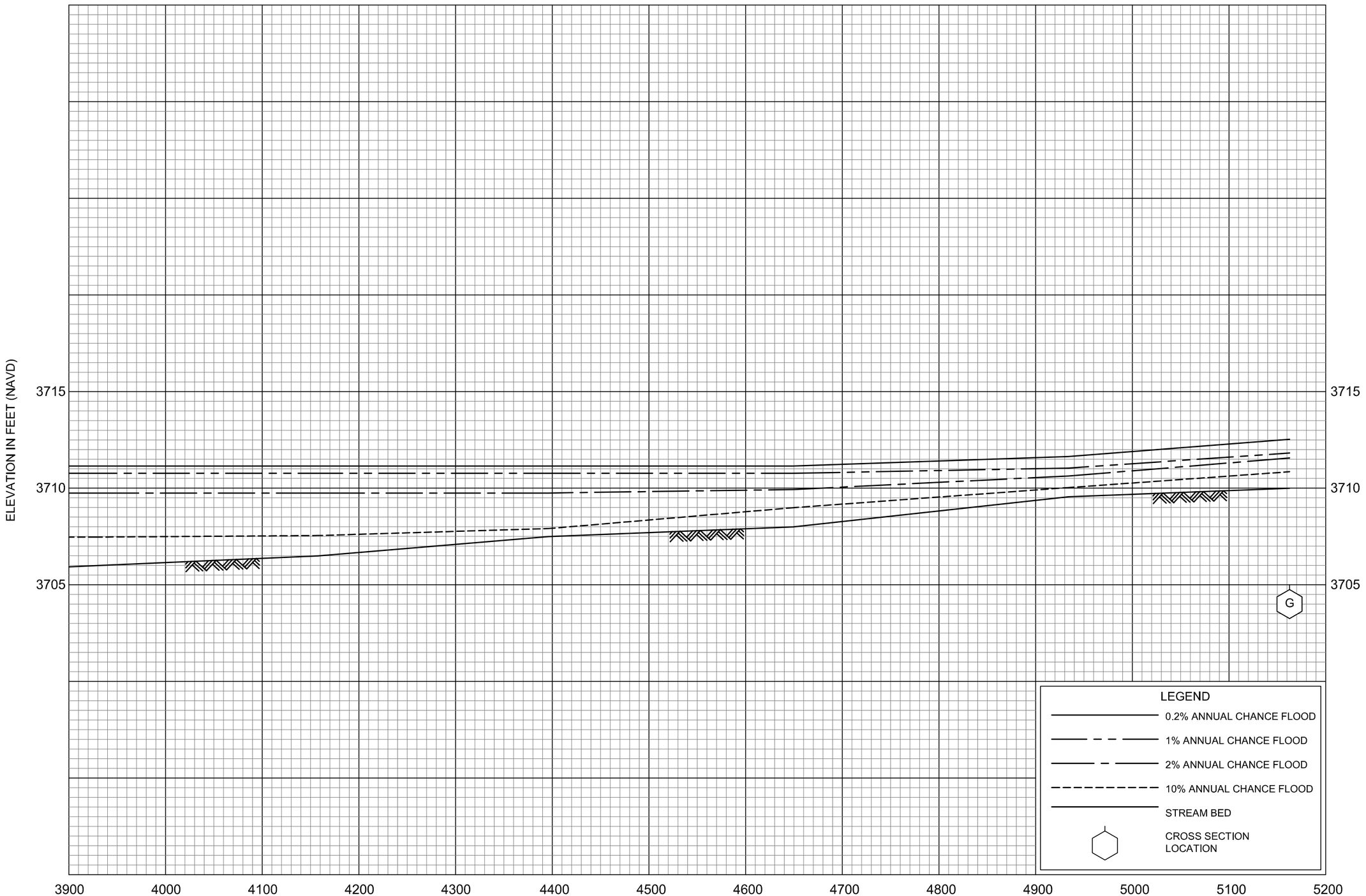
SILVER CREEK OVERFLOW (D2 DITCH)

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

58P



FLOOD PROFILES

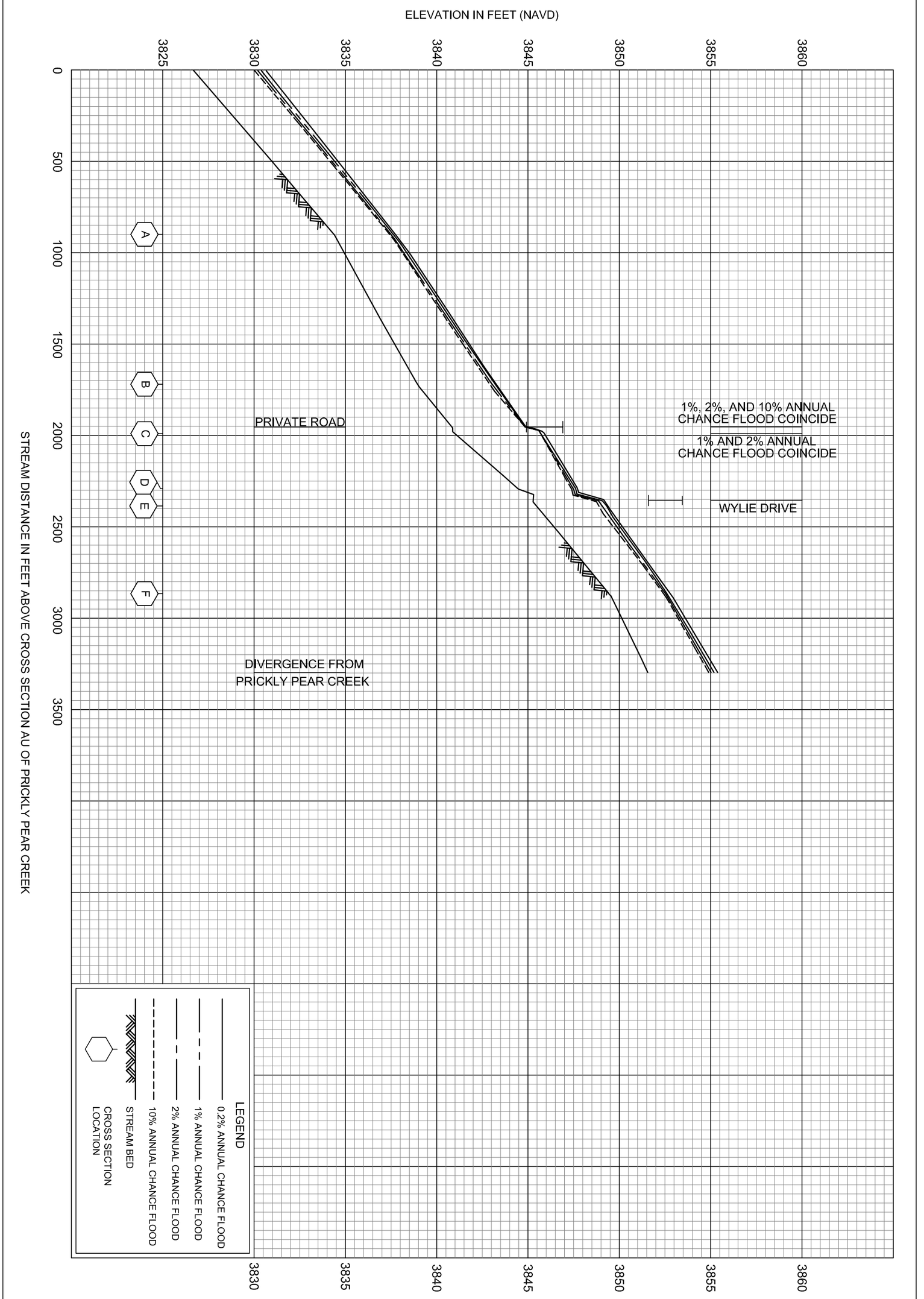
SILVER CREEK OVERFLOW (D2 DITCH)

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

59P



60P

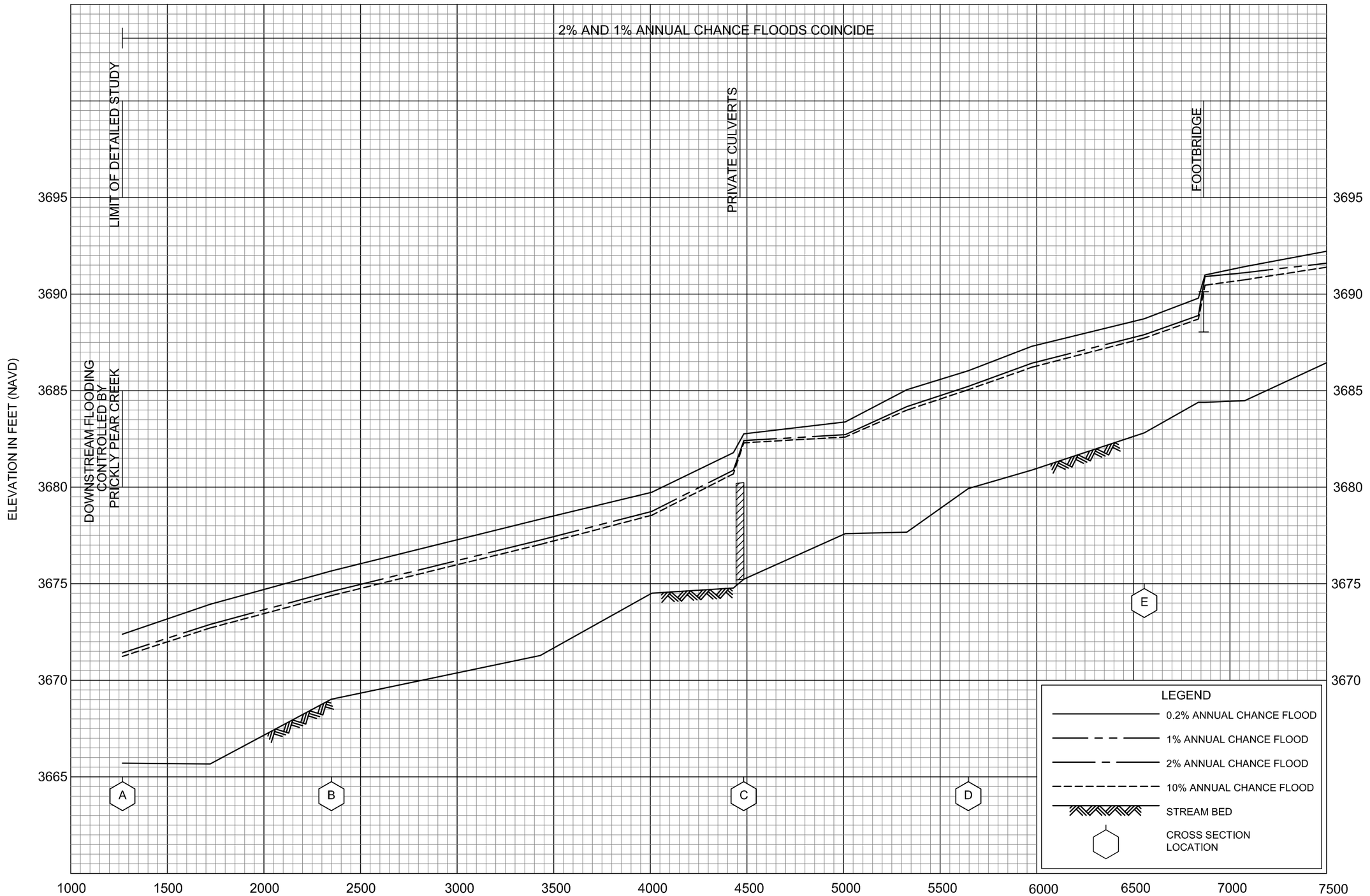
FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

FLOOD PROFILES

SOUTH BRAID OF PRICKLY PEAR CREEK



FLOOD PROFILES

TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

61P

2% AND 1% ANNUAL CHANCE FLOODS COINCIDE

EAST SIERRA ROAD

ELEVATION IN FEET (NAVD)

3720
3715
3710
3705
3700
3695
3690
3685

F G H I J K

7500 8000 8500 9000 9500 10,000 10,500 11,000 11,500 12,000 12,500 13,000 13,500 14,000

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH PRICKLY PEAR CREEK

LEGEND

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

FLOOD PROFILES

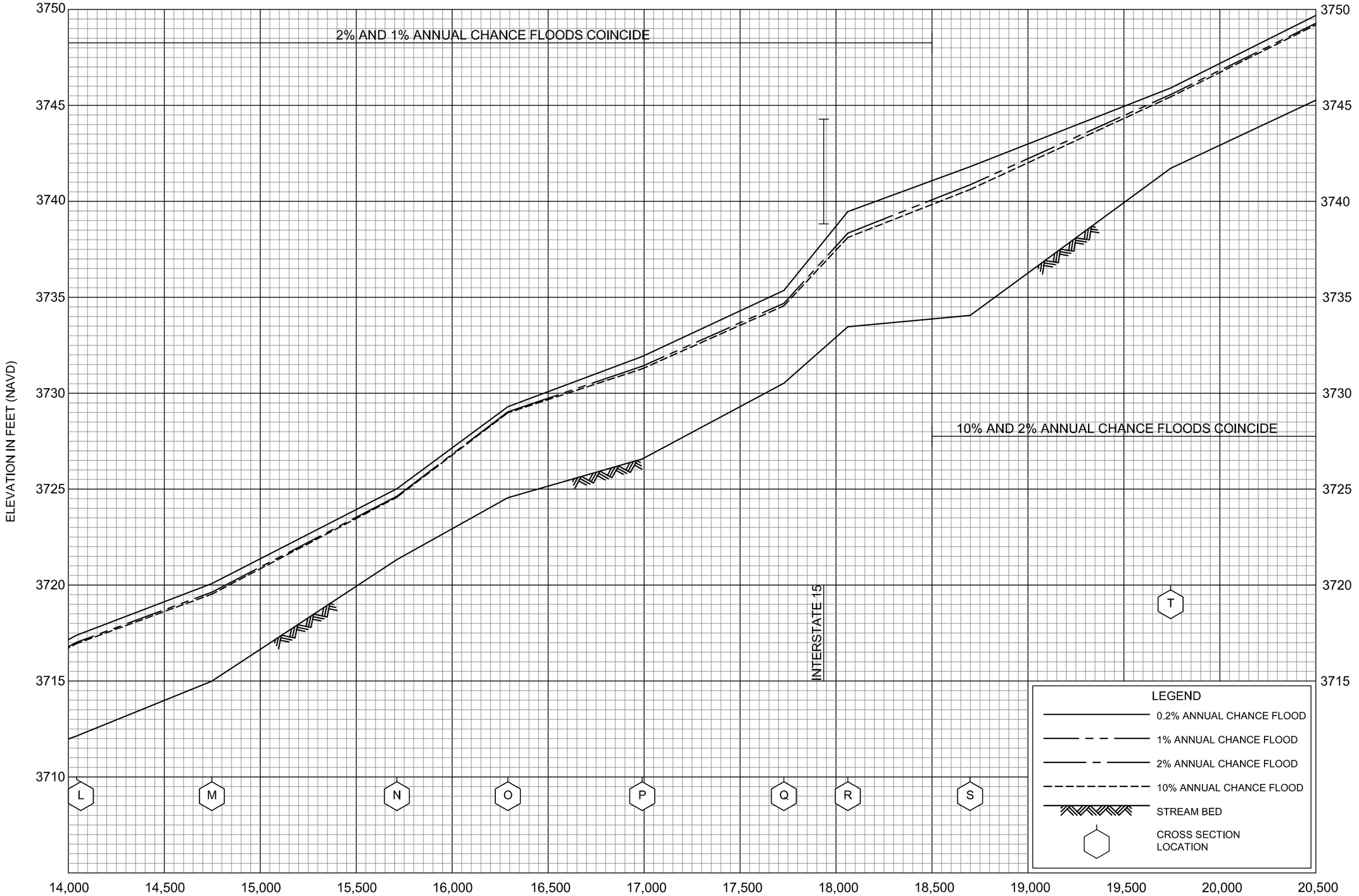
TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

62P



FLOOD PROFILES

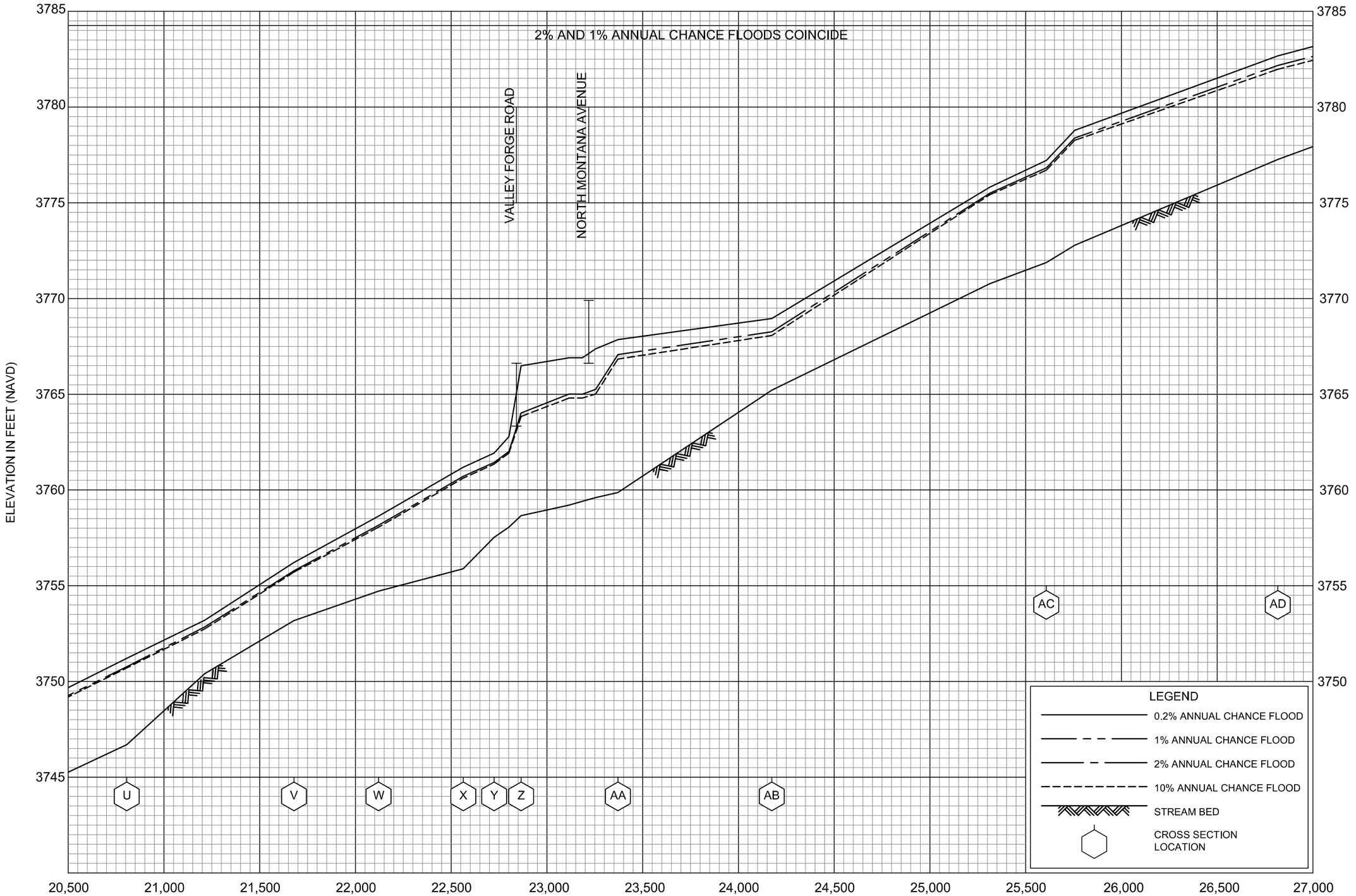
TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

63P



FLOOD PROFILES

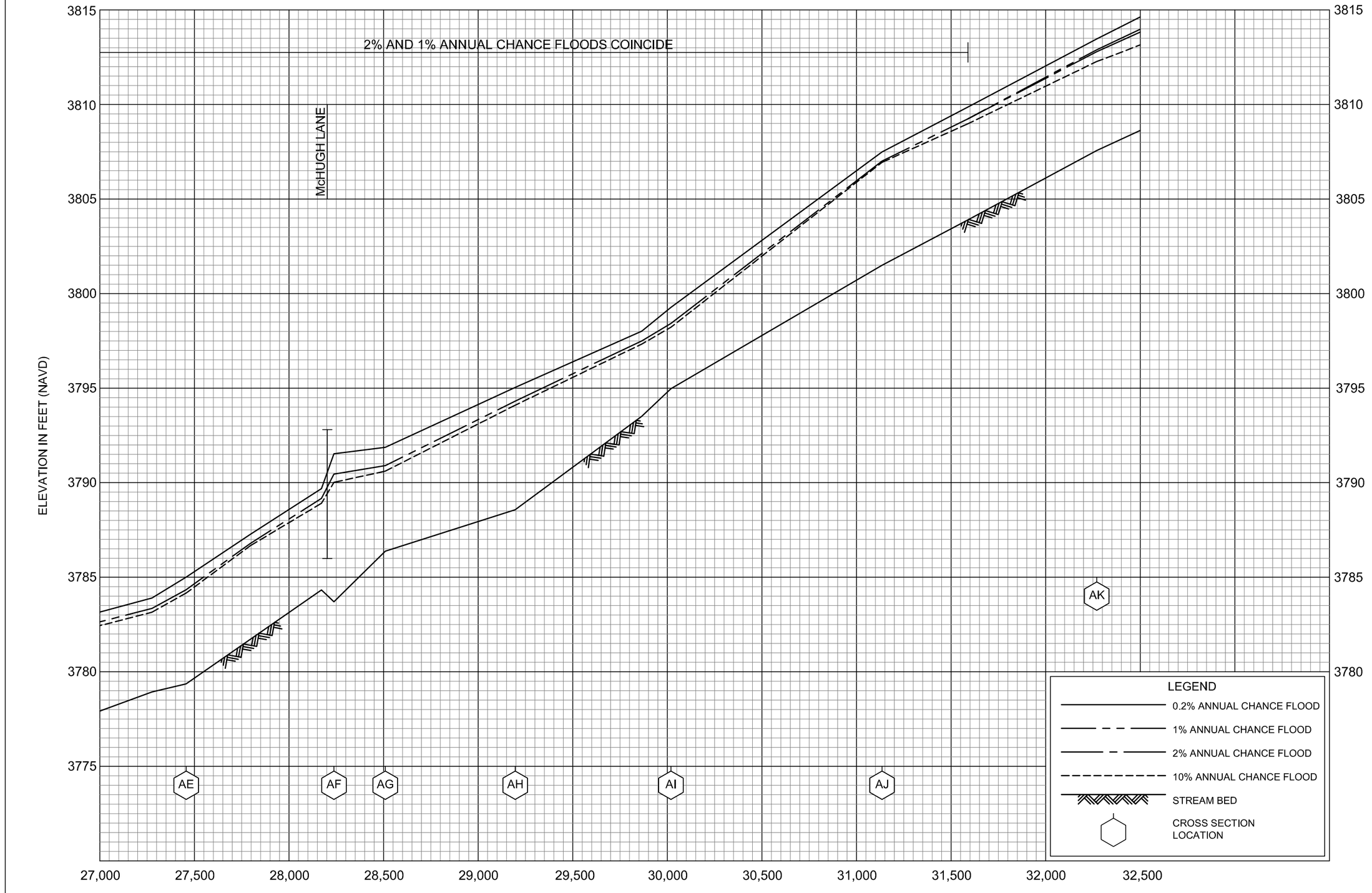
TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

64P



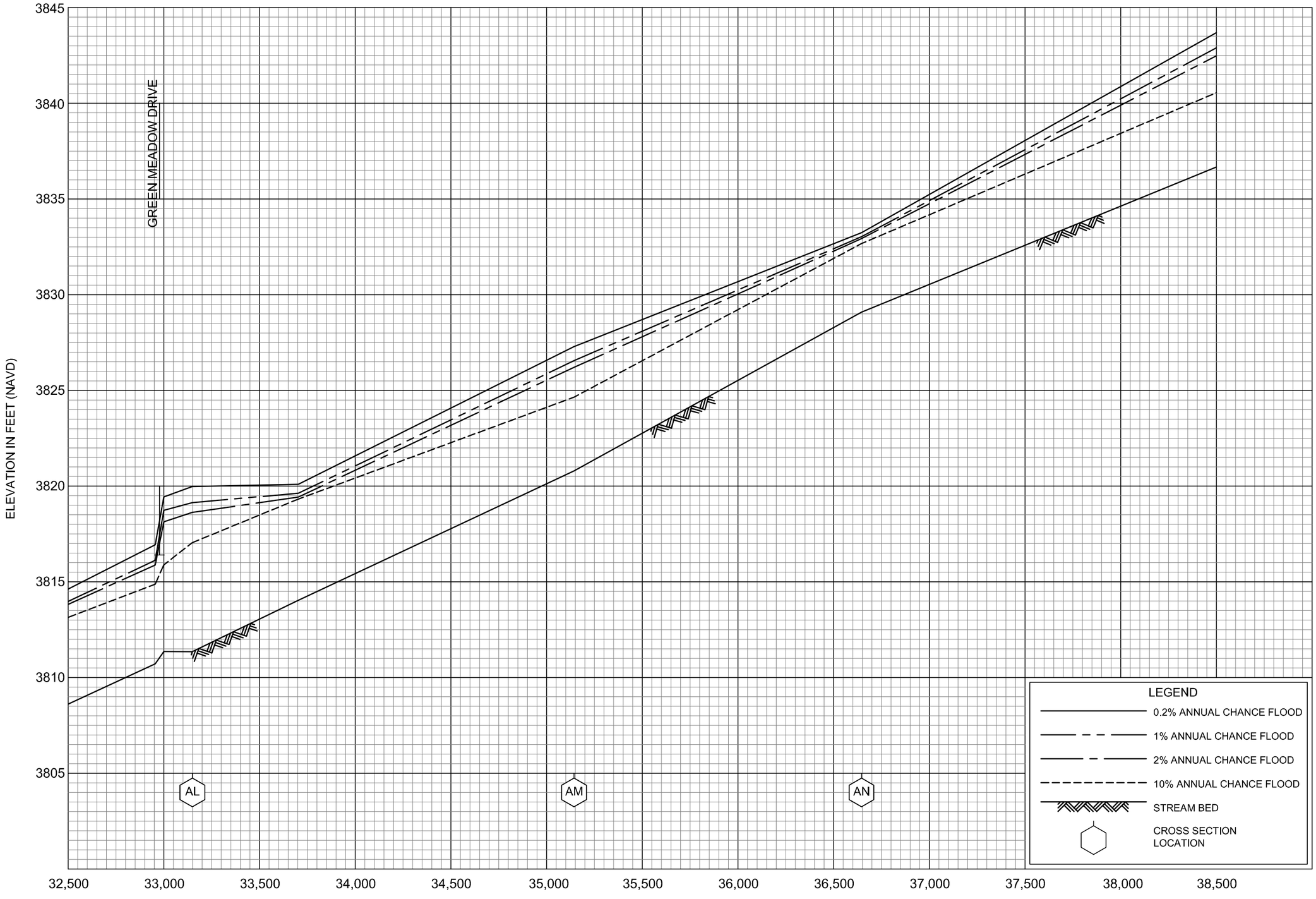
FLOOD PROFILES

TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS



FLOOD PROFILES

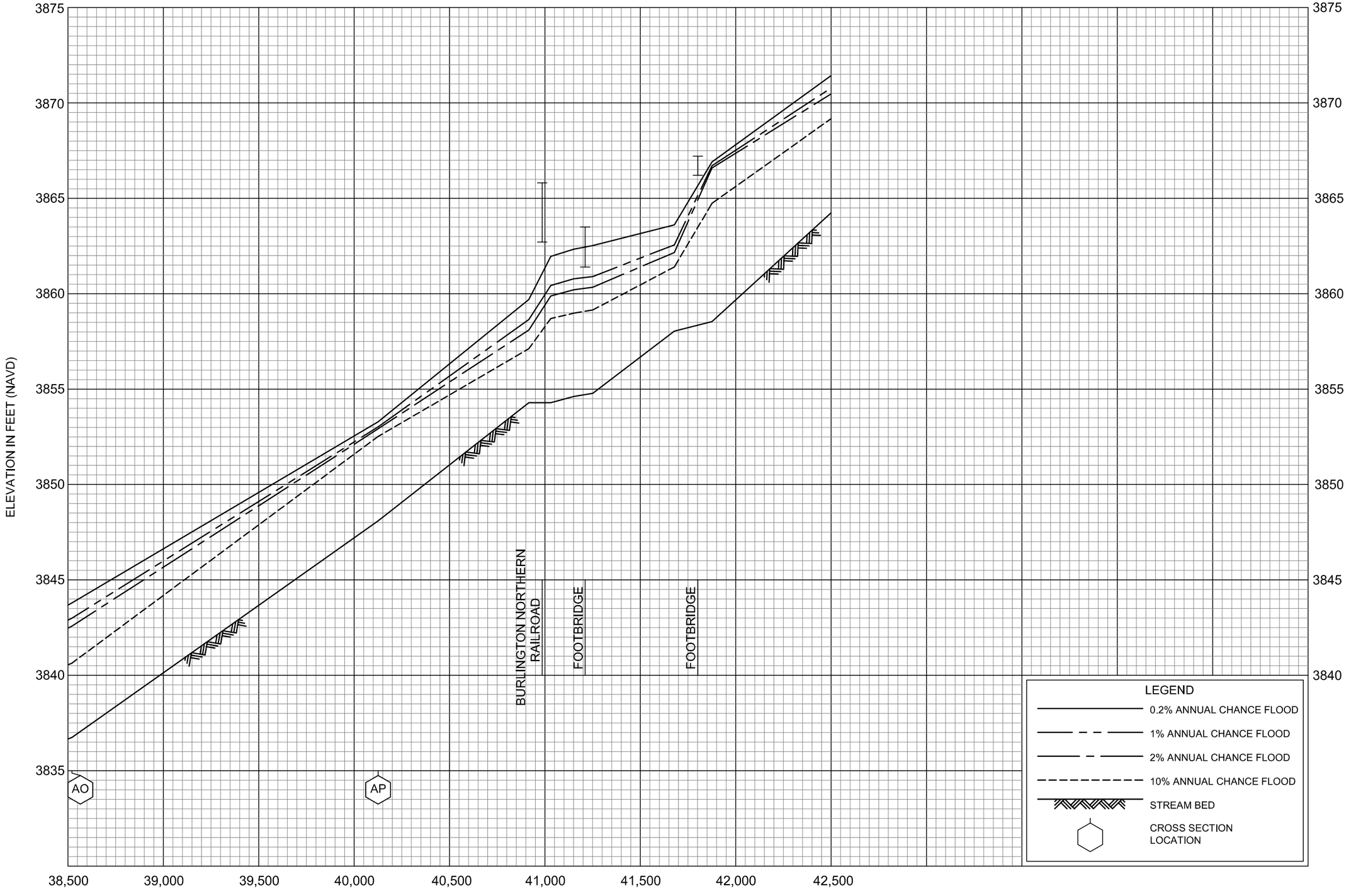
TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

66P



FLOOD PROFILES

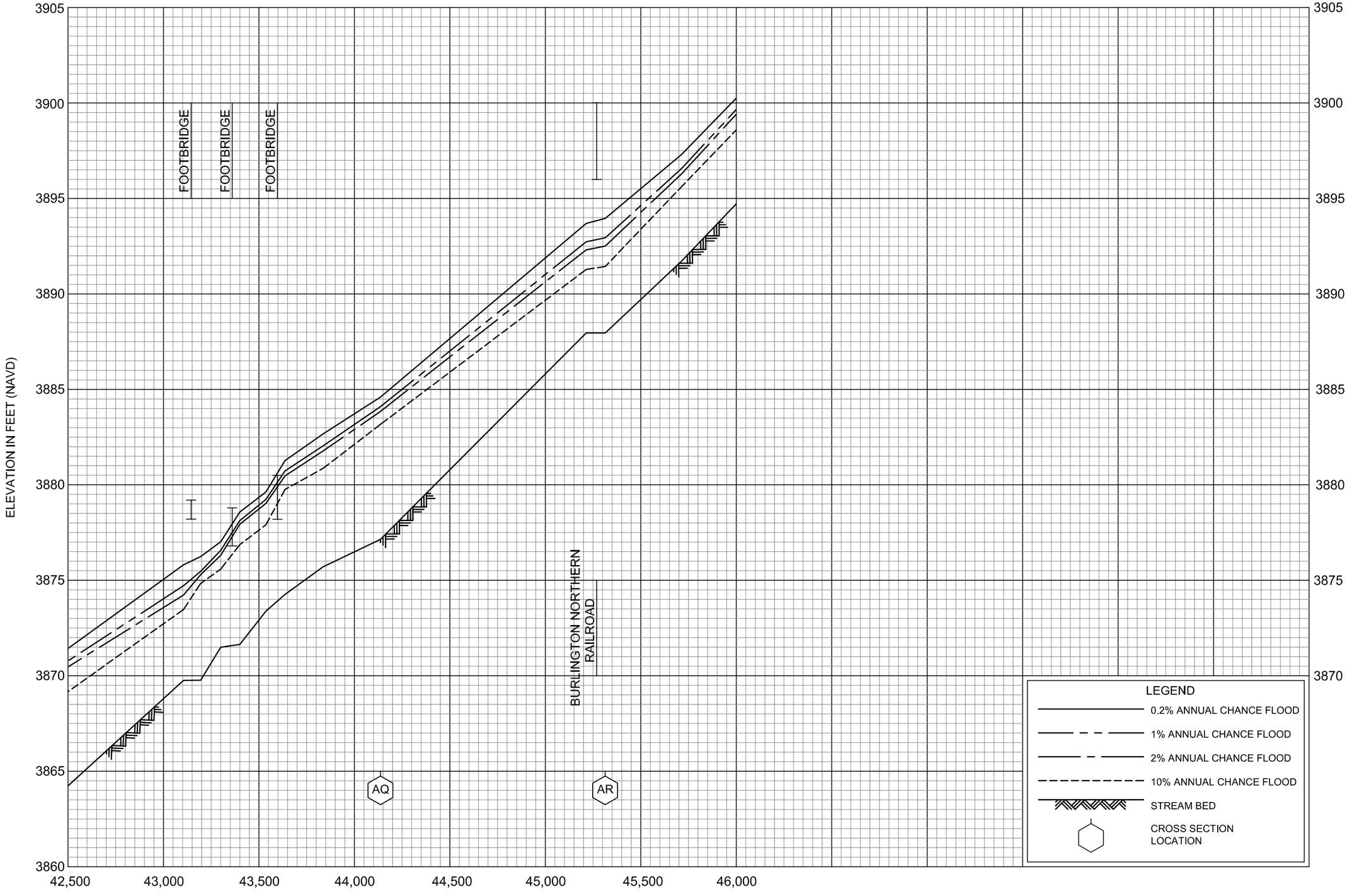
TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

67P



FLOOD PROFILES

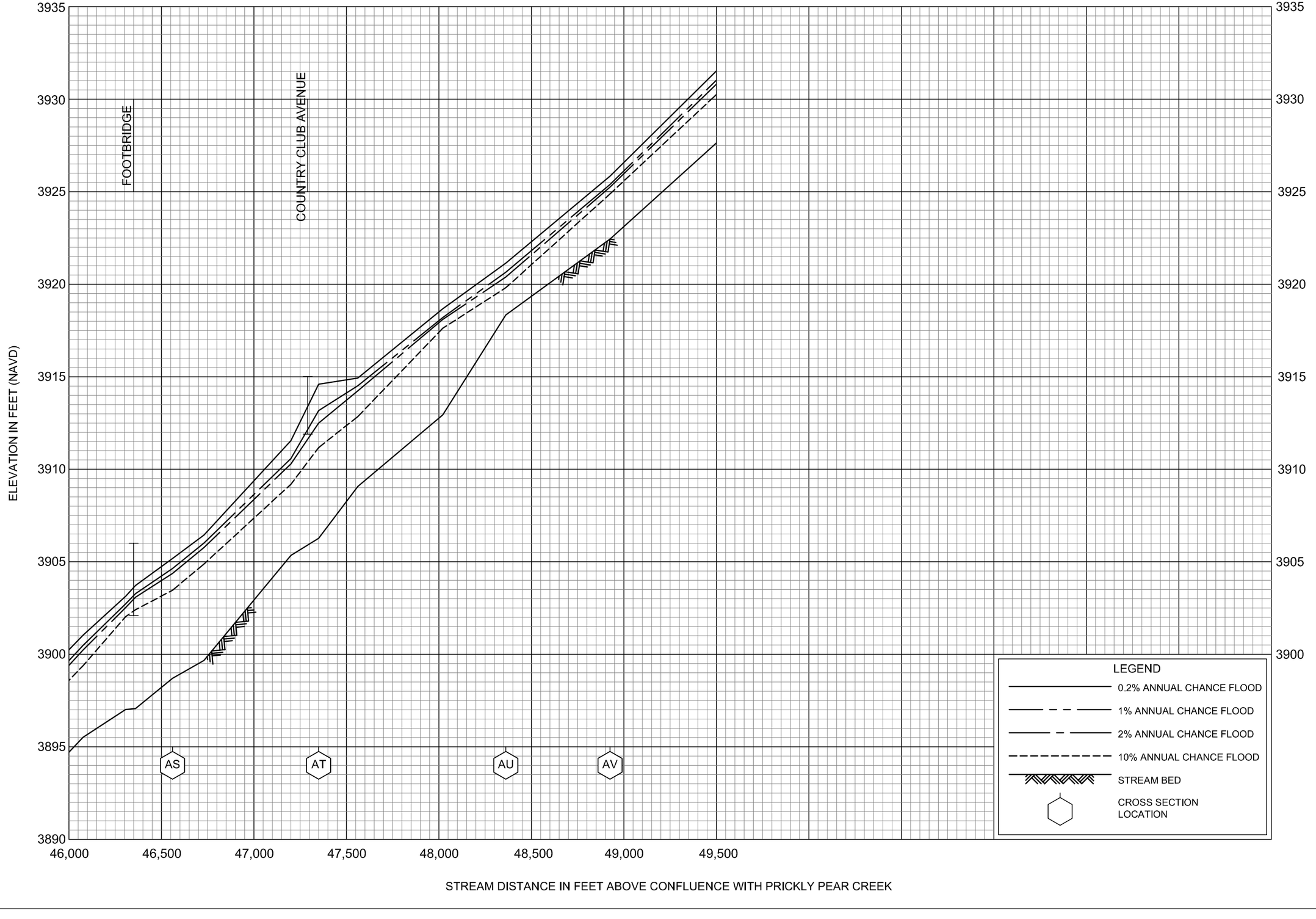
TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

68P



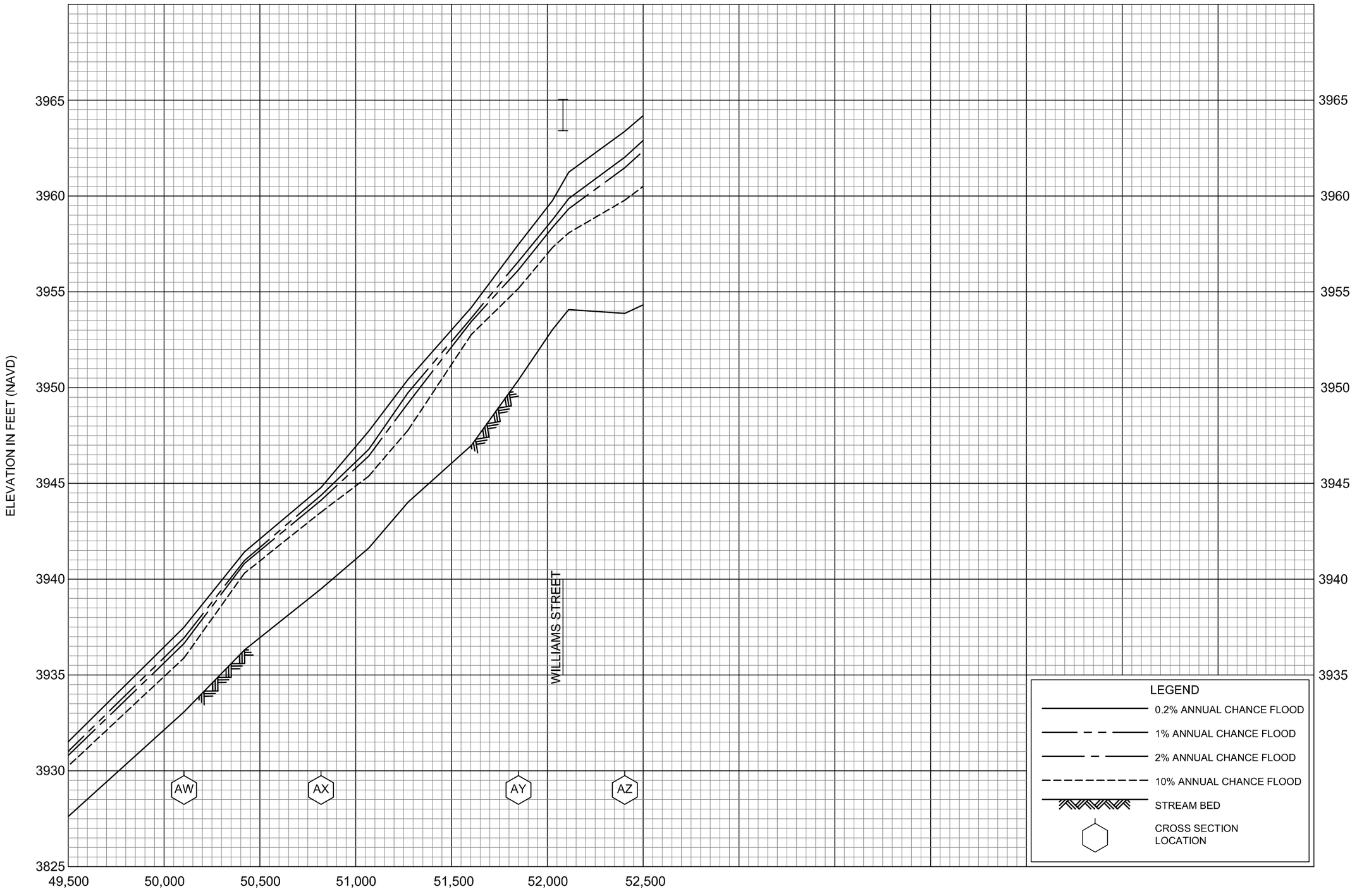
FLOOD PROFILES

TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS



FLOOD PROFILES

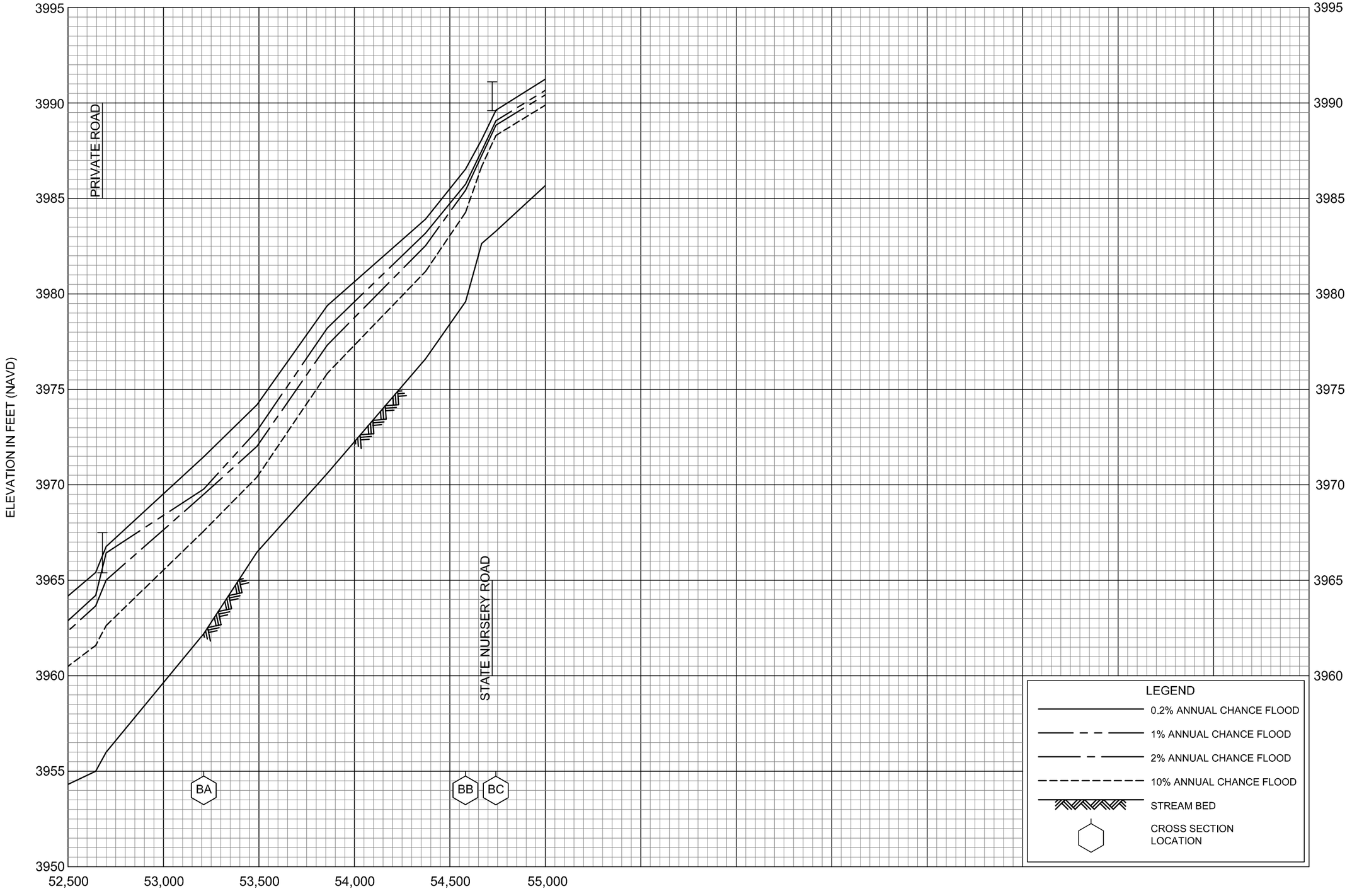
TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

70P



FLOOD PROFILES

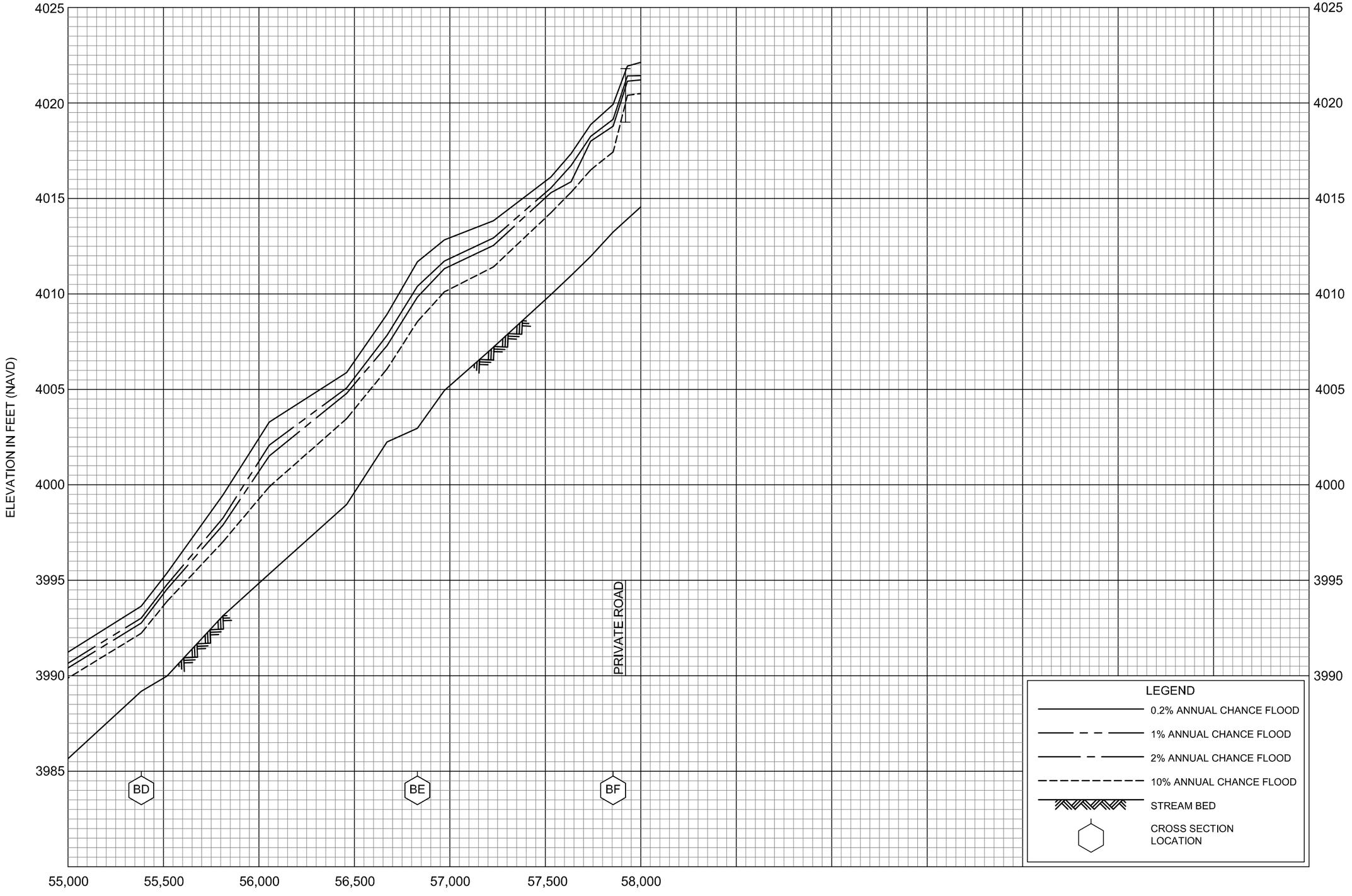
TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

71P



FLOOD PROFILES

TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

72P

FLOOD PROFILES

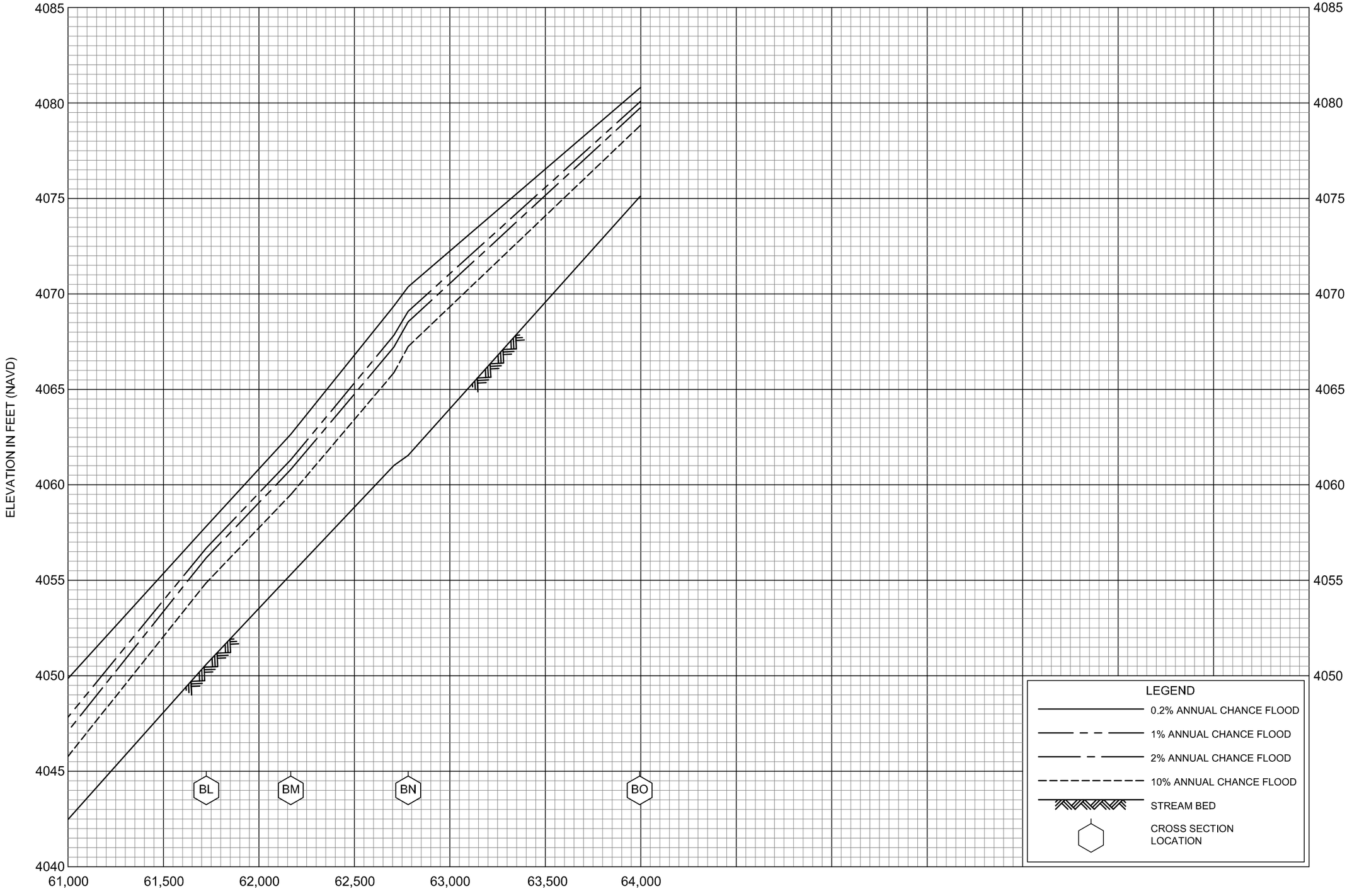
TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

73P



FLOOD PROFILES

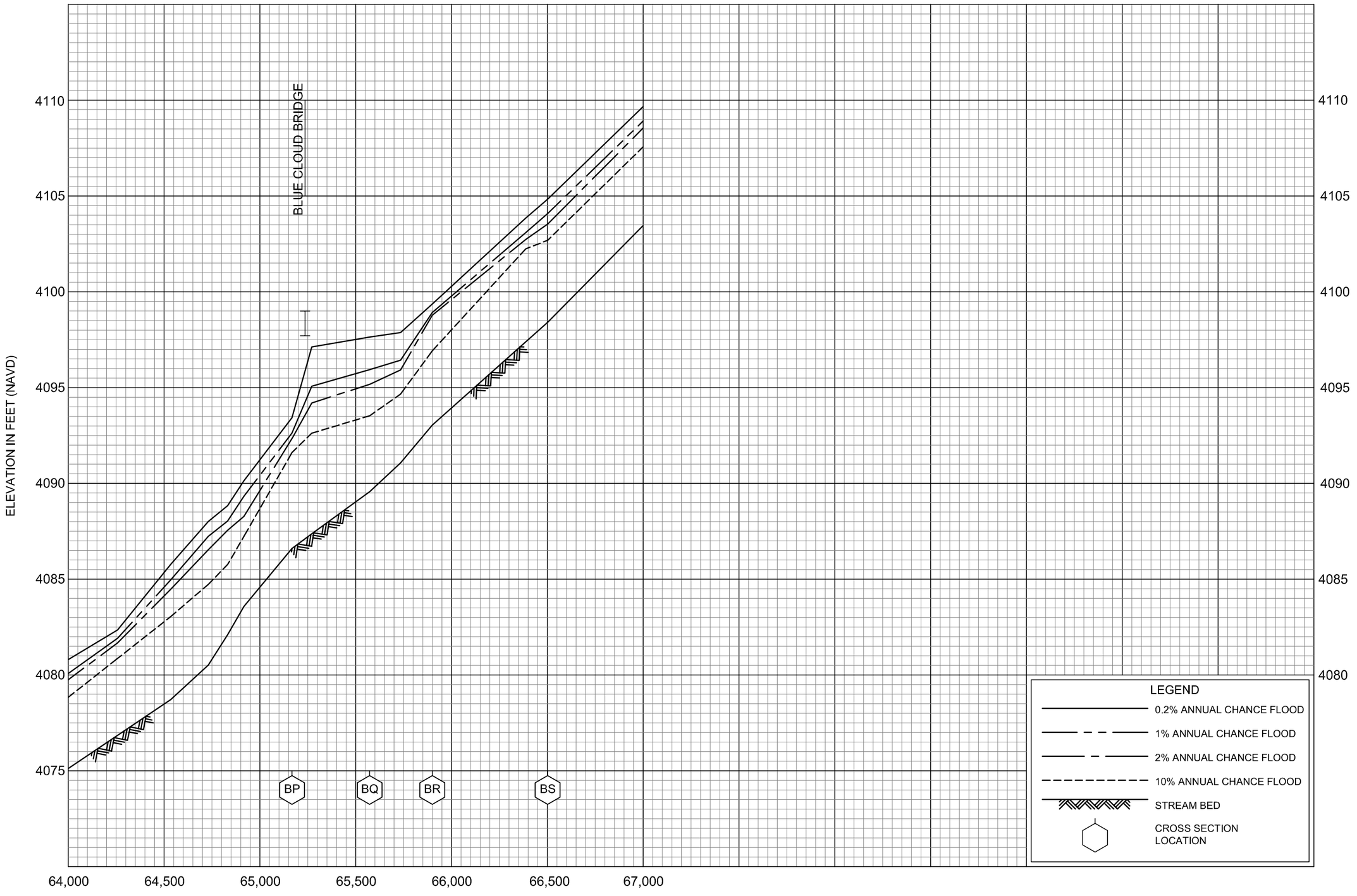
TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

74P



FLOOD PROFILES

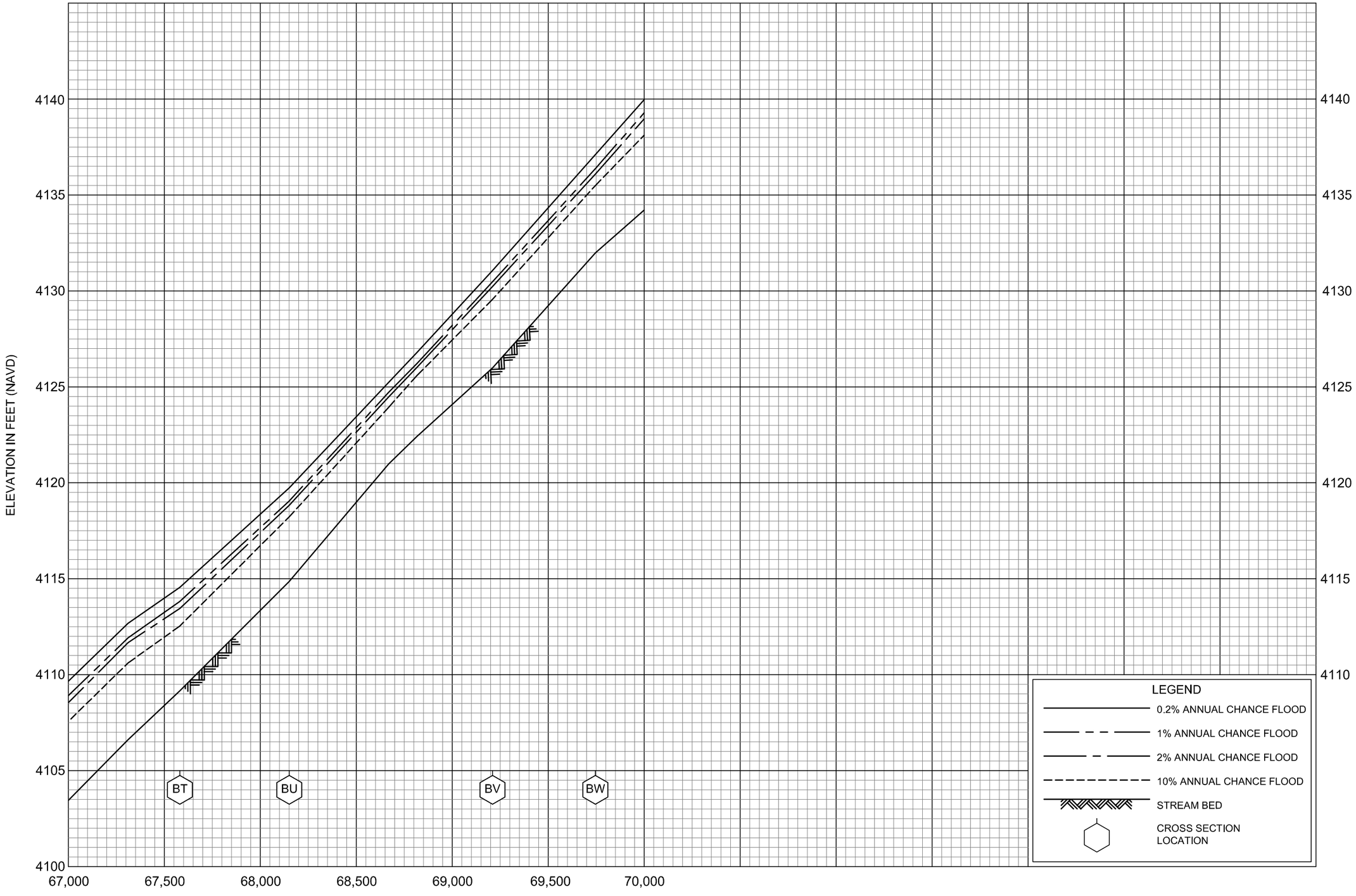
TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

75P



FLOOD PROFILES

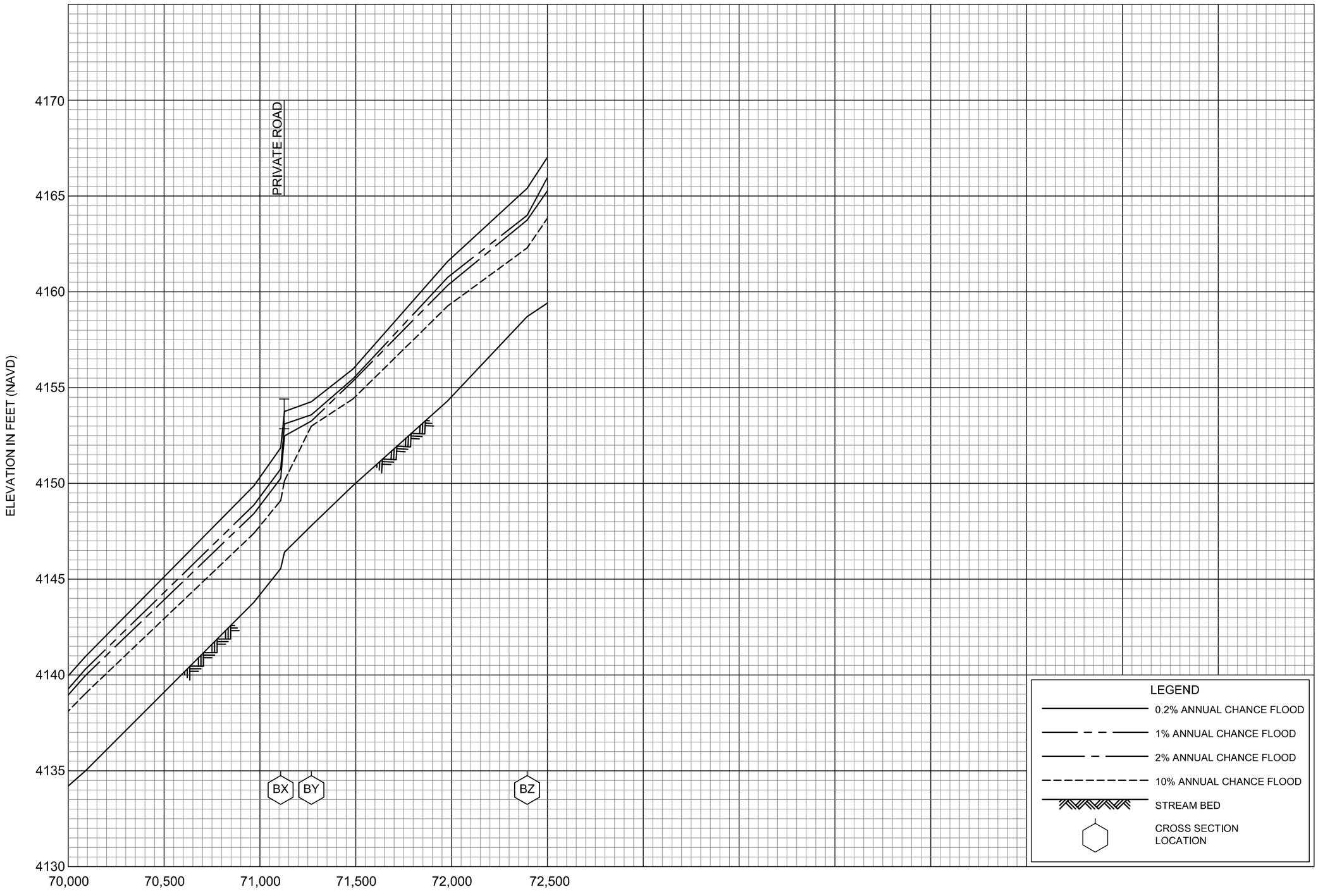
TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

76P



FLOOD PROFILES

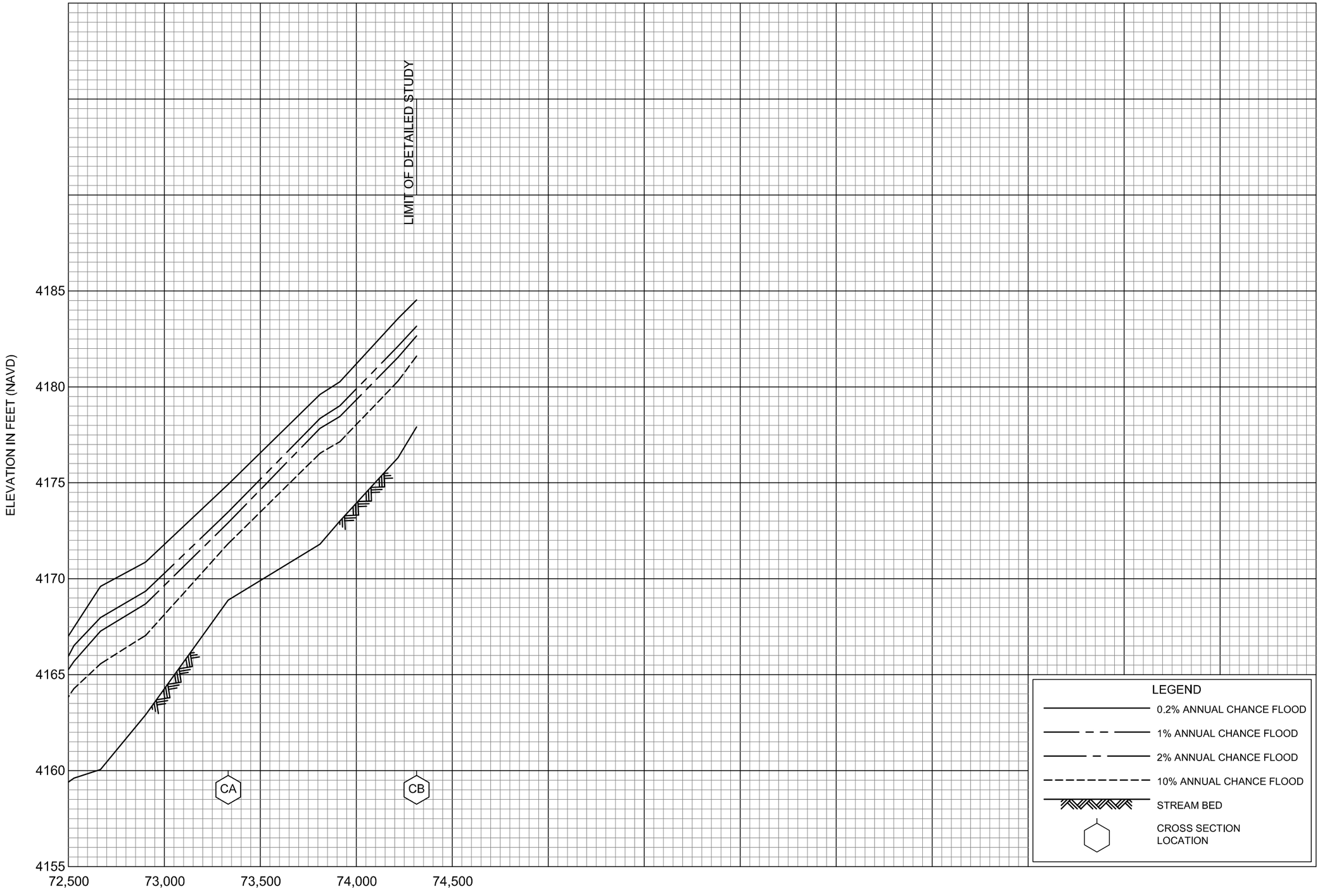
TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

77P



FLOOD PROFILES

TENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEWIS AND CLARK COUNTY, MT

AND INCORPORATED AREAS

78P