FLOOD INSURANCE STUDY

SUMMIT COUNTY, COLORADO

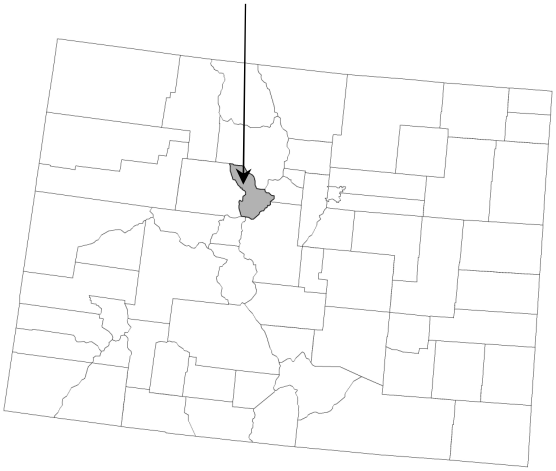
AND INCORPORATED AREAS

Notice

This preliminary FIS report includes only revised Flood Profiles and Floodway Data Tables. See "Notice to Flood Insurance Study Users" page for additional details.

Community Name	*Community Number*
BLUE RIVER, TOWN OF	080016
BRECKENRIDGE, TOWN OF	080172
DILLON, TOWN OF	080237
FRISCO, TOWN OF	080245
MONTEZUMA, TOWN OF	080072
SILVERTHORNE, TOWN OF	080201
SUMMIT COUNTY (UNINCORPORATED AREAS)	080290

Summit County



Preliminary: TBD

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
08117CV001B

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.

Initial Countywide FIS Effective Date: November 16, 2011
Revised Countywide FIS Effective Date: TBD

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FLOOD INSURANCE STUDY
SUMMIT COUNTY, COLORADO AND INCORPORATED AREAS

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) in the geographic area of Summit County, Colorado, including the Towns of Blue River, Breckenridge, Dillon, Frisco, Montezuma and Silverthorne, and unincorporated areas of Summit County (hereinafter referred to collectively as Summit County) and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates. This information will also be used by Summit 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.

Please note that the Towns of Dillon and Montezuma do not have any Special Flood Hazard Areas identified.

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 initial countywide FIS was prepared by combining data from the Towns of Breckenridge, Frisco and Silverthorne, and the unincorporated areas of Summit County. Information on the authority and acknowledgements for each jurisdiction included in the countywide FIS, as compiled from their previously printed individual FIS reports is shown below.

Town of Breckenridge
The original hydrologic and hydraulic analyses for Town of Breckenridge were performed by Gingery Associates, Inc., for the Federal Insurance Administration, under Contract No. H-4549. This work, which was completed in December 1978, covered all significant flooding sources affecting the town.

The original study was revised on June 20, 2001, to incorporate detailed flood-hazard information along Blue River Middle Branch and Cucumber, Illinois, Jones, and Gold Run Gulches, and approximate flood-hazard information along the Blue River Middle Branch split-flow area in the vicinity of the Town of Breckenridge. The hydrologic and hydraulic analyses for the restudy were performed for the Federal Emergency Management Agency (FEMA), by Flo Engineering Consultants, Inc., under Contract No. EMW-92-C-3811.

Town of Frisco
The original hydrologic and hydraulic analyses for the Town of Frisco were performed by Gingery Associates, Inc., for the Federal Insurance Administration, under Contract No. H-4549. This work, which was completed in December 1978, covered all significant flooding sources affecting the town.

The original study was revised on November 2, 1994, to show the effects of updated hydraulic analyses for Jug Creek, Meadow Creek, Miners Creek, No Name Creek, and Tenmile Creek. The analyses for this revision to Meadow Creek, Miners Creek, and Tenmile Creek were performed by Muller Engineering Company, Inc., Lakewood, Colorado, for FEMA, Contract No. EMW-91-C-3365. In addition, the analyses for the revisions to Jug Creek, No Name Creek, and a portion of Meadow Creek were performed by Robillard and Associates, Dillon, Colorado.

Town of Silverthorne
The original hydrologic and hydraulic analyses for the Town of Silverthorne were performed by Gingery Associates, Inc., for the Federal Insurance Administration, under Contract No. H-4549. This work, which was completed in September 1978, covered all significant flooding sources affecting the town.

The hydrologic and hydraulic analyses for the restudy were performed by Simons and Associates, Inc., for FEMA, under Contract No. EMD 97-CO-0031. The study was completed in October 1998.

Summit County (Unincorporated Areas)
The original hydrologic and hydraulic analyses for the Unincorporated Areas of Summit County were performed by Gingery Associates, Inc., for the Federal Insurance Administration, under Contract No. H-4549. This work, which was completed in December 1978, covered all significant flooding sources affecting the unincorporated areas of the county.

The original study was revised on November 2, 1994, to show the effects of updated hydraulic analyses for the following streams: Blue River, French Gulch, Miners Creek, North Fork Snake River, Snake River, South Barton Gulch, Swan River, and Tenmile Creek. The analyses for the revision were performed by Muller Engineering Company, Inc., Lakewood, Colorado, for FEMA, Contract No. EMW-91-C-3365. In addition, the study included updated hydraulic analyses for Jug Creek, No Name Creek, and a portion of Meadow Creek, performed by Robillard and Associates, Inc., Dillon, Colorado.

On August 9, 2001 the FIS for the Unincorporated Areas of Summit County was revised again to incorporate detailed flood-hazard information along Blue River Middle Branch and Cucumber and Illinois Gulches, and approximate flood-hazard information along Gold Run Gulches and Blue River split-flow area around the vicinity of the Town of Breckenridge, Colorado.

The hydrologic and hydraulic analyses for the restudy were performed for FEMA by Flo Engineering Consultants, Inc., under Contract No. EMW-92-C-3811. In July 1997, Flo Engineering Consultants, Inc., submitted information contained in a report entitled "Drainage Master Plan for the Town of Breckenridge, Colorado, Drainage Report" (Reference 1).

Additionally, the August 9, 2001, revision included detailed hydraulic analyses for the following streams: Blue River within the corporate limits of the Town of Silverthorne; and Willow Creek, from west of the upstream corporate limits of the Town of Silverthorne to its confluence with the Blue River (beyond the downstream corporate limits).

The hydrologic and hydraulic analyses for this part of the revision were performed by Simons and Associates, Inc., for FEMA, under Contract No. EMD97-CO-0031. The study was completed in October 1998.

The physical map revision (PMR) to correct inaccuracies identified along some of the Special Flood Hazard Areas (SFHAs) and to remove the datum conversion that was inadvertently added to Willow Creek was completed by Atkins on behalf of the Colorado Water Conservation Board (CWCB) in accordance with the Cooperating Technical Partners (CTP) Partnership Agreement between CWCB and FEMA. Revisions to flood hazard areas were made to Blue River (Above Green Mountain Reservoir), Blue River (Above Dillon Reservoir), Blue River Middle Branch, Cucumber Gulch, Illinois Gulch, Jones Gulch, Jug Creek, Meadow Creek, Sawmill Gulch, Snake River, South Barton Gulch, Straight Creek, Swan River, Tenmile Creek, and West Tenmile Creek. These revisions were completed by October 2014.

The digital base mapping information was provided by the USDA Data Gateway, Federal Center, 501 W. Felix St., Bldg. 23, P.O. Box 6567, Fort Worth, Texas. It was downloaded from their website, www.datagateway.nrcs.usda.gov. These files were compiled by remote-sensing methods and meet or exceed National Map Accuracy Standards at the original compilation scale of 1:12,000. The primary digital orthophotoquad (DOQ) is a 1-meter ground resolution, quarter-quadrangle (3.75-minute of latitude and 3.75-minute of longitude) image cast on the Universal Transverse Mercator Projection (UTM) on the North American Datum of 1983 (NAD83).

1.3 Coordination

For the physical map revision, the initial Consultation Coordination Officer (CCO) meeting was held October 4, 2012. This meeting was attended by representatives of FEMA, the Colorado Water Conservation Board (CWCB), Summit County, the Towns of Breckenridge, Frisco, and Silverthorne, and the study contractor.

The results of this study were reviewed at the final CCO meeting held on TBD, and attended by representatives of FEMA, CWCB, Summit County, the Towns of Breckenridge, Dillon, and Silverthorne, and the study contractor. All problems raised at the meeting have been addressed.

For the countywide study, the initial Consultation Coordination Officer (CCO) meeting was held August 10, 2006. This meeting was attended by representatives of FEMA, the Colorado Water Conservation Board (CWCB), Summit County, the Towns of Breckenridge, and Frisco, and the study contractor.

The results of this study were reviewed at the final CCO meeting held on March 10, 2009, and attended by representatives of FEMA, CWCB, Summit County, the Towns of Breckenridge, Dillon, and Silverthorne, and the study contractor. All problems raised at the meeting have been addressed.

The countywide FIS was prepared by incorporating data from the Towns of Breckenridge, Frisco and Silverthorne, and the unincorporated areas of Summit County. Information on the coordination of the original studies from their previously printed individual FIS reports is shown below.

Town of Breckenridge

For the original study for the Town of Breckenridge, the community base map selection and the identification of streams requiring detailed study were accomplished in a meeting attended by representatives from the Federal Insurance Administration, the study contractor, CWCB, and the Town of Breckenridge on May 12, 1977. The Summit County Planning Commission also provided assistance in gathering information for the report.

During the course of the study, hydrologic procedures, flood elevations, flood boundaries, and floodway delineations were reviewed with officials of CWCB and the Federal Insurance Administration.

The results of the study were reviewed at a final community coordination meeting held on May 3, 1979. Attending the meeting were representatives of the Federal Insurance Administration, the study contractor, CWCB, and the town. No problems were raised at the meeting.

Town of Frisco

For the original study for the Town of Frisco, the streams requiring detailed study were identified at a meeting attended by representatives of the study contractor, the Federal Insurance Administration, CWCB, and the Town of Frisco in May 1977.

Results of the hydrologic analyses were coordinated with the Federal Insurance Administration and CWCB. The results of the study were reviewed at a final community coordination meeting held on April 30, 1979. Attending the meeting were representatives of the Federal Insurance Administration, the study contractor, and the town. All comments and problems raised at the meeting were resolved.

For the revision, initial CCO meetings were held on June 18 and 19, 1990, with representatives of FEMA, Summit County, the Town of Frisco, CWCB, and the study contractor attending. At the meeting the streams requiring detailed study were identified.

An intermediate CCO meeting was held on September 23, 1992, to present the preliminary results of this revision. This meeting was attended by representatives o£ FEMA, Summit County, the Town of Frisco, CWCB, and the study contractor.

On November 15, 1993, the results of this revision were reviewed at a final CCO meeting attended by representatives of the Town of Frisco, Summit County, CWCB, FEMA, and the study contractor.

Town of Silverthorne

For the original study for the Town of Silverthorne, the community base map selection and the identification of streams requiring detailed study were accomplished in a meeting attended by representatives from FEMA, the study contractor, CWCB, and the Town of Silverthorne on May 12, 1977. The Summit County Planning Commission and Backlund Surveys, Frisco, Colorado, also provided assistance in gathering information for this report.

During the course of the original study, hydrologic procedures, flood elevations, flood boundaries, and floodway delineations were reviewed with officials of CWCB and FEMA.

The final community coordination meeting was held on February 21, 1979, and was attended by representatives of FEMA, the study contractor, and the Town Planning commission. All problems raised at the meeting were resolved in the study.

For the revision, the community base map selection and the identification of streams requiring detailed study was accomplished in a meeting attended by representatives from FEMA, the study contractor, CWCB, and the Town of Silverthorne on February 6, 1997. Summit County also provided assistance in gathering information for the report.

During the course of the study, hydrologic procedures, flood elevations, flood boundaries, and floodway delineations were reviewed with officials of CWCB (Reference 2) and FEMA.

The results of the revision were reviewed at the final CCO meeting held on June 22, 2000, and attended by representatives of FEMA, the State of Colorado, and the community. All problems raised at that meeting were addressed in the study.

Summit County (Unincorporated Areas)
For the original study for the Unincorporated Areas of Summit County, the community base map selection and the identification of streams requiring detailed study were accomplished in a meeting attended by representatives from the Federal Insurance Administration, the Summit County Planning Commission, CWCB, and the study contractor on May 17, 1977. Copper Mountain, Inc., and Backlund Surveys provided assistance in gathering information for the study.

During the course of the study, hydrologic procedures, flood elevations, flood boundaries, and floodway delineations were reviewed with officials of CWCB and the Federal Insurance Administration.

The results of the study were reviewed at a final community coordination meeting held on November 15, 1979. Attending the meeting were representatives of the Federal Insurance Administration, the study contractor, and the county. This study incorporates all appropriate comments, and all problems have been resolved.

For the first revision, the initial CCO meetings were held on June 18 and 19, 1990, with representatives of FEMA, Summit County, the Town of Frisco, CWCB, and the study contractor. At this meeting, the streams requiring detailed study were identified.

An intermediate CCO meeting was held on September 23, 1992, to present the preliminary results of this revision. This meeting was attended by representatives of FEMA, Summit County, the Town of Frisco, CWCB, and the study contractor.

On November 15, 1993, the results of the revision were reviewed at a final CCO meeting attended by representatives of the Town of Frisco, Summit County, CWCB, FEMA, and the study contractor.

For the second revision, the community base map selection and the identification of streams requiring detailed study was accomplished in a meeting attended by representatives from FEMA, the study contractor, CWCB, and the Town of Silverthorne on February 6, 1997. Summit County also provided assistance in gathering information for the revision.

During the course of revision, hydrologic procedures, flood elevations, flood boundaries, and floodway delineations were reviewed with officials of CWCB (Reference 2) and FEMA.

The results of the revision were reviewed at the final CCO meeting held on June 22, 2000, and attended by representatives of FEMA, the State of Colorado, and the Town of Silverthorne. All problems raised at that meeting, and by community comments received November 23, 2000, were addressed in the study.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Summit County, Colorado including the Towns of Blue River, Breckenridge, Dillon, Frisco, Montezuma, and Silverthorne, and the unincorporated areas of Summit 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 2010.

Table 1 – Streams Studied by Detailed Methods

Stream	Limits of Detailed Study
Alpine Rock Overflow	From the confluence with Blue River (Above Dillon Reservoir) to approximately 330 feet upstream of Alpine Rock Access Road
Blue River (Above Green Mountain Reservoir)	From 700 feet downstream of Rock Creek, south to the Town of Silverthorne
Blue River (Above Dillon Reservoir)	From Dillon Reservoir upstream to the confluence with the Swan River; and from approximately 2,080 feet upstream to approximately 4,210 feet upstream of Highway 9
Blue River Middle Branch	From the southern corporate limits of the Town of Breckenridge upstream to the northern corporate limits of the Town of Blue River
Braddock Wetlands Split	From approximately 3,315 feet upstream of Highway 9 to approximately 4,005 upstream of Highway 9
Cucumber Gulch	From the confluence with Blue River to a point approximately 0.6 miles upstream
French Gulch	From the Blue River upstream to the road at Gibson Gulch from Highway 9 upstream of Interstate 70.
Illinois Gulch	From the confluence with Blue River to approximately 500 feet upstream of Robbers Nest Road
Jones Gulch	From 1250 feet upstream of the confluence with Blue River to a point approximately 1100 feet upstream.
Jug Creek	From the confluence with Miner's Creek to approximately 2,100 feet upstream.

Stream	Limits of Detailed Study
Lehman Gulch	From the confluence with the Blue River to a point 0.2 miles upstream
Meadow Creek	From Dillon Reservoir upstream to the eastern corporate limits
Miners Creek	From Dillon Reservoir to the Breckenridge/Vail bike trail.
No Name Creek	From the confluence with Jug Creek to approximately 2,000 feet upstream.
North Fork Snake River	From the confluence with the Snake River to approximately 0.5 mile upstream
Sawmill Gulch	From the confluence with Blue River to point 1.1 miles upstream
Snake River	From approximately 0.9 mile downstream to approximately 0.8 mile upstream of East Keystone Road
Soda Creek	From approximately 1.1 miles above Swan Mountain Road, upstream for 0.2 mile
South Barton Gulch	From approximately 0.5 mile downstream to approximately 0.6 mile upstream of American Road
Straight Creek	From the Town of Dillon upstream for 1.6 miles
Swan River	From the confluence with the Blue River (above Dillon) to approximately 0.8 mile upstream of Tiger Run Road
Tenmile Creek	From Dillon Reservoir to 4th Avenue and from just upstream to approximately 0.2 mile upstream of Main Street
Tenmile Creek Side Channel No. 1	From convergence with Tenmile Creek to a point 500 feet upstream
Tenmile Creek Side Channel No. 2	From convergence with Tenmile Creek to a point approximately 0.5 miles upstream
West Tenmile Creek	From Colorado Highway 91, westward 1.8 miles
Willow Creek	From Blue River to the eastern corporate limits of Silverthorne, and from the western corporate limits of Silverthorne, upstream for approximately 0.3 mile

The Blue River was studied by limited detailed methods from the northern corporate limits of Silverthorne to 700 feet downstream of Rock Creek. This method of study was agreed upon by the FEMA and Summit County.

Flooding caused by the Blue River above the Town of Blue River, portions of French Gulch, Soda Creek, and South Barton Gulch among others were studied by approximate

methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by FEMA and Summit County.

2.2 Community Description

Summit County, one of the original 17 counties defined when the Colorado Territory was created in 1861, is 75 miles west of Denver, in north-central Colorado. Its boundaries with adjacent Clear Creek, Eagle, Grand, Lake, and Park Counties are defined by mountain ranges, with the south and southeast boundaries on the Continental Divide. Elevations within the county range from 7,750 feet at Green Mountain Reservoir to 14,270 feet at Grays Peak. The county is comprised of one drainage basin, that of the Blue River. The river flows northerly for the length of the county, from its source near Hoosier Pass to its confluence with the Colorado River near Kremmling in Grand County (Reference 3).

Summit County is served by two major highways, State Highway 9 (north-south) and Interstate Highway 70 - U.S. Highway 6 (east-west). In addition, there are county-maintained roads and old mining roads on U.S. Forest Service land.

Incorporated areas in Summit County are the Towns of Blue River, Breckenridge, Dillon, Frisco, Montezuma, and Silverthorne. These towns accounted for 1609 of the total county population of 2665 in 1970. By 1975, the county population had risen to 5409, with 38 percent living in unincorporated areas (References 4 and 5). The county population increased to 23,548 in 2000 with the majority of the population living in the incorporated areas of Summit County (Reference 6). Eastern slope visitors and nonresident property owners increase the population considerably during the winter and summer recreation seasons.

The economy of Summit County is based mainly on tourism, with the ski industry, including its related activities and supporting services, being a significant contributor. Local ski areas attract visitors during the winter, when other outdoor recreational activities are experiencing their off season. They also provide employment and income in rural areas. Many residents are self-employed in recreation-related businesses, and the remainder are involved primarily in construction, mining, and government work (Reference 5).

The Summit County climate is characterized by cold winters, mild summers, and wide daily variations in temperature during both these seasons. Most precipitation occurs in winter in the form of dry, powdery snow. Summer precipitation occurs in the form of brief, localized thunderstorms.

Large temperature ranges are observed at Dillon, where the monthly average varies from 15.5°F in January to 55°F in July. The mean maximum temperature varies from 32.2°F in January to 74.9°F in July, and the mean minimum temperature varies from -1.4°F in January to 36.1°F in July. The difference between the average maximum and minimum temperatures is 34°F in January and 39°F in July, which is indicative of the daily temperature range (Reference 7).

Average annual precipitation varies considerably over the county. Measurements (excluding snowfall) are 15.46 inches at Green Mountain Reservoir, 17.01 inches east of Dillon, and 19.33 inches at Breckenridge. Estimates of mountain precipitation are as high as 50 inches annually for a section of the Gore Range (Reference 8).

Average snowfall measurements range from 89 inches per year at Green Mountain Reservoir to 159 inches at Breckenridge. A few large snowstorms account for most of the average snowfall (Reference 5).

The major soil types along the streams in Summit County are the Cryaquolls, Cryoborolls-Rock Outcrop Association, and Cryoboralfs-Rock Outcrop Association (Reference 9). Cryaquolls occupy high mountain-meadow areas on floodplains, low terraces, and fans. These deep, dark colored, poorly drained, loamy soils are formed in mixed alluvium and are found primarily along Tenmile Creek, Meadow Creek, and Blue River and its tributaries. Depth to the seasonal high water table varies from 0.0 to 1.5 feet. The native vegetation is mostly sedge, rush, and tufted hairgrass, with willows near the streams.

The Cryoborolls-Rock Outcrop Association is found adjacent to the Cryaquolls along much of the Blue River and its tributaries. These moderately deep to deep, dark-colored, well-drained, loamy soils occupy subalpine mountain slopes, mesas, upland benches, and old high terraces and fans. The soils are formed in glacial till and outwash, weathered sandstone, shale, disintegrated granite, and stony and cobbly, coarse-textured alluvium. Native vegetation over these soils is a sparse cover of muttongrass, western wheatgrass, pine needlegrass, and sagebrush.

The Cryoboralfs-Rock Outcrop Association is the most extensive in the state and occurs in a major portion of the high mountainous areas. In Summit County, this association occurs on the upland areas and valley walls along the lower Blue River. Along much of the Snake River and Tenmile Creek, these soils occur on the floodplain. These soils along the mountain-stream valleys are shallow, dark colored and wet, and those soils that occupy timbered mountain slopes and high plateaus are moderately deep to deep, light colored and well drained. The soils were formed in materials weathered from a variety of crystalline and sedimentary rocks. Granite, sandstone, gneiss, basalt, rhyolite, and other rock outcrops are interspersed among the soil areas. The native vegetation consists mainly of Engelmann's spruce, subalpine fir, lodgepole pine, limber pine, and aspen.

The remainder of the county, alpine areas ranging in elevation from 11,000 feet to 14,500 feet consists of the Rock Outcrop-Cryumbrepts-Cryochrepts Association and the Ptarmigan-Bobtail-Rock Outcrop Association. Mosses and lichens on the rocks are the only vegetation types in much of this area. A variety of alpine shrubs along with a few grasses and sedges grow on the more protected slopes (References 9 and 10).

The Upper Blue River Basin begins at the Continental Divide, bounded by Hoosier Ridge to the south. The basin has a drainage area of 129 square miles and drains to the north along the Blue River to Dillon Reservoir. The Blue River channel slope varies from 4.6 percent above Breckenridge to 1.2 percent above Lake Dillon. Study reaches within this basin include two stretches along the Blue River and portions of three tributaries of the Blue River, which are French Gulch, South Barton Gulch, and Swan River.

The Blue River basin, which covers all of Summit County, is on the west side of the Continental Divide and feeds into the Colorado River at the Town of Kremmling. The basin has a drainage area of 514 square miles and generally drains in a north to northwest direction. The basin width ranges from 21 miles at Lake Dillon to 9 miles at Green Mountain Reservoir. The topography is mountainous with larger rivers in deep broad valleys and smaller creeks in steep gullies. The basin is bounded by the Continental Divide on the east and south, from Loveland Pass to Fremont Pass; the Gore Range and Vail Pass form the boundary on the west. The average elevation in the basin is approximately 10,000 feet (Reference 11). There has been little development along the riverbanks with the exception of some gravel-mining operations and scattered houses.

The discharge of the Blue River through Silverthorne is regulated by the Dillon Reservoir. The average annual peak discharge downstream of the reservoir is approximately 1,103 cubic feet per second (cfs) (Reference 12).

The major drainageway through Breckenridge is the Blue River Middle Branch, which flows through the center of town. It has a steep, narrow channel with a slope of approximately 130 feet per mile. Its width is approximately 30 feet and its bank-to-bottom depth varies from 5 to 7 feet. Its streambed is straight and rough, containing fairly large rocks. The floodplain is largely confined to the channel, but does increase to between 300 to 400 feet in width in ponds and behind some of the culverts. Most of the floodplain in Breckenridge contains no vegetation, but is covered with rocks. The downstream reaches of the Blue River Middle Branch at Breckenridge have willow bushes and gravel tailings covering much of the floodplain.

The tributaries flowing into the Blue River Middle Branch are very steep and shallow. The channels are approximately 1 foot deep, and the slopes are approximately 150 feet per mile. The floodplains, which are developed in the lower reaches, vary in width from 10 to 400 feet. They are covered with grass and willow and pine trees in the upper reaches.

The Willow Creek basin drains to the east from the Gore Range into Blue River at Silverthorne. It has a total drainage area of 13.5 square miles and a basin length of 4.3 miles. The basin width - varies from 4 miles, at the upper section around Willow Lakes, to 1 mile, at the foot of the Gore Range. The channel slope averages 2.7 percent at Silverthorne and 9.8 percent in the Gore Range. The elevations in the basin range from 8,620 to 13,300 feet.

The Tenmile Creek Basin drains to the north, then northeast into Lake Dillon from the Fremont Pass vicinity. This basin parallels the Upper Blue River basin with the Tenmile Range dividing the two. The western boundary of the basin is formed by the Gore Range and Vail Pass, and the southern boundary is the Continental Divide. The upper basin is characterized by an open rolling terrain. In contrast, the lower basin consists of the narrow winding Tenmile Canyon. The total drainage area is 94 square miles at Frisco, with 35 square miles lying in the upper basin above the confluence with West Tenmile Creek. The basin width is 7 miles and the total basin length is about 14 miles. The creek slopes at about 1.4 percent at Frisco, 2 percent in the canyon, and 2.7 percent in the upper basin. The elevations in the basin range from 13,000 feet above Copper Mountain to 9,000 feet at

Lake Di11on. The study reaches within this basin are portions of Tenmile Creek adjacent to and within the Town of Frisco.

West Tenmile Creek forms the westernmost portion of the Blue River basin. It flows easterly from the Shrine Pass/Vail Pass area to Wheeler Junction where it joins Tenmile Creek. It is separated from Tenmile Creek by Copper Mountain to the south. The basin has a total drainage area of 21 square miles, and its width varies from 5 miles at Vail Pass to 2 miles at Copper Mountain Resort. The channel slope varies from 3.7 percent around Vail Pass to 1.5 percent at Copper Mountain. The elevations in the basin range from 9,600 feet at Wheeler Junction to 13,000 feet at the West Tenmile Mountain Range. The study area is at the base of Copper Mountain and has been developed as a ski resort area.

The Meadow Creek Basin drains to the east from the Gore Range into Dillon Reservoir at Frisco, just north of Lower Tenmile Creek. The basin has a total drainage area of 5.8 square miles and a length of 4.5 miles. The width of the basin varies from 1.0 to 1.5 miles. The channel slope averages 1.1 percent for the study reach near Frisco while steeper slopes of 10.7 percent exist above Frisco in the Gore Range. The elevations in the basin range from 12,700 feet to 9,000 feet at Dillon Reservoir. The study reaches within this basin are portions of Meadow Creek adjacent to the Town of Frisco, with some segments located within the Town's corporate limits.

Miners Creek Basin is located to the east of Tenmile Range, with the ridge to the east of Peak 4 being the southern boundary of the basin. The basin has a drainage area of 6.8 square miles which drains east into Miners Creek, then north to Dillon Reservoir. Jug Creek and No Name Creek are tributaries of Miners Creek. The study reach within the basin is a segment along Miners Creek.

The Straight Creek basin lies just north of the Snake River basin and drains southwesterly from an elevation of approximately 12,500 feet above the Eisenhower Tunnel. It empties into Blue River just below Lake Dillon near Silverthorne at an elevation of 8800 feet. The basin has a uniform width of approximately 3 miles. It is 8 miles long and has a drainage area of 20 square miles at the mouth. The channel slope ranges from 3.4 percent in the study area to a steep slope of 7.1 percent in the upper basin. Development in the upper one-half of the basin is relatively dense with many condominium units and single-family homes, whereas, the lower one-half is sparsely developed.

Soda Creek basin drains northerly into Dillon Reservoir at the mouth of the Snake River. Drainage is from the timbered, rolling hills just east of the reservoir. The total drainage area is approximately 10 square miles. The basin is 5 miles long, and basin width averages 2 miles. The channel slope varies from 1.5 percent at its mouth to 9.0 percent in the upper basin. The elevations in the basin range from 9,017 feet at its mouth to 11,000 feet. Beginning at Swan Mountain Road, 1.6 miles of the creek were studied. Development is concentrated near the upper study limit.

The Snake River Basin forms the easternmost section of the Blue River Basin. The Snake River Basin drains in a westerly direction, from an elevation of 14,270 feet at Grays Peak along the Continental Divide south of Loveland Pass, to Dillon Reservoir at an elevation of 9,000 feet. The basin is approximately 7 miles wide throughout and 12 miles long with a

drainage area of 76 square miles at Dillon Reservoir. The channel slope ranges from 5.7 percent in the upper basin above the Town of Montezuma to 1.1 percent in the study reach near the Keystone Ski Area. The study reaches within the Snake River Basin include a portion of the North Fork of the Snake River and a portion of the Snake River near Keystone.

2.3 Principal Flood Problems

Major floods on the streams in Summit County are caused by the melting of the winter accumulation of snow. As the temperatures rise, the snowmelt runoff increases, generally reaching a peak sometime in June and receding to normal flow by mid-July or August (Reference 13). Rains that occur prior to mid-June do not increase the streamflows appreciably. However, after peak runoffs have occurred and snowmelt begins to decrease, rainfall usually increases the runoff. Rains that occur in July and August have a greater potential for causing major flooding.

According to stream gage records, approximately 97 percent of the annual peak flows in the Blue River basin have been the result of melting winter snow accumulations (Reference 13). Spring runoff usually begins the first week in April, increases to a peak by mid-June, and then returns to a normal flow by early August. Rainfall occurs in the basin; however, this is primarily after the peak snowmelt period. These summer rainstorms rarely cause floodflows (References 11 and 14).

There have been no serious flood problems along the Blue River downstream of Dillon since the Dillon Reservoir began operating in 1963. The highest discharge has been 2,010 cfs, which is less than the 10-percent annual chance flood event. The longest flood on record prior to the construction of the dam was in 1918. The combined flow of the Blue River, Ten Mile Creek, and the Snake River was 3,500 cfs, just upstream from the present location of Silverthorne. According to U.S. Geological Survey (USGS) records, high flows have been recorded during May and June of several other years on all three streams. However, no significant damage was reported (References 13 and 15).

One of the largest discharges recorded during the 64 years of record on the Blue River near Dillon was 1250 cubic feet per second (cfs), which occurred on June 17, 1965. The high discharge was a result of snowmelt and a high-intensity thunderstorm center centered on a tributary above the Town of Breckenridge; it was a 2-percent annual chance flood event. Flooding within the Town of Breckenridge was caused by backwater from blocked culverts and bridges (Reference 16). Many of the culverts have since been replaced; however, if these become blocked, they would again cause flooding around the major crossings. Some shallow flooding is caused by the culverts backing up and overland flow from gulches.

The most recent flood occurred on July 23, 1965. This flood was caused by a high-intensity storm over a tributary. As in the storm earlier that year, the Blue River topped its banks; however, damage was not as extensive.

During the time of this storm, the other rivers in the county were at their peaks (Reference 16).

Flooding along Tenmile and Meadow Creeks in the Town of Frisco normally occurs from May through September. Floodwaters may result from snowmelt and/or intense rainstorms. Records of damages resulting from past floods of Tenmile and Meadow Creeks were not available. However, flows approximately equaling the computed 1-percent annual chance discharge were recorded on June 16, 1965, along Tenmile Creek.

Flooding along Straight Creek and Willow Creek normally occurs from April to July. Floodwaters can breach a private road to the south of Willow Creek, causing a ponding effect along State Highway 9.

2.4 Flood Protection Measures

The major flood protection measures for Summit County are Dillon Dam and Dillon Reservoir, which are located just upstream from Silverthorne on the Blue River. The reservoir receives flows from three of the major streams in the county: Blue River, Snake River, and Tenmile Creek. The reservoir storage significantly reduces the peak discharges of frequent floods and is also used to control discharges of Blue River through Silverthorne to Green Mountain Reservoir. The primary function of the Dillon Reservoir is collection and storage of snowmelt runoff for domestic use on the eastern slope. The structure is an earth fill dam, approximately 231 feet high at its maximum section, with a 32-foot crest width. The reservoir, when at the full reservoir water-surface elevation of 9,017 feet, has a total storage capacity of 261,800 acre-feet (References 13, 17, and 18).

The Goose Pasture Tarn, a small reservoir immediately upstream of Breckenridge, also serves as a flood protection measure for Blue River. The tarn has a drainage area of approximately 43.5 square miles, a storage capacity of nearly 1000 acre-feet, and a spillway design capacity of 5000 cubic feet per second. The reservoir is important in reducing the peak discharge of Blue River due to rainfall. The reduction, however, is only marginal for runoff due to snowmelt, which is normally the major cause of peak flows (References 10 and 13).

Other reservoirs in the Blue River basin above Breckenridge provide only incidental flood protection (Reference 13).

The recent changes that have been made in the Blue River Middle Branch channel through part of Breckenridge will significantly reduce flood potential in the town. The improvements were made with the intention to contain a 1-percent annual chance flood. During a 1-percent annual chance flood event much of the flow, which previously would have spilled over the banks, will now be confined to the channel, particularly in the areas from the northern corporate limits to approximately 400 feet downstream of Watson Road; from approximately 600 feet downstream of Lincoln Avenue to the Washington Avenue footbridge; and, in the area of the Four Seasons shopping center.

No other structures such as dams, levees, dikes, canals, or other flood control devices were found to provide protection from the 1-percent annual chance flood event.

Summit County is provided some protection from floods through flood warning and forecasting by the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service (NWS).

3.0 ENGINEERING METHODS

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

Peak discharge-drainage area relationships for all flooding sources studied by detailed methods are in Table 2, "Summary of Discharges."

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 Hydrology Report for the Summit County Flood Insurance Study completed in 1978 (Reference 11) contained the discharge-frequency data that were tabulated. Stream gage data for a particular study reach were statistically analyzed to compute peak flow rates for specific recurrence intervals. This was done for the Snake River using data from Gage No. 475 and for Tenmile Creek using data from Gage No. 501. Adjustments for locations other than at the gage station were made by making a discharge versus drainage area comparison.

A regional regression analysis was performed to provide a basis for estimating flows from ungaged drainage basins having similar characteristics of gaged drainage basins. A single variable (drainage area) algorithm was developed from the regression analysis for each selected flood frequency. These algorithms were converted into a graphical depiction (Reference 11) of drainage area versus peak flow rate with each line representing all values of the same frequency event.

For smaller basins (less than 30 square miles), the rainfall events were investigated using the Soil Conservation Service (SCS) TR-20 model. The 0.2-percent annual chance peak flow due to rainfall was found to be much higher than the 0.2-percent annual chance peak flow due to snowmelt. The 2-, 1- and 0.2-percent annual chance regression lines were modified to incorporate the discharge versus drainage area relationship obtained by the SCS procedure.

The Breckenridge Floodplain Information Report (Reference 16), completed in 1975, derived frequency-discharge relationships for certain tributaries within the Town of Breckenridge. Synthetic storms were derived from the statistical analysis of rainfall data as presented in Technical Paper 40 of the U.S. Department of Commerce, Weather Service. The peak flow rate data for French Gulch and the Blue River (downstream of Goose Pasture Tarn) are contained in the 1975 report, and provide peak flow rates for the 10-, 1- and 0.2-percent annual chance flood events.

The Master Drainage Plan for Breckenridge (Reference 19), prepared in 1986, contains a statistical analysis of 21 individual gage stations. A regional frequency analysis, similar to the analysis described in Reference 11, was performed to determine if the peak discharge values from Reference 16 were still representative. The results from the 1986 Master Plan Study as compared to the FEMA values were in close agreement; therefore, the peak discharge values were considered still valid. Formulas were derived for the 10-, 2-, and 1-percent annual chance flood events. The tributaries to the Blue River, which have drainage areas ranging from 0.8 to 11.1 square miles, were analyzed using the HEC-1 computer model. The HEC-1 run provided runoff rates produced by rainfall. The results indicated that the peak flow rates for the lower return periods, such as the 10-percent annual chance flood event, were dominated by snowmelt values as calculated using the regional regression analysis. For the 2- and 1-percent annual chance floods, the HEC-1 results were adopted as peak flow rates.

For the original study, the discharge-frequency data for the Blue River within Silverthorne were developed in a report entitled "Hydrology Report, Blue River Downstream of Dillon Reservoir, Summit County, Colorado", (Reference 17). In brief, the approach used considers the total inflow to the Dillon Reservoir and its routing through the reservoir to obtain the 10-, 2-, 1- and 0.2-percent annual chance discharges on the Blue River downstream of the Dillon Dam. The contribution of the local inflow or the tributaries' flows to the Blue River discharges is also described.

In order to determine the peak flows for the Blue River below Dillon Dam, the current gage record (through water year 1994) was compared to the flood frequency values provided in the 1978 FIS report for the Town of Silverthorne (References 20 and 21), by a statistical analysis of the USGS gage (09050700) below the dam (Reference 22) using the HEC-FFA program. It was found that there was not a significant difference between the values so the peak flows from the 1978 FIS flood frequency values were used.

Flood discharges for the 10-, 2-, 1-, and 0.2-percent annual chance flood events on Tenmile Creek were calculated using regression equations based on a regional analysis of all the gages within Summit County. At each gaging station, the annual flood peaks due to snowmelt and due to rainfall were separated. Using log-Pearson Type III distribution, the

10-, 2-, 1-, and 0.2-percent annual chance discharges were obtained separately for snowmelt events and rainfall events (Reference 23). The data showed that, except for small drainage basins (less than 10 square miles), the snowmelt events yielded higher discharge peaks than the rainfall events for the flow frequencies used in this study. Using snowmelt event gage records, regression equations were developed for the 10-, 2-, 1-, and 0.2-percent annual chance discharges as a function of drainage area.

Flood discharges for Meadow Creek were determined by modifying the drainage area-discharge relationships to include the effect of rainfall events on smaller drainage basins using a synthetic hydrograph approach.

The peak flows for Willow Creek and Straight Creek were developed using the USGS regional regression equations (Reference 23).

The peak flow rates used in this study were either taken directly from previous Flood Insurance Studies or other studies, derived from other frequencies using log-probability plots, or calculated using regression equations from previously referenced studies (for small basins regression lines were adjusted to consider rainfall effects).

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
Alpine Rock Overflow					
At confluence with Blue River (Above Dillon Reservoir)	--[1]	1	28	65	155
Blue River (Above Green Mountain Reservoir)					
Just downstream of Dillon Dam	335.0	2,500	3,100	3,350	3,800
Just upstream of Straight Creek	336.1	2,510	3,110	3,360	3,810
Just downstream of Straight Creek	355.8	2,620	3,260	3,520	4,010
Just upstream of Willow Creek	362.7	2,660	3,310	3,625	4,080
Just downstream of Willow Creek	376.6	2,740	3,410	3,700	4,220
Just upstream of Hamilton Creek	380.0	2,760	3,440	3,730	4,260
Just downstream of Hamilton Creek	381.5	2,770	3,450	3,740	4,280
Just upstream of Bushee Creek	383.8	2,780	3,470	3,760	4,300
Just downstream of Bushee Creek	390.3	2,820	3,520	3,810	4,370
Just upstream of Maryland Creek	394.7	2,840	3,550	3,775	4,420
Blue River (Above Dillon Reservoir)					
Approximately 200 feet downstream of Broken Lance Drive	43.5	450	850	900	1,200
Approximately 4,100 feet upstream of Swan River	81.0	780	1,040	1,210	1,530
Just Upstream of Dillon Reservoir	129.0	1,010	1,330	1,540	1,900
Blue River Middle Branch[2]					
Below Goose Pasture Tarn	43.5	450	850	900	1,200
Below Lehman Gulch	46.8	500	850	900	1,300
Below Illinois Gulch	50.8	500	850	900	1,400
Below Sawmill Gulch	52.8	550	850	900	1,400
Braddock Wetlands Split					
At confluence with Blue River (Above Dillon Reservoir)	--[1]	3	28	65	140

[1] Data not computed

[2] Discharges in the study area are relatively independent of drainage areas due to locations of storm center

Table 2 – Summary of Discharges (Continued)

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
Cucumber Gulch					
At confluence with Blue River Middle Branch	3.3	14	211	308	--[3]
French Gulch					
At Magnum Bonum Drive	11.1	280	490	710	880
Illinois Gulch					
At confluence with Blue River Middle Branch	3.5	130	240	330	520
Jones Gulch					
At confluence with Blue River Middle Branch	0.7	3	46	69	--[1]
Jug Creek					
Just upstream of confluence with Miners Creek	0.8	80	130	200	320
Lehman Gulch					
At confluence with Blue River Middle Branch	3.0	200	380	580	750
Meadow Creek					
Just upstream of Dillon Reservoir	5.8	125	175	280	340
Upstream from confluence with South Fork Meadow Creek	4.7	110	160	230	330
Miners Creek					
Just upstream of confluence with Jug Creek	4.9	120	170	230	330
Upstream of Dillon Reservoir	6.8	140	185	250	350
No Name Creek					
Just upstream of confluence with Jug Creek	0.8	35	85	135	280
North Fork Snake River					
At confluence with Snake River	15.6	270	430	510	720
Sawmill Gulch					
Downstream of 4 O'clock Road	1.8	--[1]	--[1]	130	--[1]
Upstream of 4 O'clock Road	2.4	--[1]	--[1]	190	--[1]
Upstream of Limit of Detailed Study	3.0	--[1]	--[1]	248	--[1]

[3] Data not computed

Table 2 – Summary of Discharges (Continued)

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
Snake River					
Approximately 3,500 feet upstream of Keystone Road	61.0	975	1,230	1,320	1,520
Just upstream of confluence with North Fork Snake River	42.1	730	900	980	1,200
South Barton Gulch					
Approximately 2,800 feet downstream of American Road	3.5	100	215	320	475
Straight Creek					
At confluence with Willow Creek	19.7	393	504	550	652
At confluence with Laskey Gulch	18.3	374	478	522	619
Swan River					
At confluence with Blue River	38.5	550	660	700	770
Tenmile Creek					
At Dillon Reservoir	94.2	1,500	1,820	1,980	2,190
Below North Tenmile Crook Gage No. 1501	93.3	1,450	1,780	1,900	2,130
Above confluence with North Tenmile Creek	79.0	1,335	1,590	1,710	1,910
At confluence with Tenmile Creek Side Channel 1	--[4]	1,070	1,310	1,400	1,570
At confluence with Tenmile Creek Side Channel 2	--[1]	1,500	1,820	1,900	2,190
Tenmile Side Channel 1					
Just upstream of confluence with Tenmile Creek	--[1]	380	470	500	560
Tenmile Side Channel 2	--[1]	30	35	40	60
Just upstream of confluence with Tenmile Creek					
Willow Creek					
At confluence with Blue River	13.9	309	394	430	508

[4] Data not computed

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.

The hydraulic analyses for the following streams studied using detailed methods were performed using the USACE HEC-2 step-backwater program (Reference 24): Blue River (Above Green Mountain Reservoir), Blue River (above Dillon Reservoir), Blue River Middle Branch, Cucumber Gulch, French Gulch, Illinois Gulch, Jones Gulch, Jug Creek, Lehman Gulch, Meadow Creek, Miners Creek, No Name Creek, North Fork Snake River, Sawmill Gulch, Snake River, Soda Creek, South Barton Gulch, Swan River, Tenmile Creek, Tenmile Creek Side Channel 1, Tenmile Creek Side Channel 2, and West Tenmile Creek.

Water-surface elevations of floods of the selected recurrence intervals for Straight Creek and Willow Creek were computed through use of the USACE HEC-RAS step-backwater computer program (Reference 25).

Starting water-surface elevations for the following streams were calculated using the slope-area method: Blue River (Above Green Mountain Reservoir), Blue River (above Dillon Reservoir), French Gulch, Meadow Creek (lower portion), Miners Creek, South Barton Gulch , Straight Creek, Tenmile Creek (lower portion), Tenmile Creek Side Channel 1, Tenmile Creek Side Channel 2, and Willow Creek. For the following streams, the WSELs were chosen based on coincident peaks: Swan River, North Fork Snake River, Jug Creek, and No Name Creek. The starting water surface elevations for Meadow Creek (upper portion), the Snake River, and Tenmile Creek (upper portion) were chosen from contiguous studies. Starting water-surface elevations for Lehman Gulch and Sawmill Gulch were obtained from normal depth calculations. Starting water-surface elevations for Blue River Middle Branch and Cucumber, Illinois, and Jones Gulches were determined by the slope-area method or predetermined elevations. For Soda Creek, starting water surface elevations were taken at Dillon Reservoir. Starting water surface elevations for West Tenmile Creek were chosen from the water-surface profiles for Tenmile Creek.

For Blue River Middle Branch, Cucumber Gulch, Illinois Gulch, and Jones Gulch, cross-section and geometric data, such as culvert sizes, inverts, bridge dimensions, and roadway elevations, were obtained from a variety of sources. Information from the original Flood Insurance Studies for the Town of Breckenridge and the unincorporated areas of Summit County (References 26 and 27), served as a base. Additionally, cross sections were surveyed specifically for the restudy, particularly in areas where the topography was known to have changed. Restudies of the floodplain had been conducted for recent developments

in the Town of Breckenridge. Several short sections of river had been surveyed for projects such as pipeline crossings or new bridge construction. This information was also incorporated into the restudy. Finally, the 1980 Breckenridge Town Topographic Mapping was used in areas where it was known that conditions changed between the time of the original study and production of the Breckenridge Town Topographic Mapping.

Cross sections for Blue River (Above Green Mountain Reservoir), Straight Creek, and Willow Creek were obtained from topographic maps and cross section surveys. The Town of Silverthorne Geographic Information System (GIS) (Reference 27) coverage for topography (1994) was combined with cross sections obtained by field survey for a complete description of the floodplain.

Cross sections for the remaining reaches were obtained through field surveys, existing topographic maps, and/or previous HEC-2 input data as follows:

Blue River (above Dillon Reservoir) - Surveys and Topographic Maps
Blue River (above Dillon Reservoir) - Approximate Study Reach: Field Reconnaissance and structures measured
French Gulch - Surveys, Topographic Maps, and HEC-2 data
Jug Creek - Topographic Maps
Lehman Gulch - Field Surveys and Topographic Maps
Meadow Creek - Surveys, Topographic Maps, and HEC-2 data
Miners Creek - Surveys, Topographic Maps, and HEC-2 data
No Name Creek - Topographic Maps
North Fork Snake River - Surveys (structures only), Topographic Maps, and HEC-2 data
Sawmill Gulch - Field Surveys and Topographic Maps
Snake River - Surveys (structures only), Topographic Maps, and HEC-2 data
Soda Creek - Field surveys and Topographic Maps
South Barton Gulch - Surveys
Swan River - Surveys
Tenmile Creek - Surveys, Topographic Maps, and HEC-2 data
Tenmile Creek Side Channel 1 - Surveys, Topographic Maps, and HEC-2 data
Tenmile Creek Side Channel 2 - Surveys, Topographic Maps, and HEC-2 data
West Tenmile Creek - Field Surveys and Topographic Maps

All bridges were field checked to obtain elevation data and structural geometry.

Channel roughness factors used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and floodplain areas. The ranges of "n" values for the streams in this study are in Table 3.

Flooding from the Blue River Middle Branch in the Town of Breckenridge is reduced by an overflow channel downstream of cross section D, outside the corporate limits. The backwater analysis for the Blue River Middle Branch has been computed for the reduced flow resulting from this over flow.

The split flow option of HEC-2 was used to determine the quantity of flow leaving the channel banks of the Blue River (above Dillon) and the flow leaving the banks of Tenmile Creek. The depths associated with this flooding were determined using Manning's "n" equation.

The Dillon Reservoir base flood elevation was determined to be 9,024.4 NAVD, and controls the flooding at the mouths of the Blue River, and Tenmile, Meadow, and Miners Creeks.

The Dillon Reservoir controls the flooding at the mouths of Tenmile Creek, Meadow Creek, and Miners Creek.

Table 3 – Manning's "n" Values

Flooding Source	Channel	Overbanks
Alpine Rock Overflow	0.030	0.035
Blue River (Above Green Mountain Reservoir)	0.040	0.100
Blue River (Above Dillon Reservoir)	0.040-0.065	0.050-0.120
Blue River Middle Branch	0.035-0.050	0.035-0.100
Braddock Wetlands Split	0.050	0.080
Cucumber Gulch	0.040	0.100
French Creek	0.035	0.035-0.050
Illinois Gulch	0.040	0.040-0.100
Jones Gulch	0.035-0.050	0.035-0.100
Jug Creek	0.035-0.045	0.040-0.050
Lehman Gulch	0.040	0.040-0.100
Meadow Creek	0.025-0.080	0.035-0.200
Miners Creek	0.060-0.100	0.100-0.150
No Name Creek	0.030-0.040	0.040-0.050
North Fork Snake River	0.045-0.060	0.080
Sawmill Gulch	0.040	0.040-0.100
Snake River	0.040-0.045	0.080
Soda Creek	0.035	0.060
South Barton Gulch	0.120	0.150
Straight Creek	0.040	0.100
Swan River	0.035-0.080	0.060-0.100
Tenmile Creek	0.040-0.100	0.060-0.160
Tenmile Creek Side Channel 1	0.040-0.100	0.060-0.160
Tenmile Creek Side Channel 2	0.040-0.100	0.060-0.160
West Tenmile Creek	0.035-0.050	0.030-0.070
Willow Creek	0.040	0.100

The depths for the areas of shallow sheet flow were determined using normal depth calculations.

The elevation for the shallow ponding area near Lehman Gulch was determined using culvert computations to estimate the inflow from the Blue River.

Due to the meandering nature of Meadow Creek, a Profile Base Line is presented to show the actual flow pattern during a 1-percent annual chance flood.

Snake River, near its upstream limit of study, splits into two channels under normal flow conditions. However, during the 1-percent annual chance flood, one flow is actually present. A Profile Base Line is presented for this area to show the 1-percent annual chance flood flow path.

Shallow flooding along Blue River, West Tenmile Creek, and Snake River was determined by hand calculations based on normal depths.

Approximate 1-percent annual chance flood elevations for the Blue River (above the Town of Blue River) were determined using inlet control charts and normal depth at road crossings and normal-depth calculations for typical stream cross sections.

Approximate 1-percent annual chance flood elevations for Blue River, Snake River, Soda Creek, and French Gulch were determined using normal-depth calculations in conjunction with topographic maps (References 28 through 36).

Approximate 1-percent annual chance flood elevations for South Barton Gulch were determined by normal-depth hand calculations.

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.

Locations of selected cross sections used in the hydraulic analyses are shown on the flood profiles (Exhibit 1) and on the Flood Insurance Rate Map (Exhibit 2).

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

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. In some cases, it was necessary to divide each reach into multiple sections in order for the maximum offset from the average conversion factor to be less than or equal to 0.25 feet.

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 4.

Table 4 – Datum Conversion Factors

Stream/Reach	Conversion from NGVD29 to NAVD88 (ft)
Blue River (Above Green Mountain Reservoir)	5.1
Blue River (Above Dillon Reservoir)	5.5
Blue River Middle Branch	5.8
Cucumber Gulch	5.8
French Gulch	5.9
Illinois Gulch	6.0
Jones Gulch	5.7
Jug Creek	5.7
Lehman Gulch	5.8
Meadow Creek	5.4
Miners Creek	5.6
No Name Creek	5.5
North Fork Snake River	5.7
Sawmill Gulch	5.8
Snake River	5.6
Soda Creek	5.5
South Barton Gulch	5.8
Straight Creek	5.5
Swan River	5.7
Tenmile Creek	5.6
Tenmile Creek Side Channel 1	5.6
Tenmile Creek Side Channel 2	5.6
West Tenmile Creek	5.7

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

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 floodplain management purposes. The 0.2-percent annual chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent annual chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:1,200, 1:2,400, 1:4,800, 1:24,000 (enlarged to a scale of 1:6,000) and 1:24,000, with a contour intervals of 2, 10 and 40 feet (References 37 through 41, and 46). Shallow flooding boundaries were delineated on topographic maps at a scale of 1:1,200 (References 27, 28, 34, 38, 39, and 47 through 50).

The stream channel for Blue River has been relocated south of Belford Street near Eighth Avenue. The new stream location was obtained from a school site plan dated July 1978 (Reference 51).

The approximate 1-percent annual chance flood boundaries for Blue River and Soda Creek were delineated by use of information from topographic maps (References 28, 30, 32, and 34) and the computed flood elevations.

The approximate 1-percent annual chance flood boundaries for Snake River were delineated using information from topographic maps (References 29 and 33), the Flood Hazard Boundary Map for Summit County (Reference 52), and computed flood elevations. The approximate 1-percent annual chance flood boundary for South Barton Gulch was taken from the Flood Hazard Boundary Map for Summit County (Reference 52).

The approximate 1-percent annual chance flood boundary for French Gulch was taken from a Floodplain Information report for Breckenridge (Reference 16), and studied in conjunction with the computed flood elevations. Lower portions of French Gulch have been relocated since the Floodplain Information report was completed. The new stream location and flood boundary were adjusted using photoquadrangle and topographic maps (References 35 and 36).

Approximate boundaries in some portions of the study area were taken from FEMA's Flood Hazard Boundary Maps (Reference 52 and 53).

All approximate 1-percent annual chance flood boundaries were redelineated using USGS 7.5 Minute Quadrangle Maps for this revision.

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

For the streams studied by approximate methods, only the 1-percent annual chance floodplain boundary is shown on the FIRM (Exhibit 2).

4.2 Floodways

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

A floodway was not computed for Meadow Creek because it is not appropriate due to the wetland habitat of the area. In addition, the floodway was computed for French Gulch by considering the entire 1-percent annual chance peak discharge.

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 5). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

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

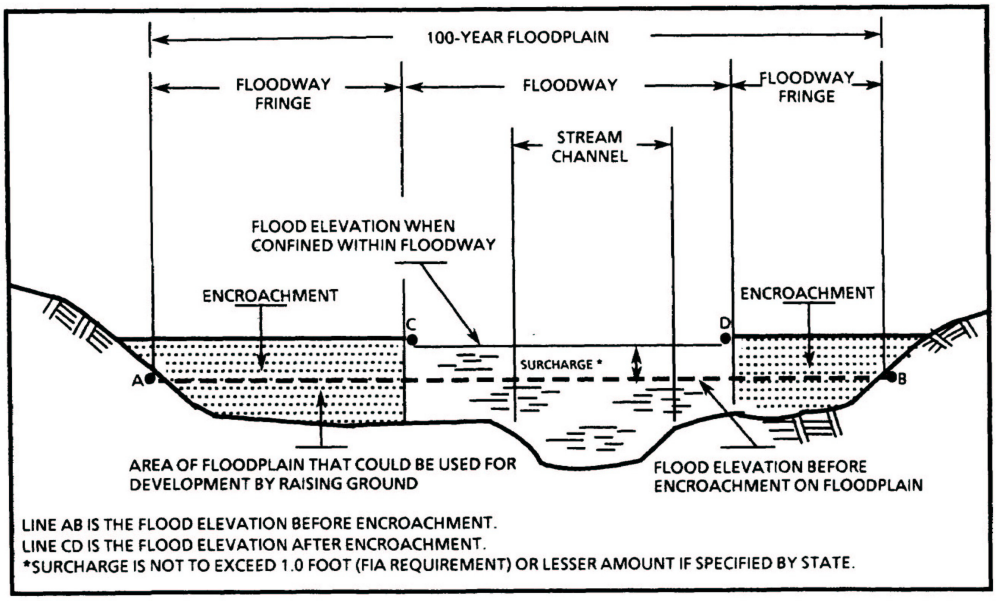

Figure 1 – Floodway Schematic

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)
BLUE RIVER (ABOVE GREEN MOUNTAIN RESERVOIR)								
A-AI[2]								
AJ	86,720	575	1,065	3.5	8,570.5	8,570.5	8,571.1	0.6
AK	88,303	77	432	8.7	8,584.2	8,584.2	8,584.9	0.7
AL	89,160	102	473	8.0	8,589.9	8,589.9	8,590.4	0.5
AM	90,562	159	613	6.1	8,600.6	8,600.6	8,600.6	0.0
AN	91,822	82	401	9.4	8,608.7	8,608.7	8,608.8	0.1
AO	94,530	644	868	4.3	8,628.3	8,628.3	8,628.7	0.4
AP	96,121	136	510	7.4	8,638.8	8,638.8	8,639.2	0.4
AQ	96,678	122	545	6.8	8,642.9	8,642.9	8,643.4	0.5
AR	98,509	211	696	5.4	8,656.0	8,656.0	8,656.7	0.7
AS	99,800	198	757	5.3	8,666.9	8,666.9	8,666.9	0.0
AT	100,864	82	441	8.5	8,674.8	8,674.8	8,675.0	0.2
AU	102,493	100	399	9.1	8,690.1	8,690.1	8,690.1	0.3
AV	104,034	168	637	5.7	8,703.6	8,703.6	8,703.7	0.1
AW	105,076	200	960	3.8	8,712.9	8,712.9	8,713.7	0.8
AX	106,048	156	423	8.6	8,719.7	8,719.7	8,719.8	0.1
AY	107,321	77	463	7.8	8,731.1	8,731.1	8,731.5	0.4
AZ	108,330	79	356	10.2	8,738.5	8,738.5	8,738.9	0.4
BA	109,762	129	372	9.7	8,749.6	8,749.6	8,749.6	0.0

[1]Feet above Confluence with Green Mountain Reservoir
[2]Floodway Not Computed

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BLUE RIVER
(ABOVE GREEN MOUNTAIN RESERVOIR)

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)
BLUE RIVER (ABOVE GREEN MOUNTAIN RESERVOIR)								
BB	110,923	110	579	6.3	8,761.5	8,761.5	8,761.5	0.0
BC	112,192	147	576	6.3	8,770.3	8,770.3	8,770.3	0.0
BD	113,456	86	470	7.1	8,779.4	8,779.4	8790.3	0.7

[1]Feet above Confluence with Green Mountain Reservoir

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BLUE RIVER
(ABOVE GREEN MOUNTAIN RESERVOIR)

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)
BLUE RIVER (ABOVE DILLON RESERVOIR)								
BE	1,000	404	508	6.5	9,025.7	9,025.7	9,025.7	0.0
BF	1,600	106	271	5.7	9,034.1	9,034.1	9,034.6	0.5
BG	2,421	93	215	7.2	9,044.4	9,044.4	9,044.4	0.0
BH	2,932	47	196	7.8	9,050.4	9,050.4	9,050.7	0.3
BI	4,150	187	444	3.5	9,065.6	9,065.6	9,066.0	0.4
BJ	4,900	40	209	8.1	9,076.3	9,076.3	9,076.3	0.0
BK	5,628	90	277	5.6	9,083.6	9,083.6	9,083.7	0.1
BL	6,607	109	451	5.3	9,095.2	9,095.2	9,095.9	0.7
BM	7,647	70	300	5.1	9,107.9	9,107.9	9,107.9	0.0
BN	8,607	94	330	7.2	9,117.9	9,117.9	9,118.7	0.8
BO	9,407	59	254	5.5	9,128.1	9,118.1	9,118.7	0.6
BP	9,897	58	254	6.1	9,132.3	9,132.3	9,132.3	0.0
BQ	16,055	49	160	7.6	9,210.2	9,210.2	9,210.5	0.3
BR	16,598	51	133	9.1	9,217.7	9,217.7	9,218.0	0.3
BS	17,008	281	371	3.3	9,224.0	9,224.0	9,224.3	0.3
BT	17,357	35	116	10.4	9,227.8	9,227.8	9,227.8	0.0
BU	17,783	51	232	5.2	9,229.8	9,229.8	9,230.1	0.3
BV	18,171	36	152	8.0	9,234.7	9,234.7	9,235.0	0.3
BW	18,864	33	131	9.2	9,240.4	9,240.4	9,241.0	0.6
BX	19,170	28	132	9.2	9,244.7	9,244.7	9,245.6	0.9
BY	19,535	37	146	8.3	9,250.7	9,250.7	9,251.4	0.7

[1]Feet above Confluence with Dillon Reservoir

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BLUE RIVER (ABOVE DILLON RESERVOIR)

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)
BLUE RIVER (ABOVE DILLON RESERVOIR)								
BZ	19,906	22	101	12.0	9,260.2	9,260.2	9,260.3	0.1
CA	20,083	20	95	12.1	9,269.8	9,269.8	9,270.1	0.3
CB	20,268	49	225	5.1	9,274.6	9,274.6	9,275.4	0.8

[1]Feet above Confluence with Dillon Reservoir

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BLUE RIVER (ABOVE DILLON RESERVOIR)

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)
BLUE RIVER MIDDLE BRANCH								
A	435	112	170	7.0	9,347.9	9,347.9	9,347.9	0.0
B	983	109	227	5.3	9,353.7	9,353.7	9,354.0	0.3
C	1,556	51	181	6.6	9,361.6	9,361.6	9,362.1	0.5
D	2,012	62	170	7.0	9,366.4	9,366.4	9,366.4	0.0
E	2,429	70	145	8.3	9,375.8	9,375.8	9,376.2	0.4
F	2,957	120	440	2.7	9,382.7	9,382.7	9,382.7	0.0
G	3,386	64	241	5.0	9,389.1	9,389.1	9,389.1	0.0
H	3,867	87	374	3.2	9,397.3	9,397.3	9,397.3	0.0
I	4,445	57	136	8.8	9,408.3	9,408.3	9,408.3	0.0.
J	4,946	70	302	4.0	9,416.2	9,416.2	9,416.7	0.5
K	5,368	84	336	3.6	9,425.4	9,425.4	9,425.4	0.0
L	5,901	65	140	8.6	9,434.3	9,434.3	9,434.3	0.0
M	6,526	125	228	5.3	9,447.1	9,447.1	9,447.1	0.5
N	7,011	99	1,069	1.1	9,462.1	9,462.1	9,462.1	0.0
O	7,482	123	468	2.6	9,462.3	9,462.3	9,462.4	0.1
P	7,954	43	126	9.5	9,469.9	9,469.9	9,469.9	0.0
Q	8,464	47	136	8.8	9,481.7	9,480.7	9,481.7	0.0
R	9,074	63	116	7.7	9,490.4	9,490.4	9,490.8	0.4
S	10,000	54	127	7.1	9,508.0	9,508.3	9,508.3	0.0
T	10,413	38	113	8.0	9,514.3	9,514.3	9,514.3	0.0
U	10,994	43	103	8.7	9,524.1	9,524.1	9,524.1	0.0

[1]Feet above County Road 3

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BLUE RIVER MIDDLE BRANCH

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)
BLUE RIVER MIDDLE BRANCH								
V	11,462[1]	51	127	7.1	9,540.9	9,540.9	9,540.9	0.0
W	11,949[1]	22	189	4.8	9,554.5	9,554.5	9,554.5	0.0
X	12,481[1]	29	92	9.8	9,561.6	9,561.6	9,561.6	0.0
Y	12,923[1]	33	101	8.9	9,573.0	9,573.0	9,573.0	0.0
Z	13,445[1]	30	108	8.4	9,581.1	9,581.1	9,581.1	0.0
AA	13,754[1]	48	211	4.3	9,586.3	9,586.3	9,586.3	0.0
AB	13,953[1]	32	178	5.0	9,587.9	9,587.9	9,588.2	0.4
AC	14,126[1]	36	102	8.8	9,589.4	9,589.4	9,589.4	0.0
AD	14,297[1]	32	350	2.6	9,592.7	9,592.7	9,592.7	0.0
AE	14,505[1]	25	85	10.2	9,594.6	9,594.6	9,594.6	0.0
AF	14,793[1]	44	282	3.2	9,612.7	9,612.7	9,612.7	0.0
AG	14,975[1]	29	119	7.6	9,612.7	9,612.7	9,612.7	0.0
AH	15,235[1]	145	674	1.3	9,617.6	9,617.6	9,617.6	0.0
AI	15,651[1]	85	349	2.6	9,617.6	9,617.6	9,617.6	0.0
AJ	15,798[1]	37	164	5.5	9,620.1	9,620.1	9,620.4	0.3
AK	16,113[1]	114	150	6.0	9,626.4	9,626.4	9,626.4	0.0
AL	16,408[1]	69	133	6.8	9,632.2	9,632.2	9,632.2	0.0
AM	10,350[2]	20	79	11.3	9,645.7	9,645.7	9,646.1	0.4
AN	11,125[2]	63	174	5.2	9,664.5	9,664.5	9,665.1	0.6
AO	11,935[2]	30	124	7.3	9,678.9	9,678.9	9,679.6	0.7
AP	12,765[2]	24	99	9.1	9,694.0	9,694.0	9,694.4	0.4

[1]Feet above County Road 3
[2]Feet above Cemetery Road

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BLUE RIVER MIDDLE BRANCH

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)
BLUE RIVER MIDDLE BRANCH								
AQ	13,435	62	200	4.5	9,704.5	9,704.5	9,705.2	0.7
AR	14,295	91	273	3.3	9,724.8	9,724.8	9,725.7	0.9
AS	15,190	20	79	11.4	9,743.4	9,743.4	9,743.7	0.3
AT	16,560	28	111	8.1	9,779.8	9,779.8	9,780.5	0.7
AU	17,140	34	148	6.1	9,790.3	9,790.3	9,790.5	0.2
AV	18,049	73	205	4.4	9,802.1	9,802.1	9,802.7	0.6
AW	18,834	39	140	6.4	9,813.4	9,813.4	9,813.9	0.5

[1]Feet above Cemetery Road

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BLUE RIVER MIDDLE BRANCH

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)
CUCUMBER GULCH								
A	228	20	108	2.8	9,466.3	9,466.3	9,466.9	0.6
B	344	20	151	2.0	9,467.0	9,467.0	9,467.6	0.6
C	521	20	69	4.5	9,466.9	9,466.9	9,467.6	0.7
D	643	20	79	3.9	9,469.3	9,469.3	9,469.3	0.0
E	828	20	43	7.2	9,469.8	9,469.8	9,469.8	0.0
F	1,098	40	60	5.1	9,481.5	9,481.5	9,481.7	0.2
G	1,593	40	59	5.2	9,500.6	9,500.6	9,500.6	0.0
H	2,158	40	57	5.4	9,517.9	9,517.9	9,517.9	0.0
I	3,010	40	78	3.9	9,553.6	9,553.6	9,554.2	0.6

[1]Feet above Confluence with Blue River Middle Branch

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

CUCUMBER 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)
FRENCH GULCH								
A	150	8.0	50.5	14.1	9,495.5	9,495.5	9,495.5	0.0
B	472	42.9	91.7	9.3	9,503.1	9,503.1	9,503.1	0.0
C	911	24.2	72.8	10.3	9,508.0	9,508.0	9,508.2	0.2
D	1,271	32.6	100.6	7.7	9,517.4	9,517.4	9,517.5	0.1
E	1,649	39.8	85.8	8.7	9,530.7	9,530.7	9,530.9	0.2
F	2,099	33.3	81.3	9.4	9,544.7	9,544.7	9,544.9	0.2
G	2,478	41.9	195.0	4.0	9,565.0	9,565.0	9,565.3	0.3
H	2,818	34.0	80.4	9.0	9,586.6	9,586.6	9,586.6	0.0
I	3,378	31.2	80.4	9.8	9,602.7	9,602.7	9,602.7	0.0
J	3,850	48.9	91.7	7.9	9,625.6	9,625.6	9,625.6	0.0
K	4,246	32.7	83.8	10.0	9,642.9	9,642.9	9,642.9	0.0
L	4,836	28.1	78.6	10.2	9,668.1	9,668.1	9,668.1	0.0

[1]Feet above Confluence with Blue River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

FRENCH 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)
ILLINOIS GULCH								
A	153	49	138	2.4	9,630.9	9,630.9	9,630.9	0.0
B	272	35	83	4.0	9,631.3	9,631.3	9,631.3	0.0
C	373	27	59	5.6	9,631.9	9,631.9	9,631.9	0.0
D	697	35	53	6.2	9,647.9	9,647.9	9,647.9	0.0
E	808	31	109	3.0	9,652.3	9,652.3	9,652.3	0.0
F	1,175	25	45	7.3	9,660.4	9,660.4	9,660.4	0.0
G	1,926	182	150	4.8	9,681.1	9,681.1	9,681.1	0.0
H	2,377	49	69	8.8	9,689.7	9,689.7	9,689.7	0.0
I	2,845	61	82	8.6	9,707.4	9,707.4	9,707.4	0.0
J	3,502	31	44	7.7	9,731.9	9,731.9	9,731.9	0.0
K	3,850	35	125	2.6	9,749.4	9,749.4	9,749.4	0.0

[1]Feet above Confluence with Blue River Middle Branch

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

ILLINOIS 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)
LEHMAN GULCH								
A	125	70	98	5.9	9,635.8	9,635.8	9,636.4	0.6
B	180	18	60	9.7	9,639.0	9,639.0	9,639.6	0.6
C	465	16	55	10.5	9,660.4	9,660.4	9,660.6	0.2
D	830	24	63	9.2	9,685.8	9,685.8	9,685.9	0.1

[1]Feet above Confluence with Blue River Middle Branch

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

LEHMAN 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)
MEADOW CREEK								
A	900	42	76	3.7	9,025.0	9,025.0	9,025.0	0.0
B	1,520	884	672	0.4	9,028.1	9,028.1	9,028.4	0.3
C	4,594	8	53	5.3	9,056.4	9,056.4	9,056.4	0.0
D	4,960	25	51	5.5	9,057.3	9,057.3	9,057.3	0.0
E	5,240	127	204	1.4	9,058.1	9,058.1	9,058.1	0.0

[1]Feet above Dillon Reservoir

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

MEADOW 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)
MINERS CREEK								
A	430	203	149	1.5	9,024.4	9,024.4	9,024.4	0.0
B	1,160	280	193	1.0	9,030.5	9,030.5	9,030.6	0.1
C	1,640	94	389	0.6	9,044.0	9,044.0	9,044.0	0.0
D	2,335	11	38	6.0	9,054.1	9,054.1	9,055.0	0.9
E	2,855	105	185	1.2	9,062.4	9,062.4	9,063.2	0.9
F	3,475	141	88	2.6	9,075.1	9,075.1	9,076.0	0.9
G	4,535	12	34	6.7	9,117.3	9,117.3	9,117.8	0.5

[1]Feet above Dillon Reservoir

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

MINERS 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)
NORTH FORK SNAKE RIVER								
A	270	58	77	6.6	9,337.4	9,337.4	9,337.7	0.3
B	550	13	47	10.9	9,346.8	9,346.8	9,347.1	0.3
C	900	16	51	10.1	9,361.5	9,361.5	9,361.5	0.0
D	1,400	21	56	9.2	9,381.2	9,381.2	9,381.2	0.0
E	1,760	29	216	2.4	9,402.7	9,402.7	9,402.7	0.0
F	2,310	50	88	5.8	9,418.0	9,418.0	9,418.3	0.3
G	2,650	42	69	7.4	9,444.2	9,444.2	9,444.2	0.0

[1]Feet above Confluence with Snake River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

NORTH FORK SNAKE 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)
SNAKE RIVER								
A	75	30	136	10.3	9,183.0	9,183.0	9,183.4	0.4
B	715	35	149	9.4	9,192.9	9,192.9	9,193.7	0.8
C	1,350	185	305	4.6	9,205.9	9,205.9	9,205.9	0.0
D	2,220	200	420	3.3	9,210.7	9,210.7	9,211.7	1.0
E	2,650	130	259	5.4	9,215.4	9,215.4	9,215.4	0.0
F	3,170	113	348	4.0	9,219.9	9,219.9	9,219.9	0.0
G	3,345	69	159	8.8	9,222.1	9,222.1	9,222.1	0.0
H	3,395	69	241	5.8	9,223.3	9,223.3	9,223.3	0.0
I	3,516	62	290	4.5	9,223.8	9,223.8	9,223.8	0.0
J	3,971	40	127	10.2	9,227.4	9,227.4	9,228.0	0.4
K	4,411	86	251	5.2	9,232.0	9,232.0	9,232.5	0.5
L	4,933	160	333	3.9	9,237.1	9,237.1	9,237.3	0.2
M	5,368	87	165	7.9	9,241.8	9,241.8	9,242.0	0.2
N	5,938	112	223	5.8	9,249.7	9,249.7	9,249.9	0.2
O	6,523	99	225	5.8	9,255.3	9,255.3	9,255.3	0.0
P	7,323	171	436	3.0	9,264.5	9,264.5	9,264.6	0.1
Q	7,883	62	226	5.8	9,269.5	9,269.5	9,270.1	0.6
R	8,733	81	249	5.2	9,278.7	9,278.7	9,278.7	0.0
S	9,563	140	555	2.3	9,287.6	9,287.6	9,288.6	1.0
T	10,121	23	110	11.8	9,291.4	9,291.4	9,292.1	0.7
U	10,703	75	268	4.9	9,299.1	9,299.1	9,299.3	0.1
V	11,273	23	106	12.3	9,306.2	9,306.2	9,306.2	0.0

[1]Feet above Confluence with Keystone Gulch

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

SNAKE 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)
SNAKE RIVER								
W	12,023	45	134	9.5	9,313.7	9,313.7	9,313.7	0.0
X	12,533	81	172	7.4	9,319.3	9,319.3	9,319.3	0.0
Y	13,695	106	235	4.8	9,331.7	9,331.7	9,332.2	0.5
Z	14,413	80	224	4.4	9,340.7	9,340.7	9,341.3	0.6
AA	15,504	86	195	5.0	9,351.9	9,351.9	9,352.9	1.0
AB	15,819	104	139	6.6	9,357.1	9,357.1	9,357.3	0.2
AC	16,634	124	165	5.9	9,368.6	9,368.6	9,368.6	0.0
AD	17,447	69	131	7.5	9,378.7	9,378.7	9,378.7	0.0
AE	18,318	85	124	6.3	9,391.9	9,391.9	9,391.9	0.0
AF	18,568	90	125	6.2	9,396.4	9,396.4	9,396.4	0.0
AG	19,113	60	140	7.0	9,406.4	9,406.4	9,406.7	0.3
AH	20,078	110	191	5.1	9,422.8	9,422.8	9,423.4	0.6

[1]Feet above Confluence with Keystone Gulch

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

SNAKE 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)
SODA CREEK								
A	5,980	30	40	6.5	9,083.3	9,083.3	9,083.3	0.0
B	6,405	44	45	5.8	9,088.3	9,088.3	9,088.5	0.2
C	6,490	27	38	6.8	9,090.0	9,090.0	9,090.0	0.0
D	6,740	30	78	3.3	9,091.3	9,091.3	9,091.7	0.4
E	6,900	29	43	6.0	9,091.7	9,091.7	9,091.8	0.3

[1]Feet above Swan Mountain Road

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

SODA 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)
SOUTH BARTON GULCH								
A	0	307	133	2.4	9,397.9	9,397.9	9,397.9	0.0
B	610	225	194	1.7	9,412.9	9,412.9	9,413.2	0.3
C	1,230	111	102	3.1	9,435.8	9,435.8	9,435.8	0.0
D	1,740	60	150	2.1	9,447.6	9,447.6	9,448.2	0.6
E	2,550	31	93	3.4	9,482.2	9,482.2	9,483.2	1.0
F	3,330	27	92	3.5	9,509.7	9,509.7	9,510.7	1.0
G	3,920	213	166	1.9	9,538.9	9,538.9	9,539.0	0.1
H	4,620	26	61	5.2	9,597.7	9,597.7	9,597.7	0.0
I	5,220	20	56	5.8	9,652.8	9,652.8	9,653.3	0.5
J	6,020	30	64	5.0	9,724.8	9,724.8	9,725.2	0.4

[1]Feet above Limit of Detailed Study

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

SOUTH BARTON 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)
STRAIGHT CREEK								
A	98	71	319	1.7	8,786.4	8,786.4	8,786.4	0.0
B	829	20	58	9.4	8,803.6	8,803.6	8,803.8	0.2
C	1,729	24	61	9.0	8,830.4	8,830.4	8,831.3	0.6
D	2,244	32	67	8.2	8,844.9	8,844.9	8,845.0	0.1

[1]Feet above Confluence with Blue River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

STRAIGHT 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)
SWAN RIVER								
A	380	119	512	1.4	9,150.8	9,150.8	9,150.8	0.0
B	1,120	39	118	5.9	9,155.7	9,155.7	9,155.7	0.0
C	1,870	31	98	7.2	9,168.5	9,168.5	9,168.5	0.0
D	2,210	41	142	4.9	9,175.9	9,175.9	9,175.9	0.0
E	3,070	26	73	9.6	9,188.5	9,188.5	9,188.5	0.0
F	3,910	120	276	2.5	9,200.0	9,200.0	9,200.8	0.8
G	4,750	45	177	4.0	9,212.9	9,212.9	9,213.9	1.0
H	5,560	26	105	6.7	9,224.4	9,224.4	9,225.2	0.8
I	5,750	53	197	3.5	9,226.7	9,226.7	9,227.7	1.0

[1]Feet above Confluence with Blue River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

SWAN 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)
TENMILE CREEK								
A	0	96	349	5.7	9,024.4	9,024.4	9,025.0	0.6
B	255	29	190	10.4	9,026.9	9,026.9	9,027.5	0.6
C	1,300	72	312	6.3	9,043.7	9,043.7	9,044.7	1.0
D	1,737	65	326	6.1	9,049.9	9,049.9	9,049.9	0.6
E	1,847	55	188	10.5	9,051.8	9,051.8	9,051.8	0.0
F	2,299	57	235	8.1	9,057.2	9,057.2	9,057.7	0.5
G	2,573	24	118	11.9	9,061.4	9,061.4	9,061.5	0.1
H	2,927	104	251	7.6	9,066.4	9,066.4	9,066.5	0.1
I	3,228	83	281	6.8	9,071.5	9,071.5	9,071.5	0.0
J	3,353	53	246	7.7	9,073.7	9,073.7	9,073.9	0.2
K	3,701	66	224	8.5	9,079.4	9,079.4	9,079.4	0.0
L	3,841	71	250	7.6	9,080.8	9,080.8	9,080.9	0.1
M	4,152	66	259	7.3	9,084.9	9,084.9	9,084.9	0.0
N	4,471	53	223	8.5	9,088.6	9,088.6	9,089.1	0.5
O	4,603	55	196	9.7	9,090.8	9,090.8	9,090.8	0.0
P	4,721	80	242	7.9	9,092.6	9,092.6	9,092.6	0.0
Q	4,914	80	238	8.0	9,095.6	9,095.6	9,095.6	0.0
R	5,057	98	234	8.1	9,097.3	9,097.3	9,097.5	0.2
S	5,131	120	382	5.0	9,098.8	9,098.8	9,099.3	0.5
T	5,367	79	262	7.2	9,101.5	9,101.5	9,101.9	0.4
U	5,472	107	438	4.3	9,103.8	9,103.8	9,104.6	0.8
V	5,645	136	446	4.3	9,104.8	9,104.8	9,105.6	0.8

[1]Feet above Mouth of Dillon Reservoir

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
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								
W	5,777	113	298	6.4	9,107.5	9,107.5	9,107.5	0.0
X	6,200	59	327	5.8	9,113.7	9,113.7	9,113.7	0.0
Y	7,040	50	237	7.2	9,122.1	9,122.1	9,122.9	0.8
Z	7,547	35	149	11.5	9,129.9	9,129.9	9,130.0	0.1

[1]Feet above Mouth of Dillon Reservoir

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
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 SIDE CHANNEL 1								
A	220	35	144	3.5	9,061.4	9,061.4	9,061.5	0.1
B	405	30	69	7.3	9,066.3	9,066.3	9,066.5	0.2
TENMILE CREEK SIDE CHANNEL 2								
A	103	13	35	1.2	9,067.8	9,067.8	9,068.0	0.2
B	366	13	26	1.5	9,070.6	9,070.6	9,070.6	0.0
C	986	19	10	4.1	9,076.3	9,076.3	9,076.3	0.0
D	1,214	22	13	3.0	9,080.7	9,080.7	9,080.7	0.0
E	1,432	33	60	0.7	9,086.6	9,086.6	9,086.6	0.0
F	2,072	16	9	4.4	9,093.5	9,093.5	9,093.6	0.1

[1]Feet above Confluence with Tenmile Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

TENMILE CREEK SIDE CHANNEL 1
TENMILE CREEK SIDE CHANNEL 2

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)
WEST TENMILE CREEK								
N	2,245	34	270	4.4	9,706.0	9,706.0	9,706.0	0.0
O	2,290	65	268	2.8	9,706.2	9,706.2	9,706.2	0.0
P	2,620	40	101	7.4	9,707.5	9,707.5	9,707.5	0.0
Q	3,010	37	87	8.6	9,712.5	9,712.5	9,712.5	0.0
R	3,100	29	87	8.6	9,713.4	9,713.4	9,713.4	0.0
S	3,150	23	73	10.3	9,714.7	9,714.7	9,714.7	0.0
T	3,185	40	89	8.5	9,716.1	9,716.1	9,716.1	0.0
U	3,575	31	81	9.3	9,721.5	9,721.5	9,721.5	0.1
V	3,655	39	162	4.6	9,722.6	9,722.6	9,722.6	0.0
W	3,780	51	266	2.4	9,724.8	9,724.8	9,724.8	0.0
X	3,855	63	92	6.8	9,726.6	9,726.6	9,726.6	0.0

[1]Feet above Colorado Highway 91

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

WEST 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)
WILLOW CREEK								
A	359	26	68	6.3	8,682.8	8,682.8	8,683.4	0.6
B	1,381	60	175	2.5	8,702.7	8,702.7	8,702.7	0.0
C	2,238	28	86	5.0	8,725.9	8,725.9	8,726.8	0.9
D	2,924	22	50	8.6	8,745.6	8,745.6	8,745.7	0.1
E	4,214	19	48	9.0	8,786.0	8,786.0	8,786.0	0.2
F	4,948	24	52	8.3	8,816.0	8,816.0	8,816.1	0.1
G	6,062	24	53	8.2	8,862.0	8,862.0	8,862.0	0.2

[1]Feet above Confluence with Blue River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

WILLOW CREEK

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. 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 AH

Zone AH is the flood insurance risk zone that corresponds to the areas of 1-percent annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot 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 Summit 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 6.

7.0 OTHER STUDIES

A study entitled “Floodplain Information, Breckenridge, Colorado”, by Leonard Rice Consulting Engineers, Inc., for the Colorado Water Conservation Board and the Town of Breckenridge was conducted in 1975 (Reference 13). This report presented information on the flood hazards along the Blue River in Breckenridge and included maps delineating the 1- and 0.2-percent annual chance floodplains. In many places along the Blue River, the floodplains changed since 1975, due to areas of excavation or fill along or within the channel, and as a result of culvert improvements. Generally, this resulted in a decrease in water-surface elevations in several areas from those published in the original report. Flood elevations along Lehman, Illinois, and Sawmill Gulches, published in the 1975 report, were revised. On these tributaries, detailed backwater calculations were completed where approximate methods were used in the previous study. Also, the revised study assumed all culverts were free from obstruction, whereas the previous report considered all culverts blocked.

A drainage study for Meadow Creek subdivision prepared by Donald Southerland Associates, Inc., was the only study found to exist at the time of the original study (Reference 54

A floodplain delineation study conducted by Hydro-Triad, Ltd., for the Ptarmigan Project provides an estimate for the 1-percent annual chance peak discharge for the Blue River downstream from Dillon Dam (Reference 55). However, the study, "Hydrology Report, Blue river Downstream of Dillon Reservoir, Summit county, Colorado (Reference 17), provided updated discharges based on detailed hydrologic analysis. The discharges for the Blue River developed for that report were used in the original and the restudy.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDAY MAP REVISION DATE	INITIAL FIRM EFFECTIVE DATE	FIRM REVISION DATE
Blue River, Town of	November 16, 2011	None	November 16, 2011	None
Breckenridge, Town of	May 24, 1974	June 4, 1976	June 4, 1980	June 20, 2001 November 16, 2011
Dillon, Town of *	N/A	None	N/A	None
Frisco, Town of	October 15, 1976	None	May 15, 1980	April 26, 1983 November 2, 1994 November 16, 2011
Montezuma, Town of *	N/A	None	N/A	None
Silverthorne, Town of	July 25, 1975	None	May 1, 1980	August 9, 2001 November 16, 2011
Summit County (Unincorporated Areas)	September 13, 1977	None	December 16, 1980	November 2, 1994 August 9, 2001 November 16, 2011

*No Special Flood Hazard Areas Identified

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

A Floodplain Information report was prepared for the Colorado Water Conservation Board in 1975 (Reference 16). The 1-percent annual chance floodplain boundary delineated in that report was used for the approximate study of French Gulch.

Maps of the 1-percent annual chance floodplain of the Snake River were prepared in 1972 (References 56 and 57). Since the production of the original maps, there were changes in the overbank topography and the channel due to development in the area. As a result, new topographic maps were prepared and used in delineating flood boundaries and floodways.

A report on Blue River Floodplain Delineation was prepared in 1976 (Reference 55). The 1-percent annual chance flood discharges listed in that report were not used in determining the extent of flooding along Blue River for the Summit County Flood Insurance Study. Discharges used were taken from a revised hydrologic analysis completed in 1978 by the study contractor (Reference 17).

The revised hydraulic analyses for Blue River, French Gulch, Meadow Creek, Miners Creek, North Fork Snake River, Snake River, South Barton Gulch, Swan River and Tenmile Creek were performed by Muller Engineering Company, Inc. These studies were incorporated into the 1994 revisions of the FIS for the Town of Frisco and Unincorporated Areas of Summit County (References 42, 43, 46 and 58).

The revised hydraulic analyses for Jug Creek, No Name Creek, and a portion of Meadow Creek were performed by Robillard and Associates. These studies were incorporated into the 1994 revisions of the FIS for the Town of Frisco and Unincorporated Areas of Summit County (References 59 and 60).

Flo Engineering completed a revised hydrologic and hydraulic study of Blue River Middle Branch, and Cucumber, Illinois, Jones, and Gold Run Gulches, and approximate flood hazard information along the Blue River Middle Branch split-flow area in the vicinity of the Town of Breckenridge. In July 1997, the results were submitted in a report entitled, "Drainage Master Plan for the Town of Breckenridge, Colorado, Drainage Report" (Reference 1).

Flood Insurance Studies have been prepared for the Towns of Frisco, Breckenridge, and Silverthorne, and the Unincorporated Areas of Summit County (References 18, 27, 61 and 62). This FIS supersedes the previous individual Flood Insurance Studies.

Flood Hazard Boundary Maps were previously published for the Towns of Breckenridge and Frisco, and the Unincorporated Areas of Summit County (References 52, 53 and 63). The Flood Insurance Rate Maps of this study supersede the Flood Hazard Boundary Maps for the Towns of Breckenridge and Frisco, and the Unincorporated Areas of Summit County.

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

Table 7 – Letters of Map Change

Type of LOMC	Case Number	Effective Date	Project Identifier
LOMR	95-08-227P	2/08/1996	Melvin G. Strauss Property
LOMR	99-08-234P	5/14/1999	Tenmile Creek Side Channel 2
LOMR	02-08-102P	10/22/2004	Kred Floodplain Delineation
LOMR	04-08-0049P	10/15/2004	Sawmill Gulch Updates
LOMR	05-08-0618P	5/17/2006	Winegard Ranch
LOMR	06-08-B667P	12/07/2006	Illinois Gulch at Ice Rink
LOMR	07-08-0747P	8/11/2008	Blue River Pedestrian Bridge
LOMR	08-08-0785P	5/22/2009	Angler Mountain Ranch/Bald Eagle Road Bridge
LOMR	09-08-0933P	6/7/2010	Illinois Gulch at Main Street Station
LOMR	10-08-0383P	3/16/2010	Illinois Gulch at Main Street Station
LOMR	10-08-0470P	11/29/2010	West Tenmile Creek at Copper Mountain
LOMR	10-08-0513P	6/30/2010	Keystone Gondola Bridge
LOMR	12-08-0249P	2/28/2012	Braddock Area Reissue
LOMR	13-08-0262P	7/22/2013	Blue River Existing Conditions

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.

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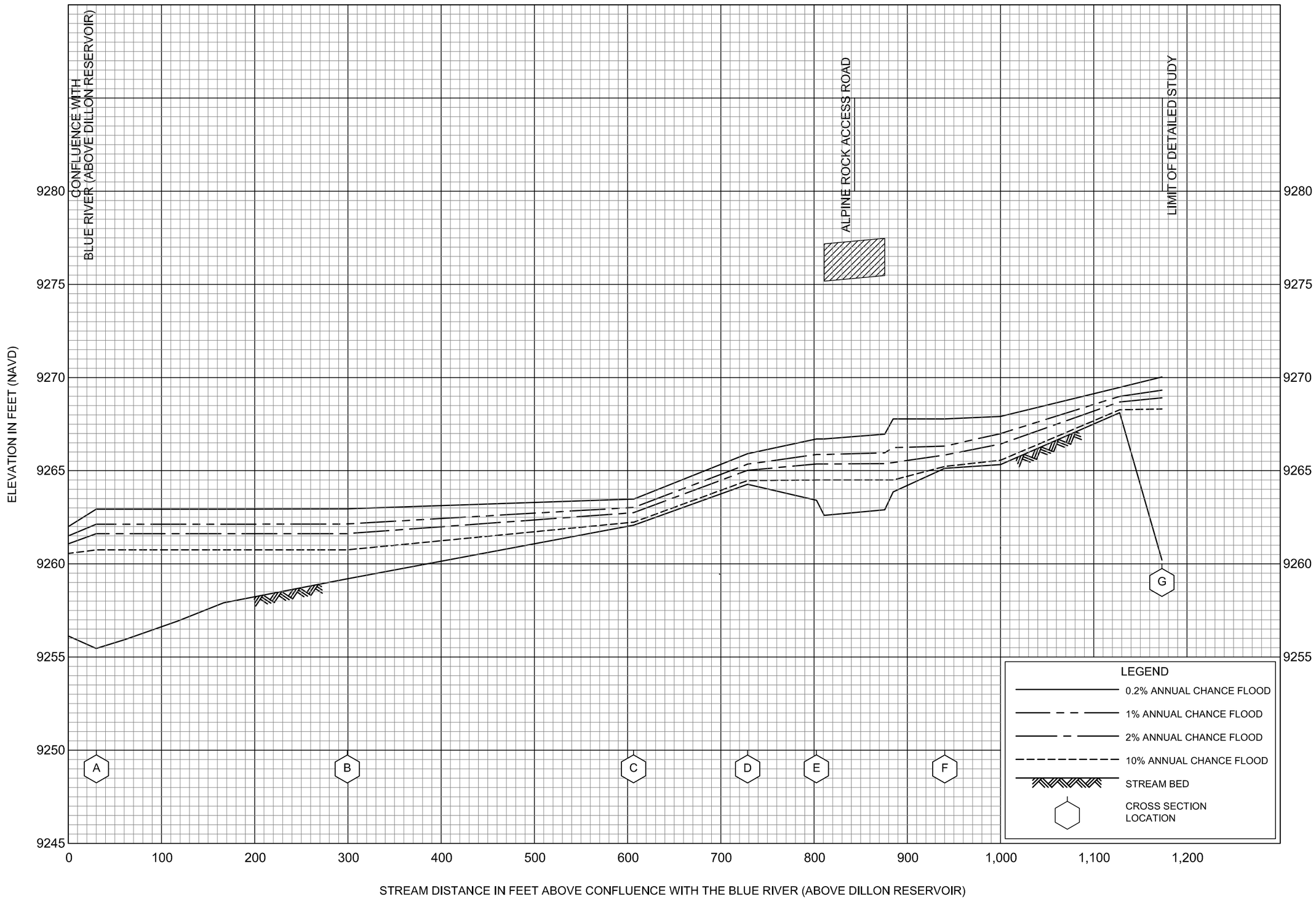


FLOOD PROFILES

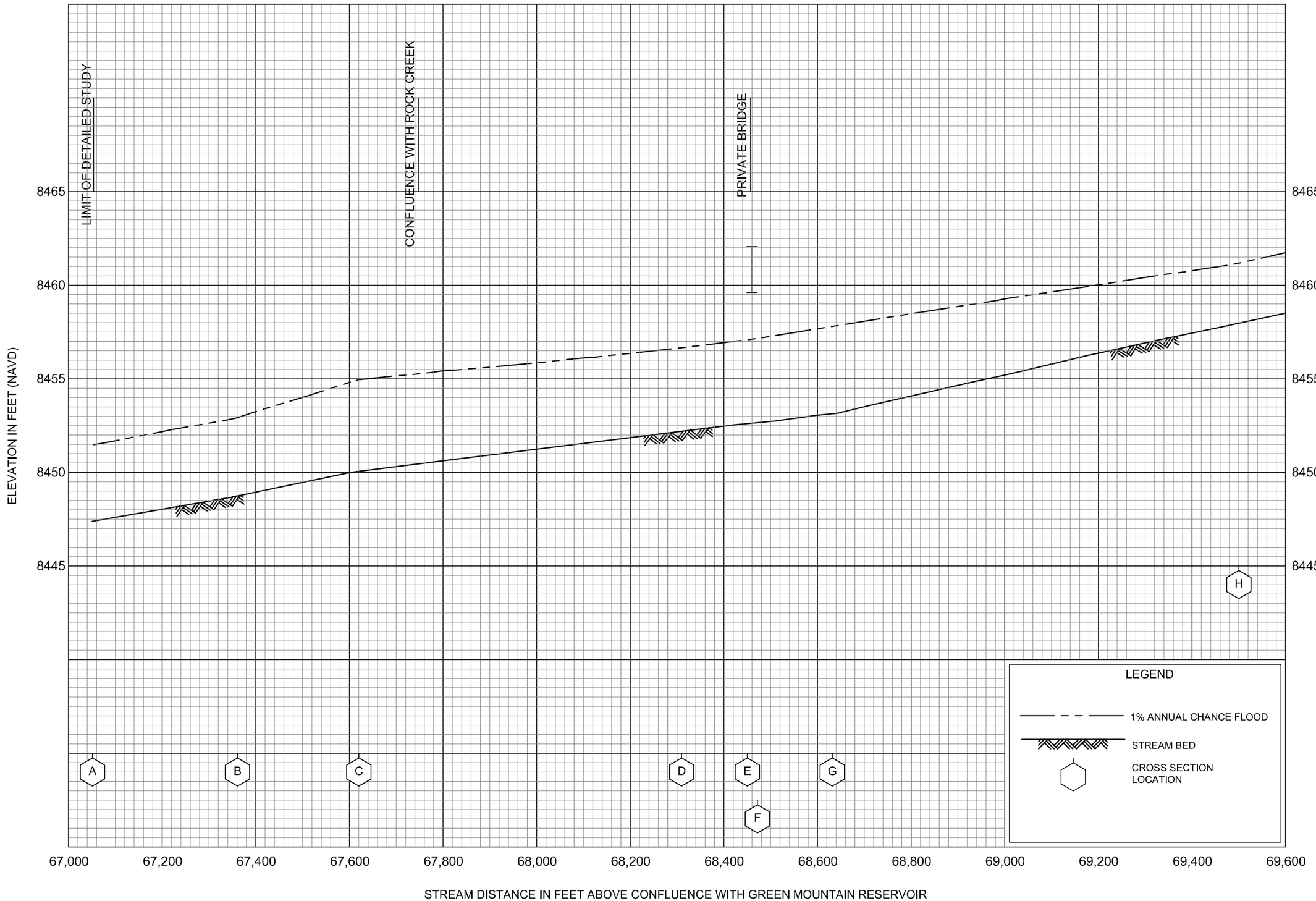
ALPINE ROCK OVERFLOW

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO

AND INCORPORATED AREAS

01P



FLOOD PROFILES

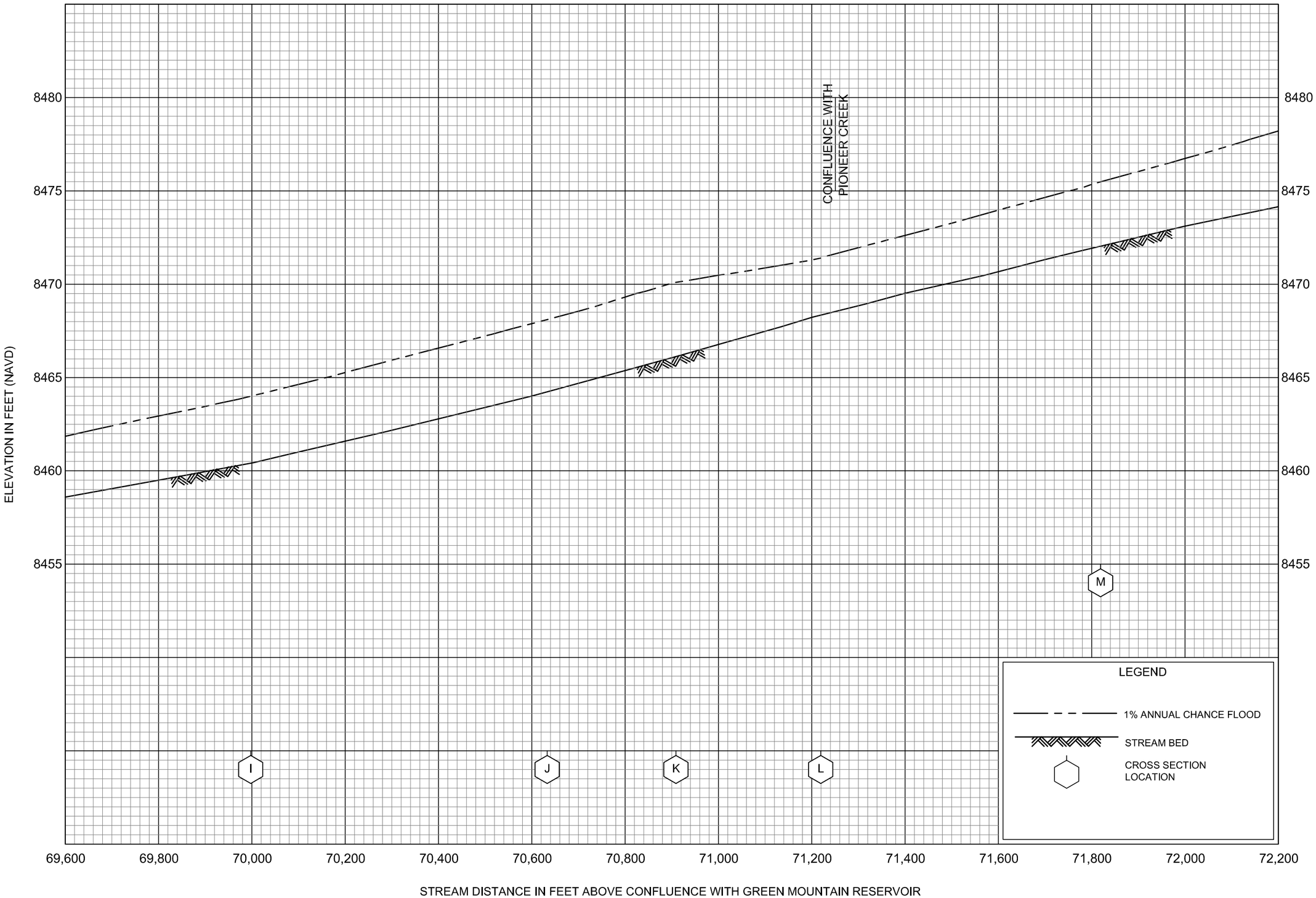
BLUE RIVER (ABOVE GREEN MOUNTAIN RESERVOIR)

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO

AND INCORPORATED AREAS

02P



FLOOD PROFILES

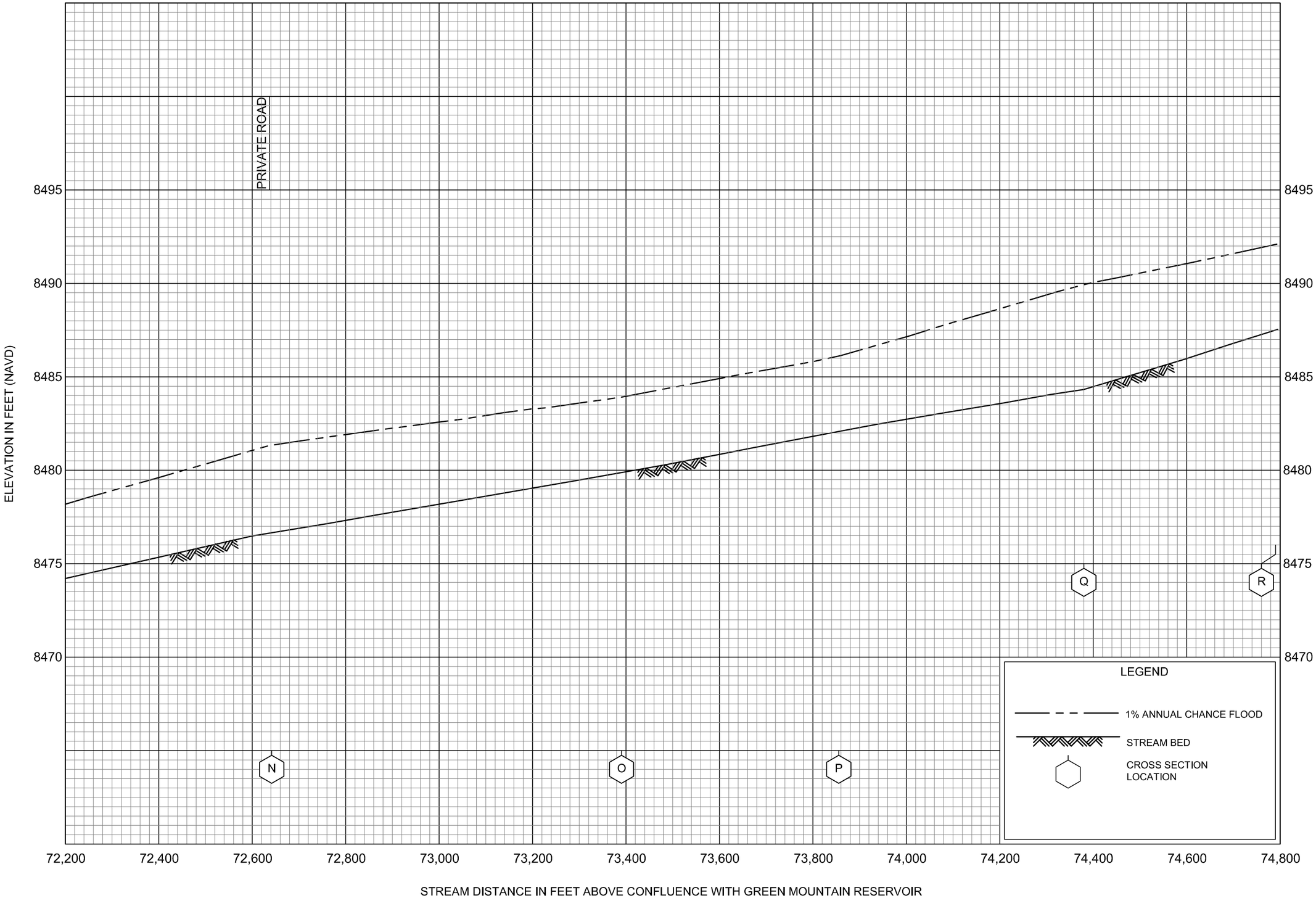
BLUE RIVER (ABOVE GREEN MOUNTAIN RESERVOIR)

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO

AND INCORPORATED AREAS

03P



FLOOD PROFILES

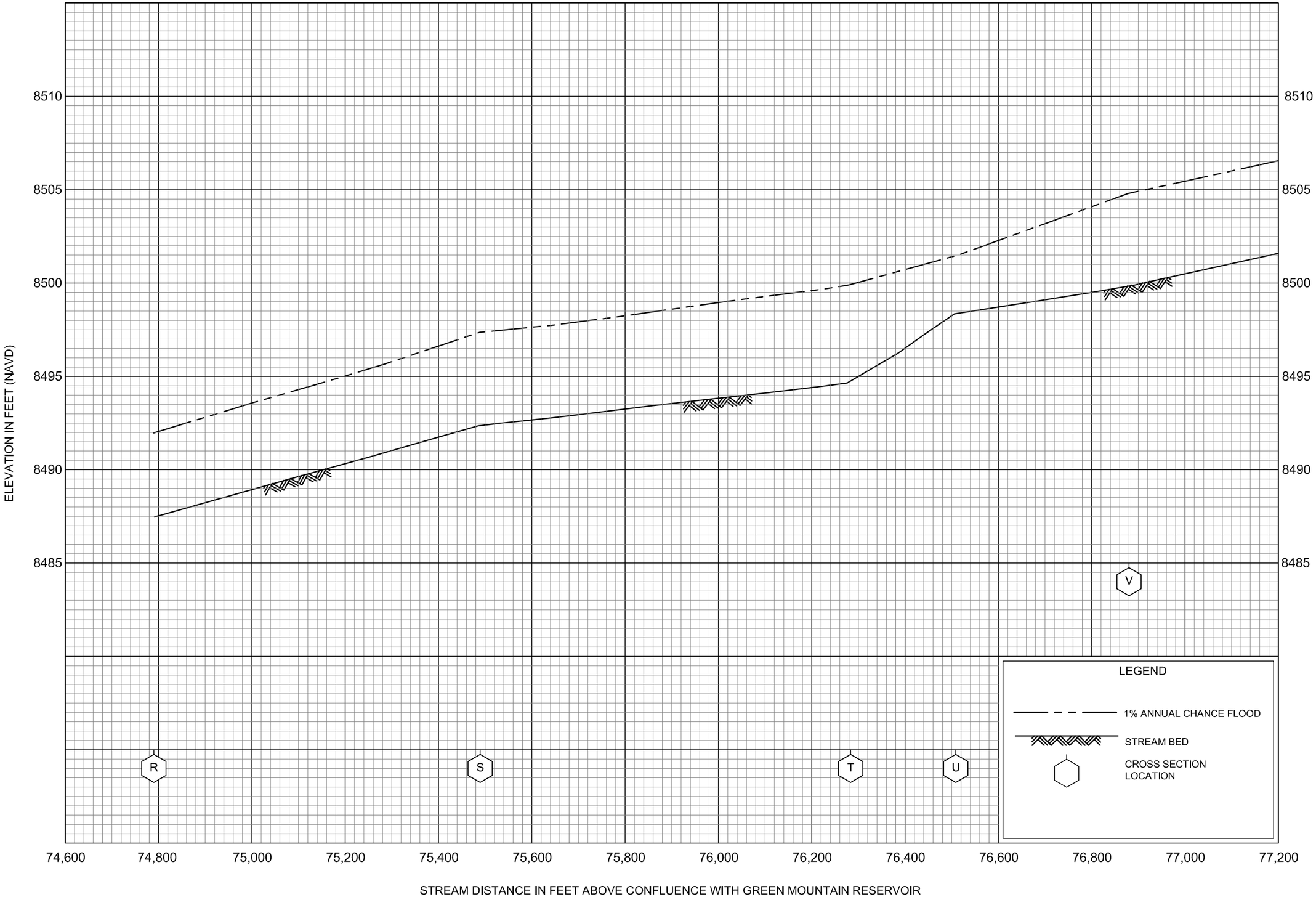
BLUE RIVER (ABOVE GREEN MOUNTAIN RESERVOIR)

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO

AND INCORPORATED AREAS

04P



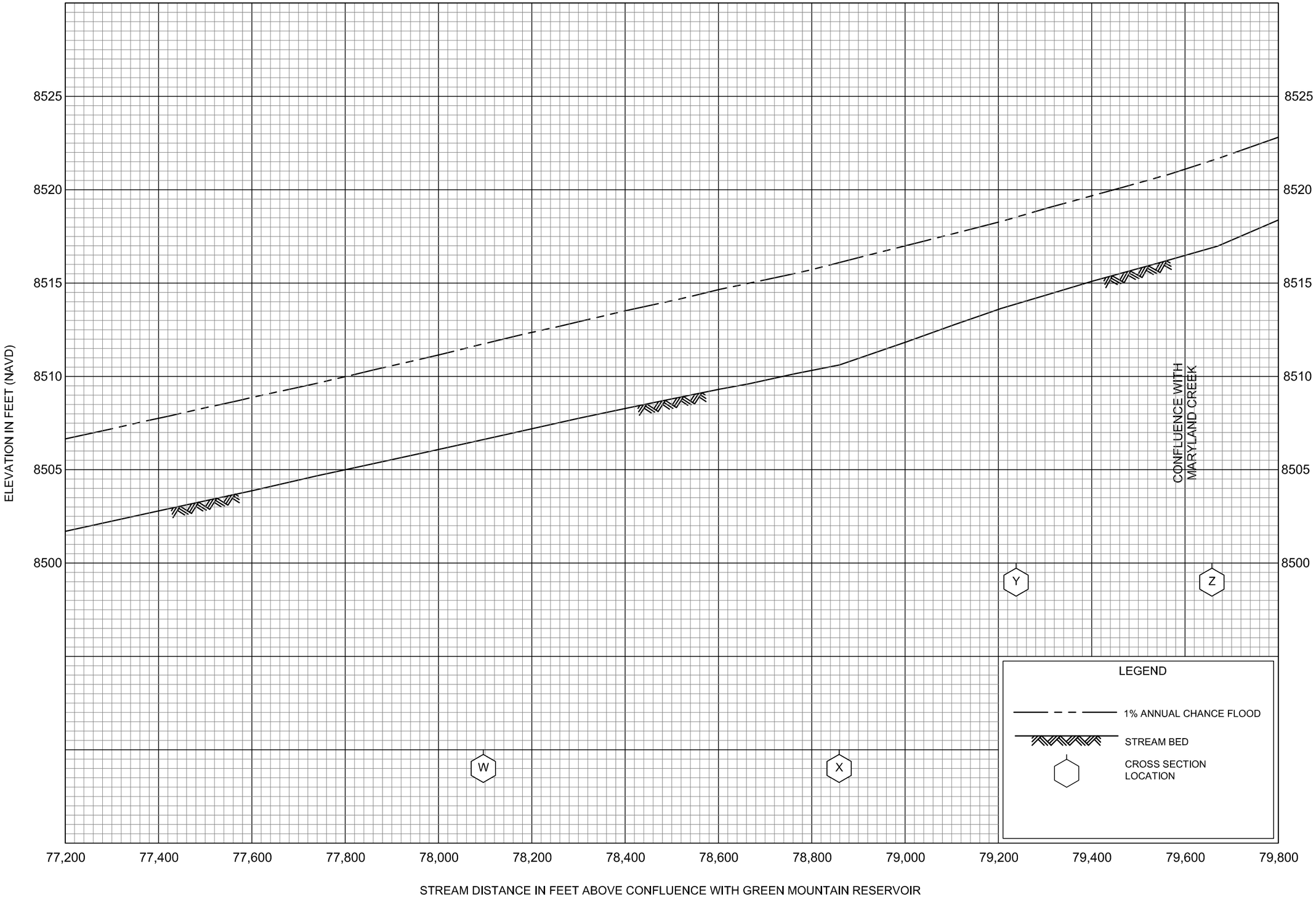
FLOOD PROFILES

BLUE RIVER (ABOVE GREEN MOUNTAIN RESERVOIR)

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO

AND INCORPORATED AREAS



FLOOD PROFILES

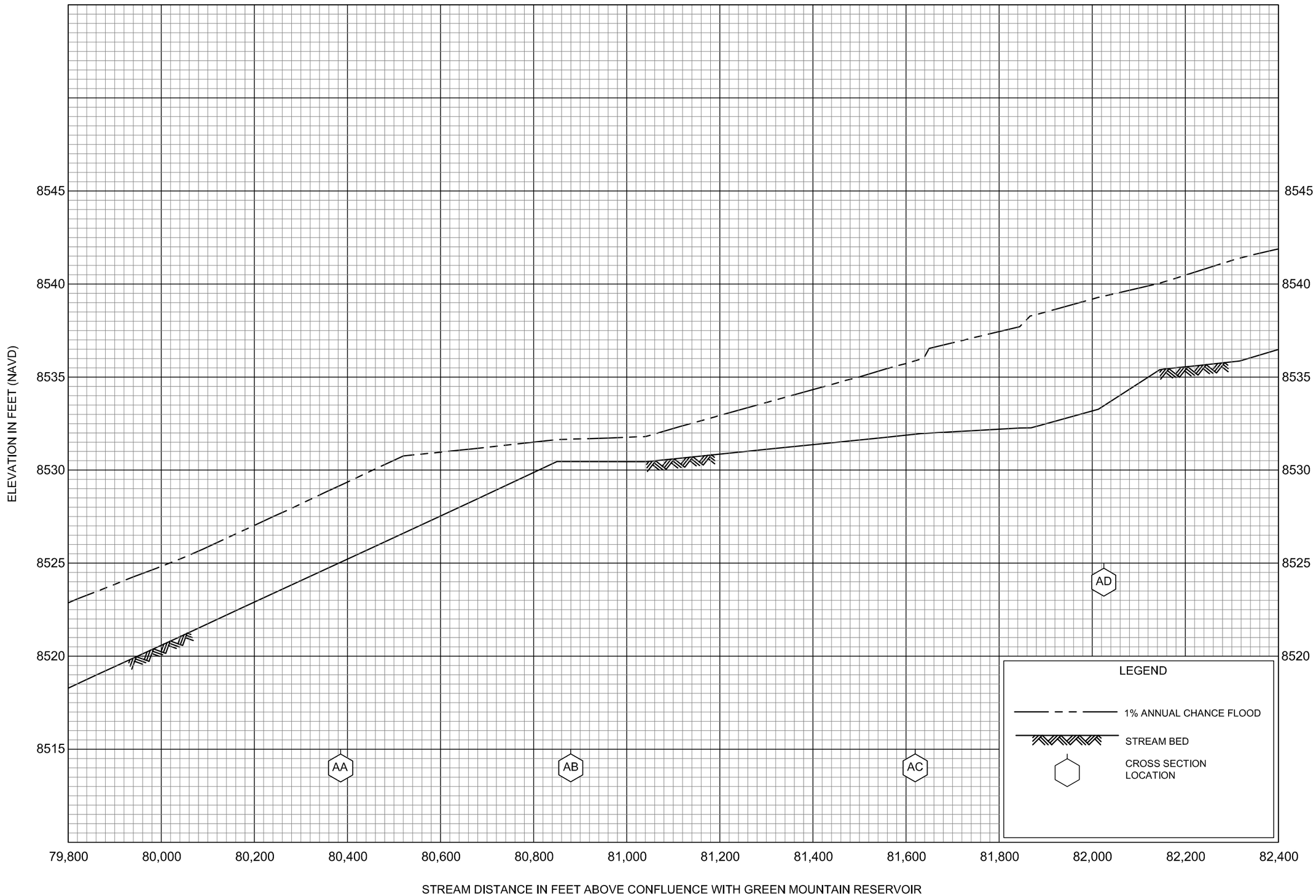
BLUE RIVER (ABOVE GREEN MOUNTAIN RESERVOIR)

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO

AND INCORPORATED AREAS

06P



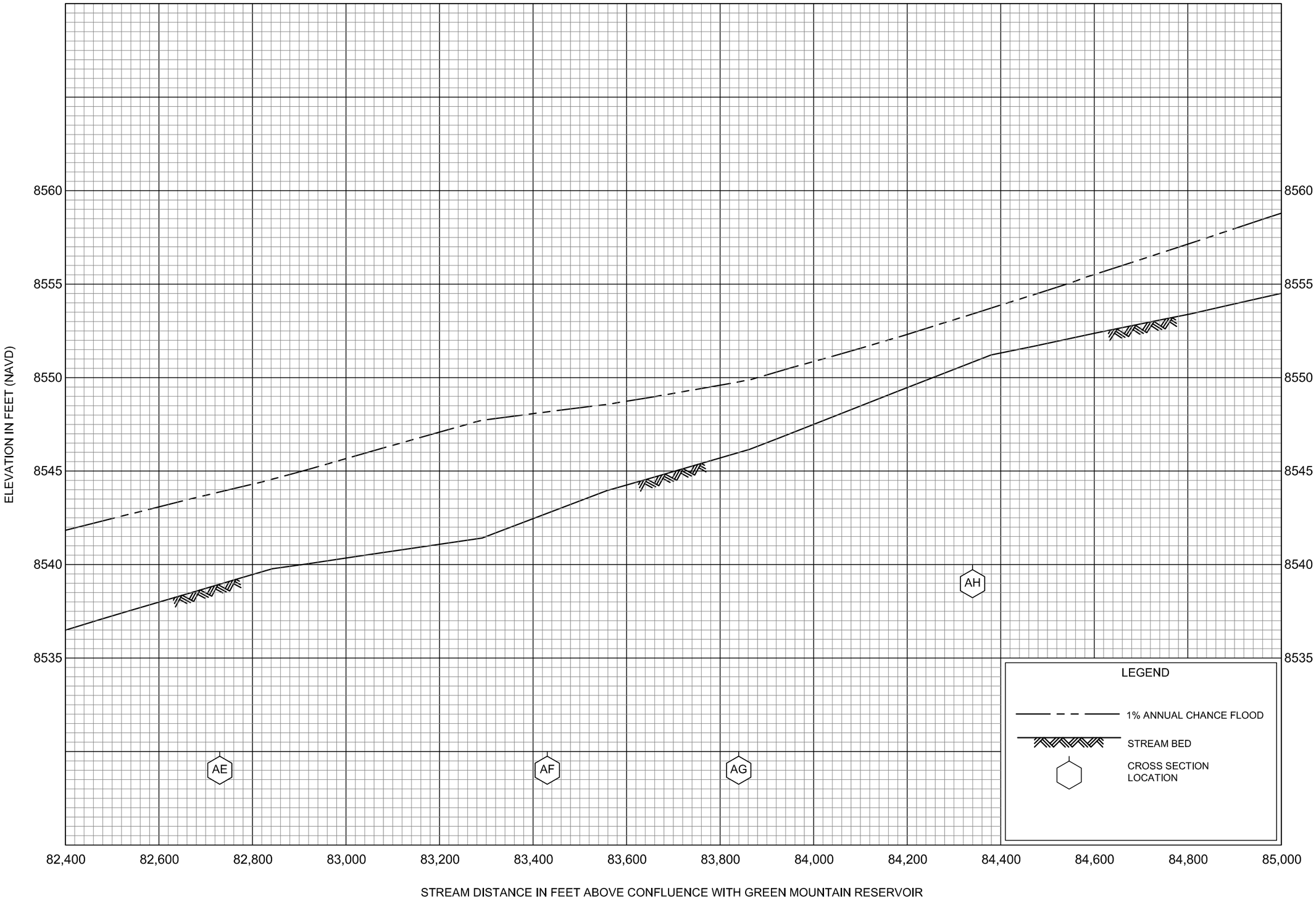
FLOOD PROFILES

BLUE RIVER (ABOVE GREEN MOUNTAIN RESERVOIR)

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO

AND INCORPORATED AREAS



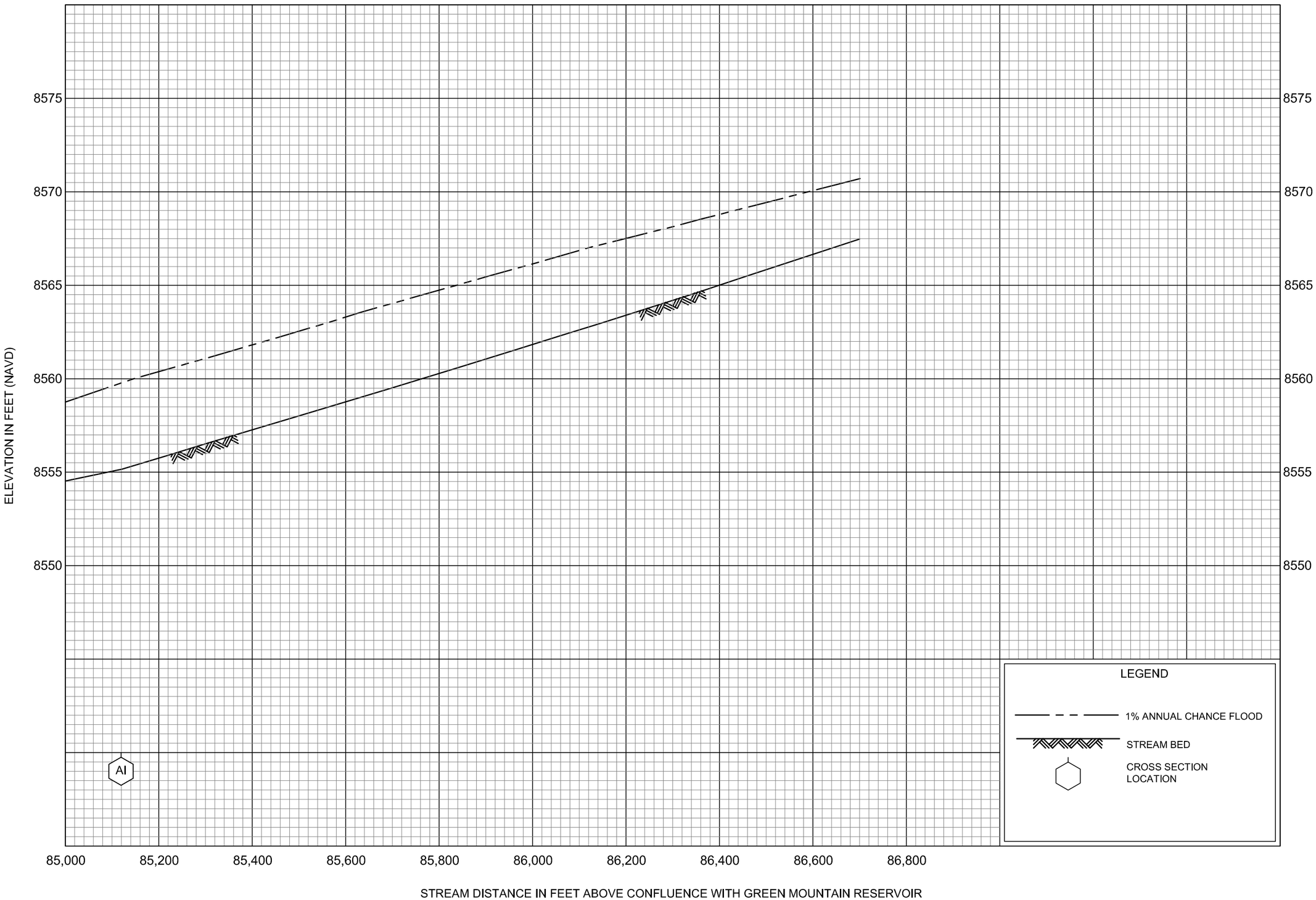
FLOOD PROFILES

BLUE RIVER (ABOVE GREEN MOUNTAIN RESERVOIR)

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO

AND INCORPORATED AREAS



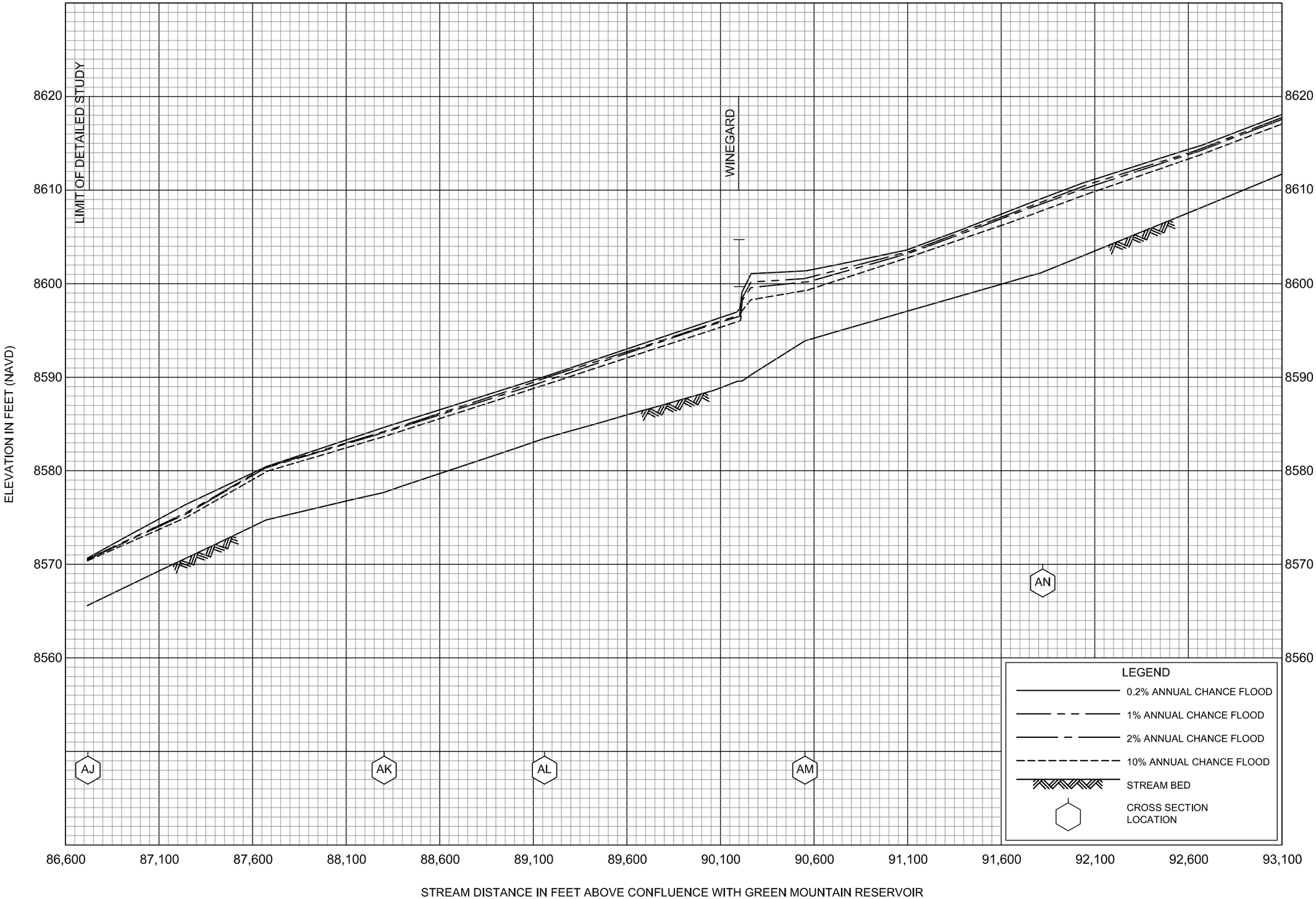
FLOOD PROFILES

BLUE RIVER (ABOVE GREEN MOUNTAIN RESERVOIR)

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO

AND INCORPORATED AREAS



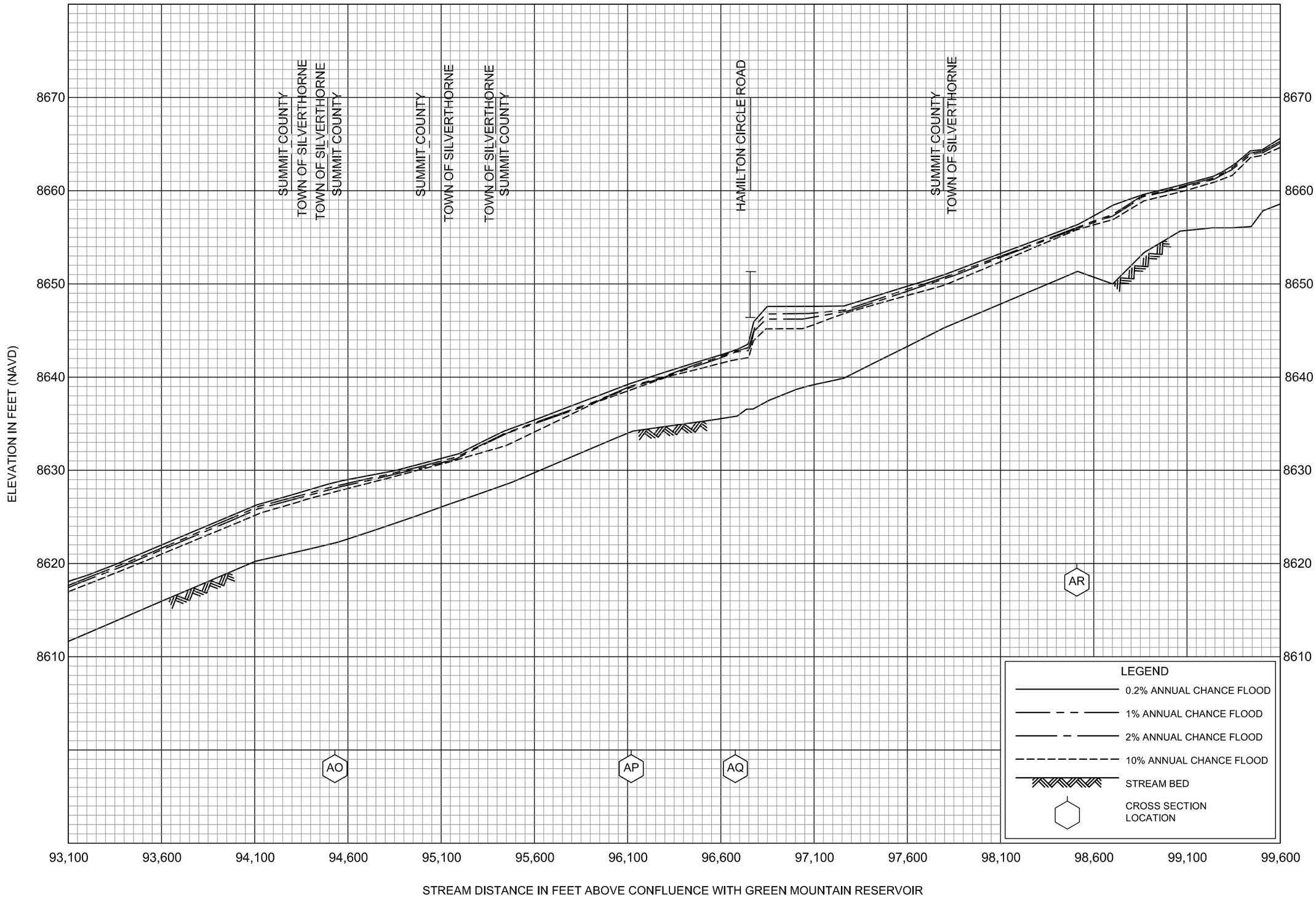
FLOOD PROFILES

BLUE RIVER (ABOVE GREEN MOUNTAIN RESERVOIR)

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO

AND INCORPORATED AREAS



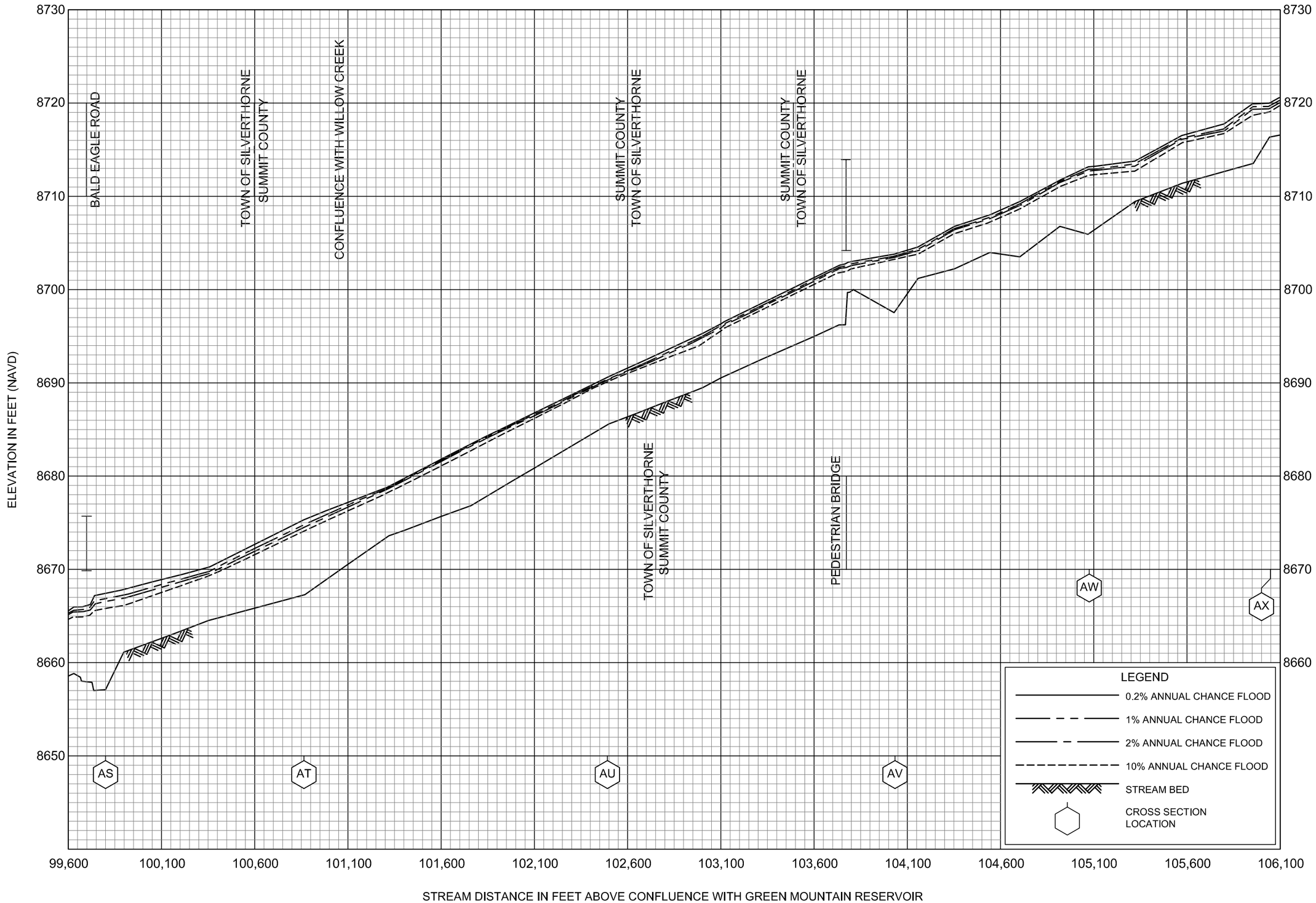
FLOOD PROFILES

BLUE RIVER (ABOVE GREEN MOUNTAIN RESERVOIR)

FEDERAL EMERGENCY MANAGEMENT AGENCY

SUMMIT COUNTY, CO

AND INCORPORATED AREAS



FLOOD PROFILES

BLUE RIVER (ABOVE GREEN MOUNTAIN RESERVOIR)

FEDERAL EMERGENCY MANAGEMENT AGENCY

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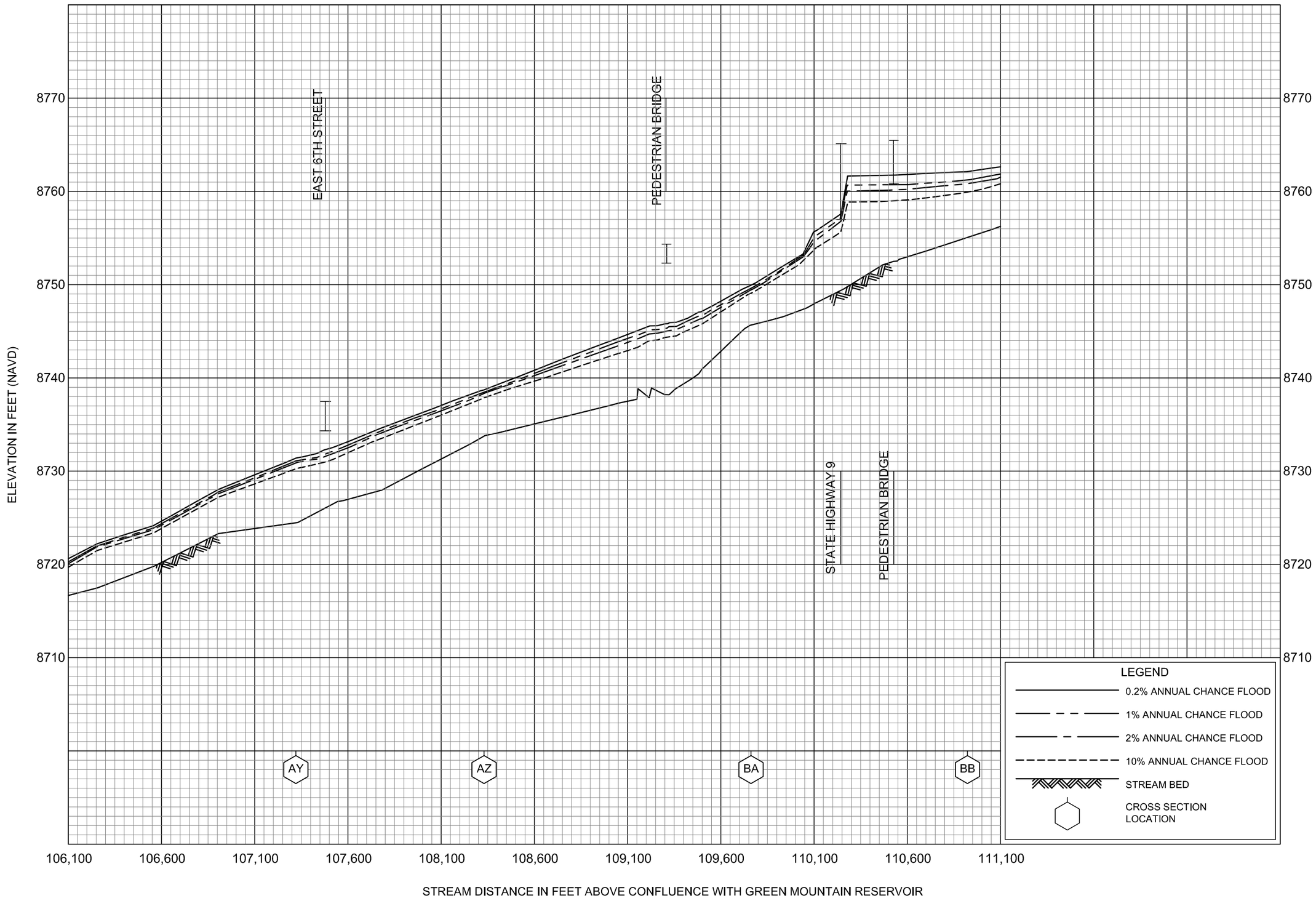

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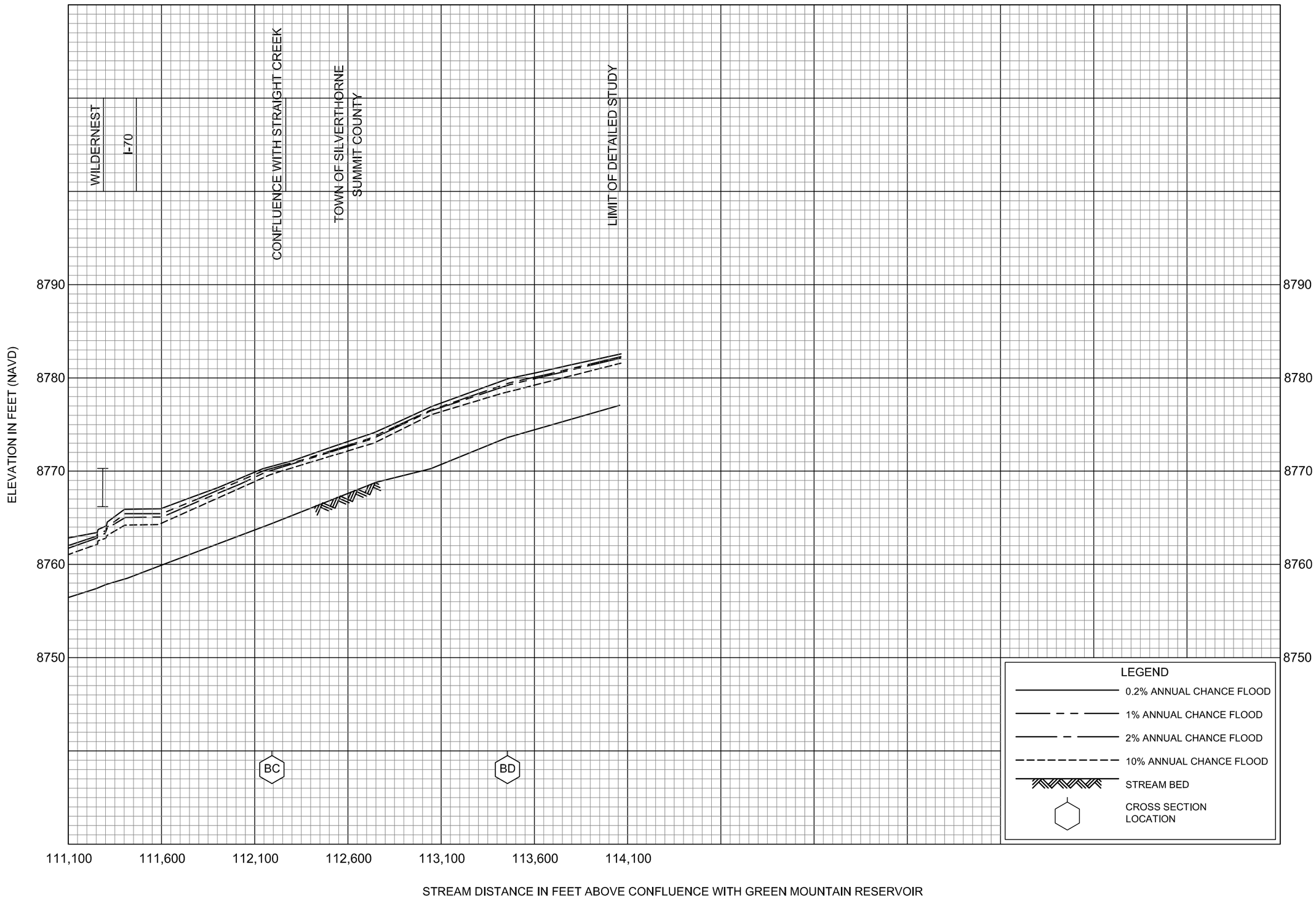

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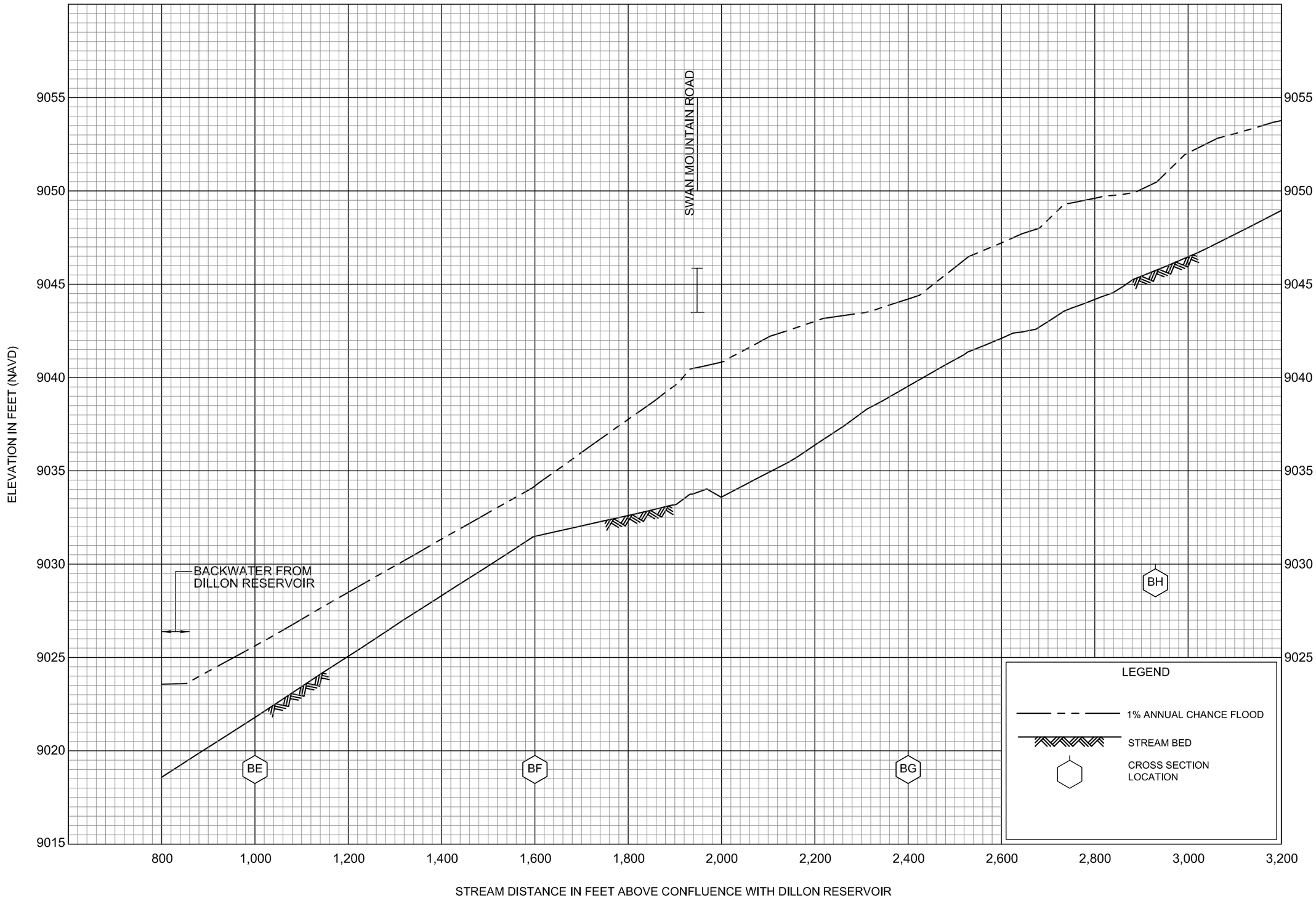

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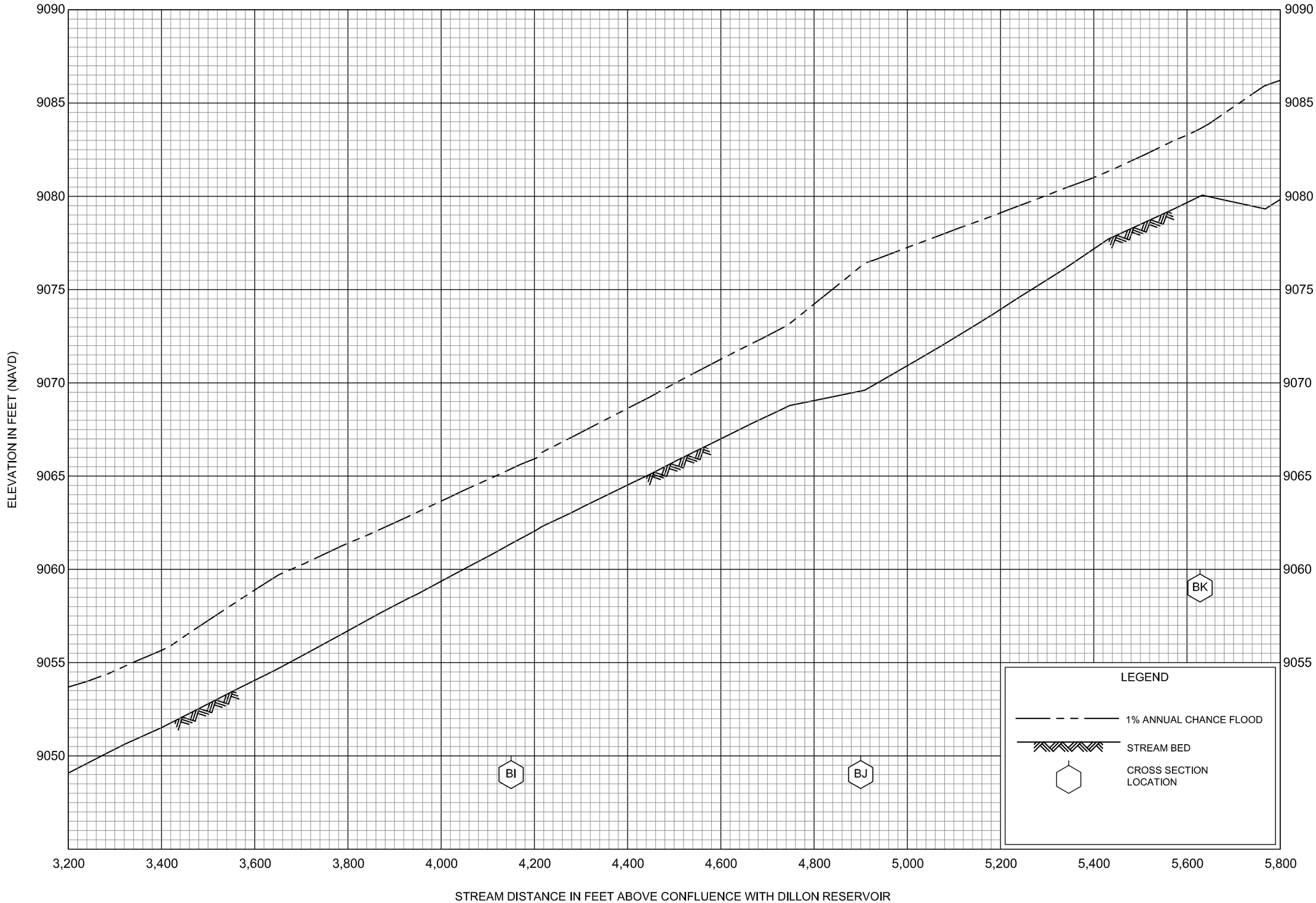

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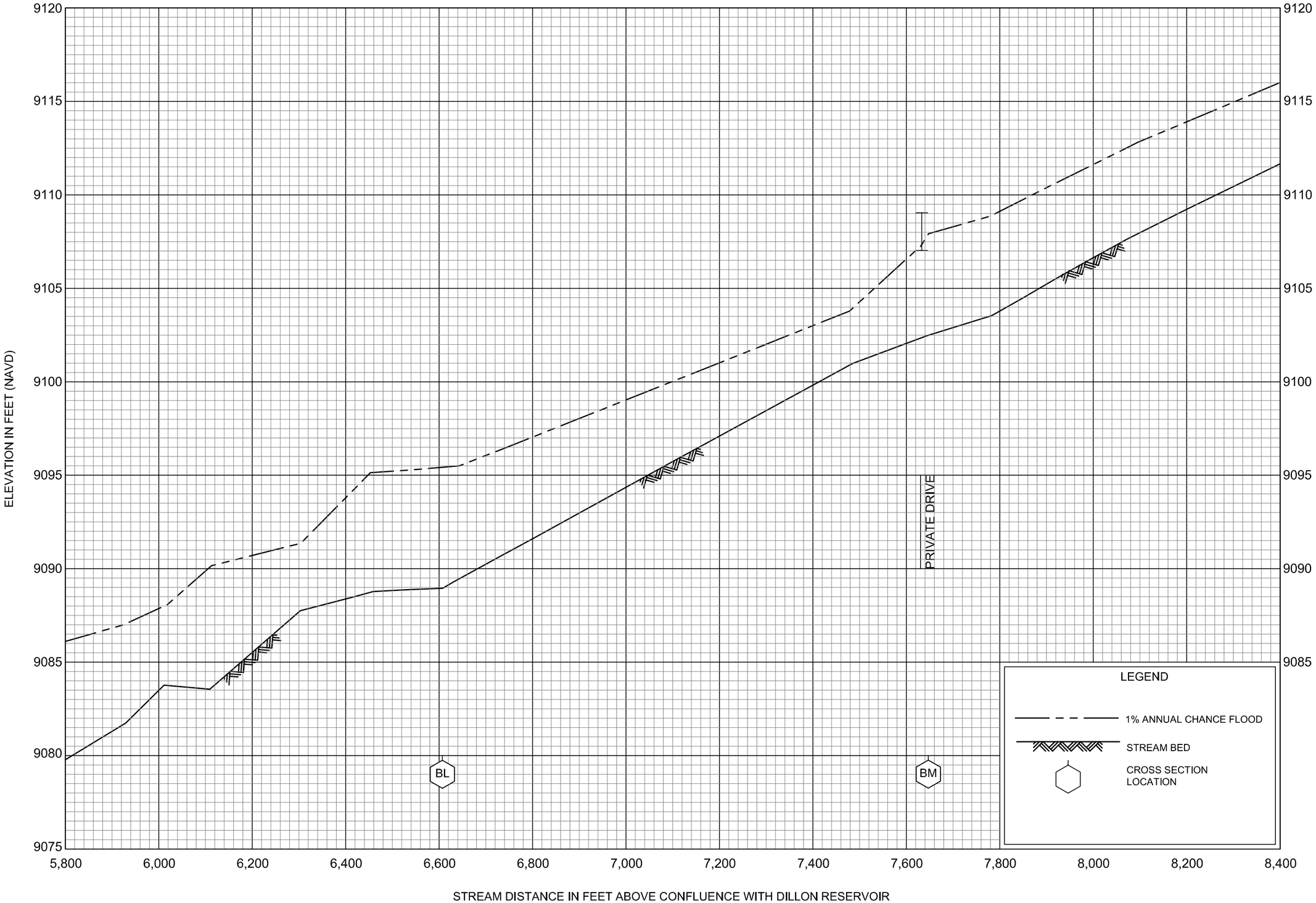

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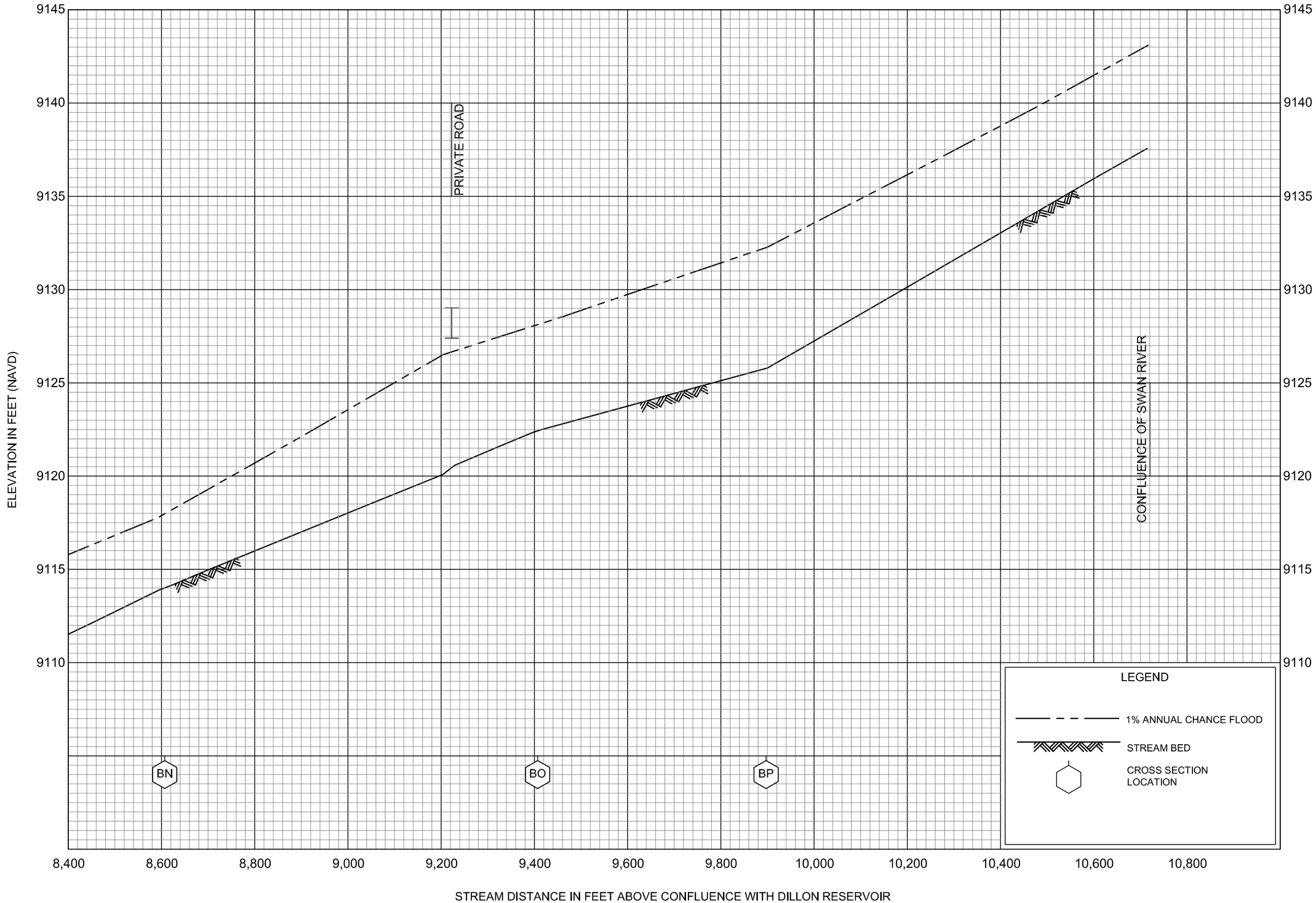

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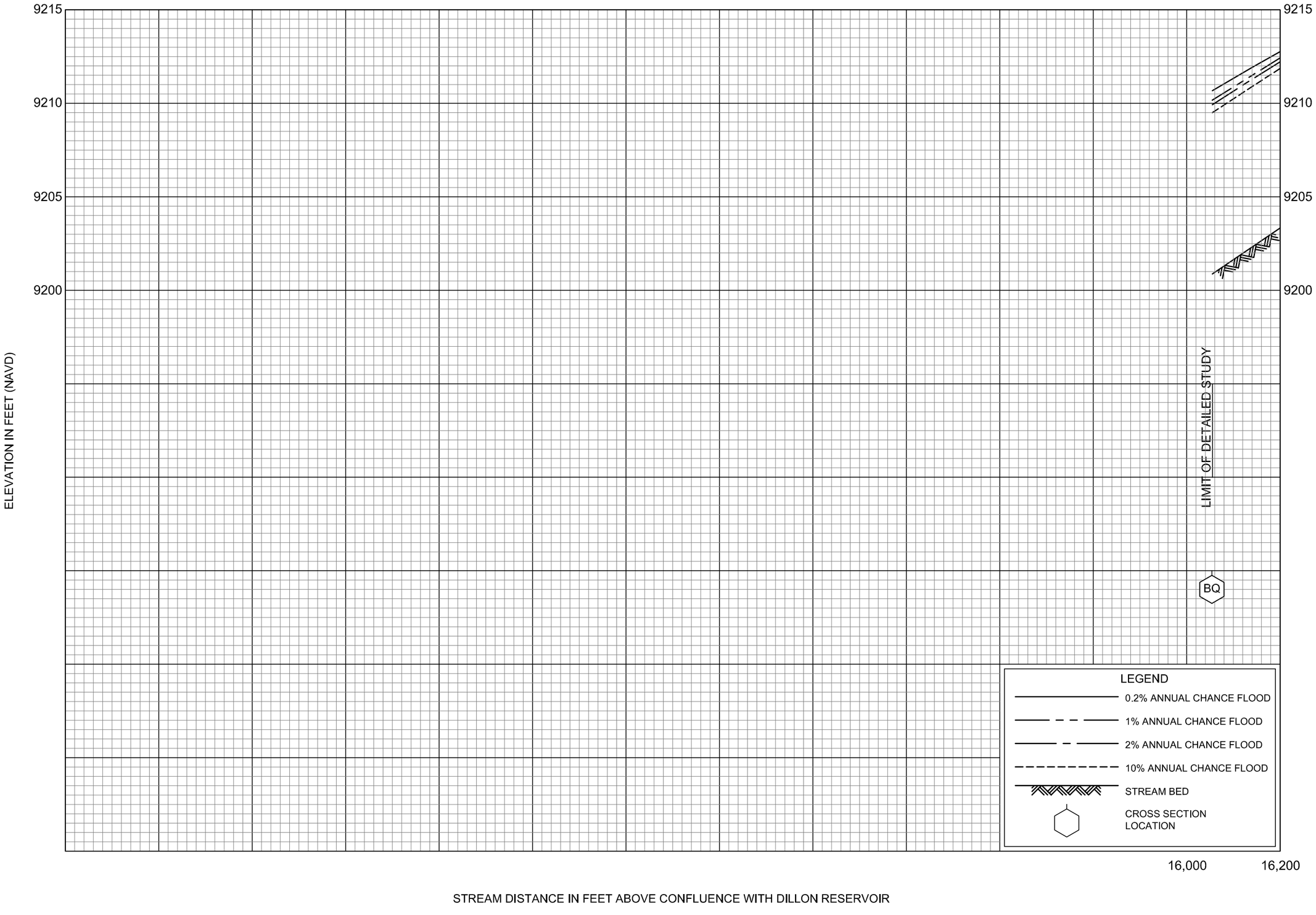

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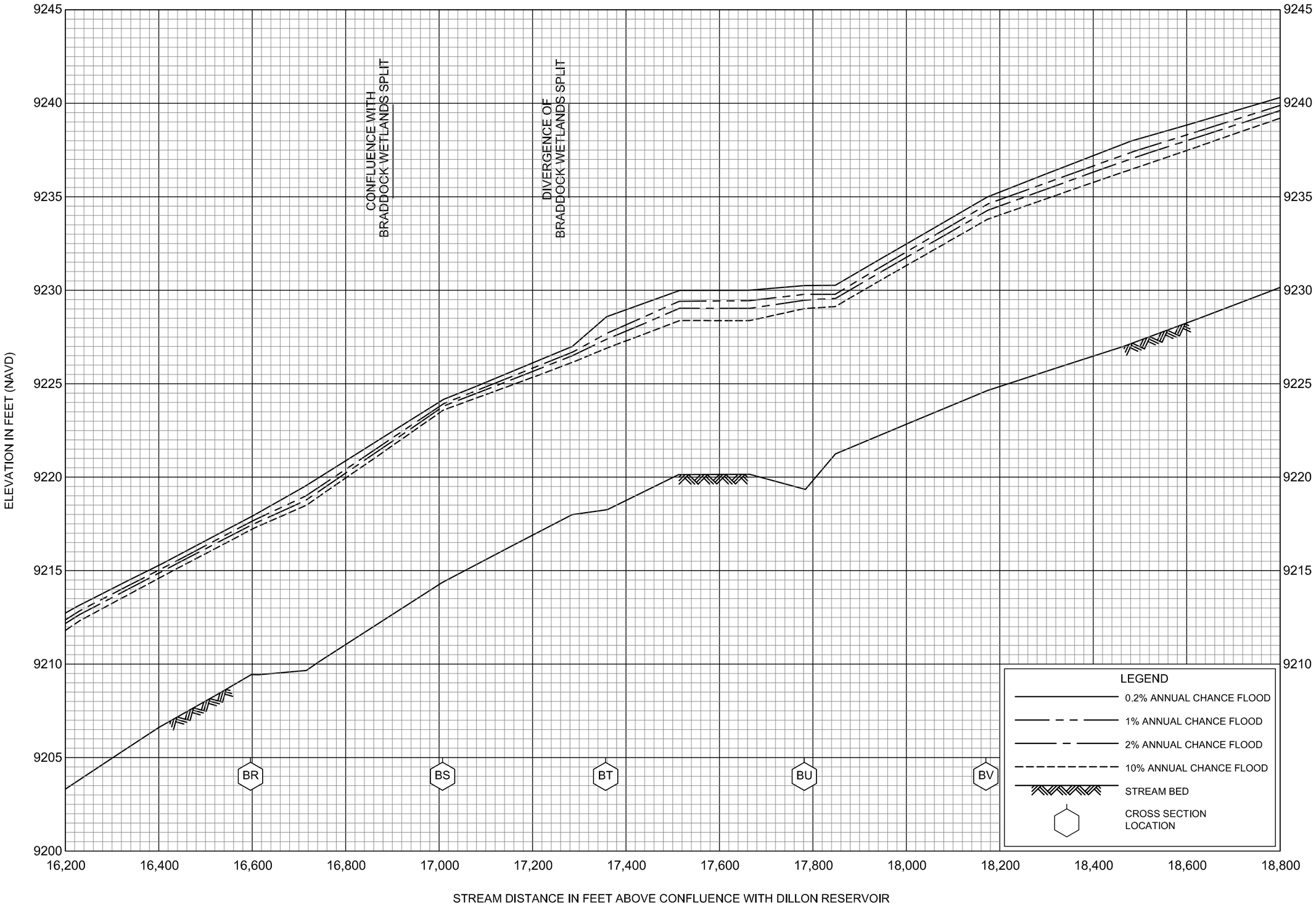

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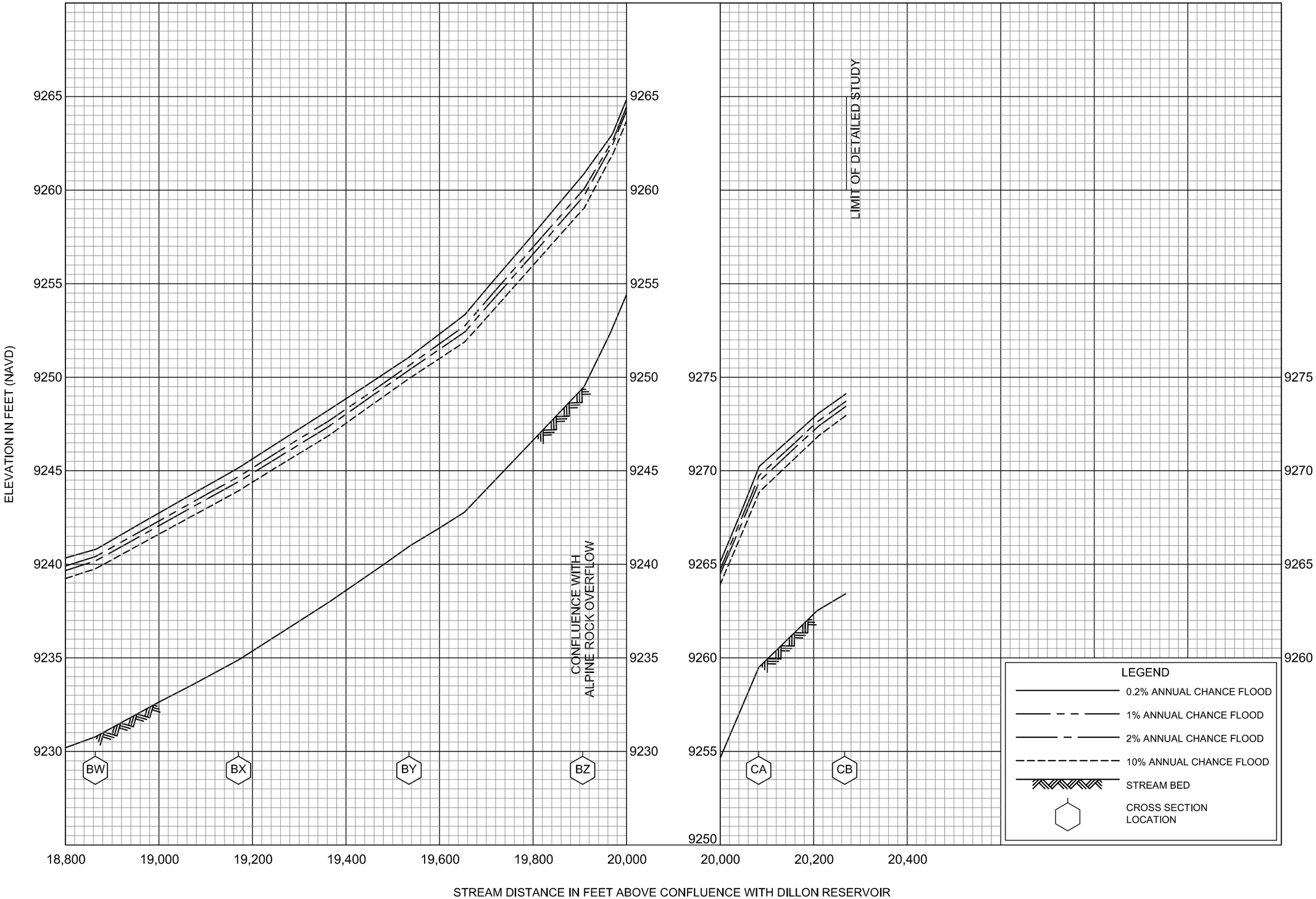

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