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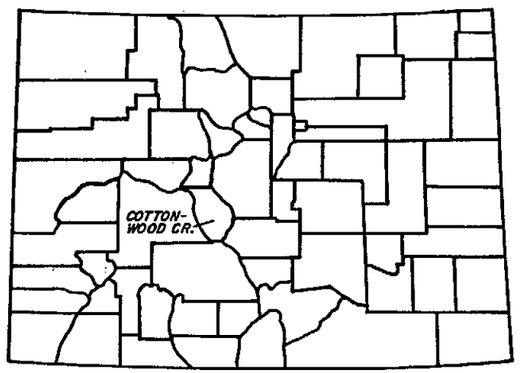
FLOOD HAZARD ANALYSES

COTTONWOOD CREEK
IN THE VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO



Prepared by the

U.S. Department of Agriculture
Soil Conservation Service
Denver, Colorado
in cooperation with the
Colorado Water Conservation Board
Chaffee County
Town of Buena Vista

July 1978

PREFACE

This report includes information on the flood hazard areas adjacent to Cottonwood Creek in the vicinity of Buena Vista, Chaffee County, Colorado

Because of potential flood damages, detailed flood hazard studies have been recognized as an essential item in guiding the use of flood plains. The purpose of this report is to provide adequate mapping and data for implementing flood plain management programs.

Included in the report are information on past floods, flood potential, maps, profiles, cross sections, discharge data, and recommendations for reducing potential flood damages on the Cottonwood Creek study area.

The Soil Conservation Service conducted the technical studies and prepared the report. These services were carried out in accordance with the Plan of Study of December 1976.

The assistance and cooperation provided by the Colorado Water Conservation Board, Chaffee County, the town of Buena Vista, are appreciated and gratefully acknowledged. Financial assistance provided by these organizations and units of government included funds for photogrammetric maps, cross-section data, survey crew assistance, installation of permanent reference monuments, and collection of historical flood information.

The survey, hydrologic, hydraulic, and other pertinent data and computations are on file with the U. S. Department of Agriculture, Soil Conservation Service, 2490 West 26th Avenue, Denver, Colorado 80217, telephone (303) 837-5653.

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FLOOD HAZARD ANALYSES

COTTONWOOD CREEK

IN THE VICINITY OF BUENA VISTA

CHAFFEE COUNTY, COLORADO

INTRODUCTION

This flood hazard analyses report presents the results of a study on the flood plain lands of Cottonwood Creek in the vicinity of Buena Vista, Colorado. It was prepared by the U. S. Department of Agriculture, Soil Conservation Service, in cooperation with the Colorado Water Conservation Board, Chaffee County, and the town of Buena Vista.

Primary purpose of this report is to provide large scale detailed mapping and flood hazard information. Without detailed mapping, it is very difficult to implement a workable flood plain management program which will minimize potential flood losses. Detailed flood hazard maps are needed to administer flood plain management regulations. Included in the report are engineering and hydrologic data which will facilitate the use of the maps. The data should be useful in developing a master drainage plan, in road and bridge plans and design, and in the planning of channel modification, and flood control structures - if needed. The report contains interpretations of the flood hazard analyses and recommendations to reduce flood damages. However, it is beyond the scope of this study to provide specific proposals or plans to rectify the flooding problems.

This study was requested by Chaffee County, and the town of Buena Vista through the Colorado Water Conservation Board (CWCB). As coordinator for all water studies in the state, the CWCB establishes priorities and schedules these studies on a priority basis. The CWCB and the Soil Conservation Service entered into a Joint Coordination Agreement for flood hazard analyses in January 1972. The Plan of Study for Cottonwood Creek was prepared in December 1976.

Flood hazard analyses are carried out by the Soil Conservation Service as an outgrowth of the recommendations in *A Report by the Task Force on Federal Flood Control Policy*, House Document No. 465 (89th Congress, August 10, 1966), especially Recommendation 9(c), *Regulation of Land Use*, which recommended the preparation of preliminary reports for guidance in those areas where assistance is needed before a full flood hazard information report can be prepared or where a full report is not scheduled.

Authority for funding flood hazard analyses is provided by Section 6 of Public Law 83-566, which authorizes the U. S. Department of Agriculture to cooperate with other federal, state, and local agencies to make investigations and surveys of the watersheds of rivers and other water ways as a basis for the development of coordinated programs. In carrying out flood hazard analyses, the Soil Conservation Service is being responsive to Executive Order 11988, entitled "Flood Plain Management", (effective May 24, 1977).

In the 1974 legislative session, the Colorado General Assembly directly attacked the flood-plain problem by describing it as a natural hazard of State interest relating to the use of land in House Bill 1041 (Title 24, Articles 65.1, 32 and 65 CRS 1973, as amended). Section 37-60-106(1)(c), Colorado Revised Statutes 1973, authorizes the Colorado Water Conservation Board to designate and approve storm flood-water runoff channels and to make such designations available to legislative bodies of local jurisdictions. The Board is providing assistance to local governments in the development and adoption of effective flood plain ordinances. In addition, the Board assists and provides financial assistance to flood plain information studies in Colorado.

Requests by Chaffee County and the town of Buena Vista to conduct flood hazard studies are in accordance with State Legislature House Bill 1041 which requires local governments to identify and designate areas, such as flood plains, that are of state interest.

DESCRIPTION OF THE STUDY AREA

The area of study includes the Cottonwood Creek flood plains in the vicinity of the town of Buena Vista. The study area is located within Hydrologic Unit Code Number 11020001. The study begins at the confluence of Cottonwood Creek with the Arkansas River and extends upstream through Buena Vista approximately six miles to the San Isabel National Forest Boundary. The Arkansas River is a major tributary to the Arkansas-White-Red Water Resources Council Region.

Located in the west central part of Chaffee County, Cottonwood Creek drains about 105 square miles. Cottonwood Creek flows in a general eastward direction and is fed by three drainages: North Cottonwood, Middle Cottonwood, and South Cottonwood Creeks. North Cottonwood drains 26 square miles and enters the flood plain study area approximately 1.7 miles east of the upper study limit. The combined drainage area of Middle and South Cottonwood Creeks is about 65 square miles. They join to form Cottonwood Creek about 2.9 miles west of the North Cottonwood Creek confluence. About 14 square miles of intervening drainages makes up the balance of the 105 square miles above the confluence with the Arkansas River. The confluence of Cottonwood Creek with the Arkansas River lies in a narrow entrenched canyon at the lower study limit. Effects of potential flooding on the Arkansas River are not included in this study. A map showing the location of the study area follows page 6.

The upstream drainage area originates in the Sawatch Range of the Rocky Mountains at the top of the Continental Divide between the Arkansas and Gunnison River Basins. Elevations vary from more than 13,000 feet along the divide to 7,900 feet (mean sea level elevations) at the lower end of the study area. Geology in the upper reaches consists of metamorphic rock (crystalline), mostly granite and other igneous type rocks. Soils are deep to moderately deep with rock outcrops; and the permeability characteristics are moderate to moderately rapid. Ground cover consists of native grass, brush, and forestland. Cottonwood, pinon-juniper, and pine trees grow at the lower elevations. Topography has a significant effect on the semi-arid climate. Average annual precipitation varies

from about 11 inches at Buena Vista to over 30 inches in the higher mountain elevations where most of the precipitation occurs as snow. Melting of the snowpack causes runoff during the spring and sustained flow in Cottonwood Creek. In Buena Vista, the normal mean temperatures range from 25.6 degrees (Fahrenheit) in January to 64.3 degrees in July. The mean annual temperature is 44.0 degrees. More than 85 percent of the total drainage area is within the San Isabel National Forest. Land use includes recreation, grazing, and a small amount of lumbering. Development within the National Forest Boundaries is under controlled conditions and will have minor effects on potential flooding in the downstream areas.

In 1865, mining for gold and silver was the main attraction for the early settlers. The townsite for Buena Vista, originally called Cottonwood, was acquired in 1879. Buena Vista was the Chaffee County seat until 1928; then the county seat was moved to Salida, due to a shift in the population concentration. Ranching, irrigated farming, the reformatory at Buena Vista, and the mining operations at Climax, are the main source of employment and the economic base. Tourism and recreation, stimulated by the natural scenic beauty, have had a significant effect on the economy. In 1960 the population of Buena Vista was 1,806 people. Population has been increasing with 1,962 persons in 1970, and another rise to 2,080 people in 1975. Important to the trend of development is the encroachment of subdivisions onto agricultural land. Land formerly used for irrigated farming in the Cottonwood Creek flood plain, has developed into a golf course with attractive building sites for homes.

In addition to potential flood problems, the poor drainage characteristics of flood plain soils are a constraint to septic systems and wells for domestic water.

For study purposes and ease of identifying locations in the flood plain, the study area has been divided into stream segments called reaches. Beginning at the lower end and progressing upstream on the main channel of Cottonwood Creek are reach numbers 1, 2, and 3. Below the confluence with North Cottonwood Creek, out of bank flows from the main channel follow the course of two older channels and these stream segments have been designated reach numbers 4 and 5.

The reach distances are as follows:

Reach Number	Distance in Miles
1	1.7
2	1.4
3	2.9
4	2.1
5	1.3
Total	= 9.4 miles

The reach locations are shown on the Flood Hazard Study Area Map.

FLOOD HISTORY

Flooding in the study area can result from snowmelt runoff, general rains, and cloudburst storms. The runoff from snowmelt occurs during the period from late May to early July. This is the time of the year that the study area is vulnerable to flooding, especially if there is warmer than usual temperatures and the snowmelt is augmented with rain. Runoff from snowmelt is characterized by moderate peak flows, long duration, and large volumes of water. Buena Vista receives most of its annual rainfall during the months of July through October. The intensity of rainfall from cloudburst storms is usually high and the runoff is characterized by high peak flows of short duration with relatively small volumes of water.

Documentation in regard to flood problems in the Buena Vista area is meager. A search through newspaper accounts revealed little in respect to a history of flooding. According to the July 5, 1957 issue of the "Chaffee County Republican," the most notable flood occurred on July 1, 1957. This flood was described by many long-time residents as the worst in history. Damage to streets and bridge crossings was extensive. Numerous residences received lawn and garden damage and a few homes and buildings had water on the first floor. The 1957 flood had a frequency occurrence of greater than once in 100 years, as estimated from the Cottonwood Creek streamgage data.

FLOOD POTENTIAL - PRESENT CONDITIONS

Hazards of Large Floods

Amount of damages and hazardous conditions caused by any flood are dependent upon: developments in the flood plain, topography of the flooded area, obstructions and debris, depths and velocities of flow, and rates of rise and duration of flooding.

Under present conditions, potential floods of the 100- and 500-year frequency magnitude would inundate portions of the residential and commercial developments in Buena Vista and the urban area west of town. In the low lying areas, floods of lesser magnitude could cause similar problems on a smaller scale. The approximate area of the 100-year flood is shown on the Flood Hazard Area Index Map. Detailed outlines showing the approximate limits of 100- and 500-year floods are located on the Flood Hazard Area Maps, Sheets 1 through 8. There is only a minute area of possible flooding from Cottonwood Creek shown on Sheet 2 (extreme southwest corner); however, this sheet is included to maintain mapping consistency in the study area. Floodwaters from Cottonwood Creek could cause damages to buildings, lawns, gardens, temporary loss of business, inventory replacement, cleanup costs and repair. Streets, road and bridge crossings, communication and power lines are also subject to damage. Some 160 existing buildings, including residential and commercial structures, are partially or totally located in the 100-year flood plain.

Obstruction in the flood plain, natural or man-made, influence the depth and width of the area flooded. Trees and brush growing along the streams retard the out of channel flood flows causing backwater and greater depths of flooding. Road crossings with inadequate culvert and/or bridge openings often become channel constrictions and obstruction to flood flows. Elevated roads in the flood plain act as barriers which raise the water surface at some locations. Other road crossings are lower than the flood plain and are over topped during flood stage. The effects of culvert and bridge constrictions are graphically displayed on the flood profile drawings, Exhibits A-1 through A-5c. Trees, brush, and debris washed out during the periods of high runoff, are carried downstream into bridges and culverts. These obstructions act as dams, backing the water upstream, until they break loose, causing a sudden surge or wall of water with additional destructive force. Obstructions caused by debris clogging culverts and bridges are variable, resulting in a multitude of flow conditions which are unpredictable for any given flood event. The potential effect of debris clogging are not included in the flood profile determinations.

Flood water flowing at high velocities creates dangerous conditions. Velocities exceeding 3 feet per second with depths of 2 feet or more are generally considered hazardous. Those conditions would exist at various locations in the study area, especially in the stream channel of Cottonwood Creek. Most of the flood plain outside of the stream channel is subject to shallow flooding and the flows are less than 2 feet in depth.

Rapidly rising streams are also hazardous to an unsuspecting public, especially at road crossings. On Cottonwood Creek a 100-year frequency flood will peak in about 7 hours at Buena Vista.

Duration of flooding will vary, depending on the season in which flooding occurs. In the spring when the streams are high with runoff from snowmelt, coupled with spring rains, high water could persist for several days. During the late summer months when the streams are normally low, runoff from thunderstorms will recede in a few hours.

Flood Hazard Areas

The total flood hazard area on all reaches subject to inundation by the 100-year flood under present conditions is about 154 acres. The area increases to about 192 acres for the 500-year flood. The following tabulation for areas flooded is by study reach.

Study Reach No.	Flood Hazard Area: 100-Year Flood Acres	Flood Hazard Area: 500-Year Flood Acres
1	6.6 1/	6.7 1/
2	11.4 1/	17.0 1/
3	52.1 1/	65.8 1/
4	62.5	79.9
5	21.5	22.7
Study Area Total	154.1	192.1

1/ Does not include channel area.

Flood Hazard Exhibits

Flood hazard exhibits for the Cottonwood Creek study area are in the Appendix following the text of this report. Included in the Appendix are: Flood hazard area map index, flood hazard area maps, flood profiles, typical valley cross-sections, and tabulations for the flood frequency-elevation and discharge data. For use in determining the flood hazard for any particular location, the flood profiles and tabular material are assembled by reach numbers in sequential order, 1 through 5. The following are descriptions and suggested uses of the exhibits.

Maps

For planning and flood zone regulation purposes, the 100-year flood is used locally as the base flood. Larger floods, such as the 500-year flood are also considered in the planning and management of flood-prone areas. The 100-year and 500-year events are outlined on the Flood Hazard Area Maps. In many instances the outerlimits of the 100- and 500-year floods will appear as one line on the maps. This is due to the topographic relief and slight difference in elevation between the two flood events. It should be noted that areas shown as flooded on the maps may vary more or less with present field conditions. For detailed information, flood elevations should be determined at specific locations and checked with field surveys. Maps, drawings, and other technical data labeled Existing Conditions are valid as of November 1975. 1/

1/ Date of aerial photography for photogrammetric mapping.

The Flood Hazard Area Map Index is useful in locating the various flood hazard exhibits in respect to the study area. The locations of flood hazard area maps and study reaches are illustrated on the Flood Hazard Area Map Index.

Flood Profiles

In addition to the 100- and 500-year frequency floods, hydraulic studies were made on the 10- and 50-year events. Information regarding these smaller floods is especially useful for engineering design purposes related to roads, storm sewers, channels, and appurtenant structures. Flood profiles for the various frequency floods are included in this report as Exhibit A. For information regarding flood elevations at a specific location, the flood profile data can be used in conjunction with the flood hazard area maps. The cross-section locations which appear on both the profiles and maps can be used as reference points. Flood hazard area sheet numbers, compatible with cross-section locations, are shown on each flood profile exhibit.

As a general guide for orientation purposes, the following designations are assigned to stream reaches, flood hazard area maps, and cross-sections.

Reach Number	Flood Hazard Area Map-Sheet Numbers	Cross-Sections Designations
1	1, 2, 3, & 4	A thru Z, AA thru AK
2	3, 4, 5, & 6	AK, BA thru BP
3	5, 6, 7, & 8	BP, CA thru CZ, DA thru DD

Reach Number	Flood Hazard Area Map-Sheet Numbers	Cross Sections Designations
4	1, 3, 5 & 6	I, EA thru EZ, FA thru FB, BP
5	1, 2, 3, 4, & 6	X, GA thru GO, BM

Typical Valley Cross Sections

Cross-sections for each stream are designated alphabetically, starting from the downstream end of each study reach. The following order has been used: Section A, B, . . . Y, Z, AA, AB, etc. The designation sequence is unique for each reach. With the exception of starting and end points, the designation is not carried over from one reach to another.

Exhibit B is a selection of typical valley cross-sections illustrating the configuration of stream channels and adjoining flood plain areas. Shown on the cross-sections are the elevations and lateral extent for the 100- and 500-year flood events.

Flood Frequency-Elevation and Discharge Data

Table 1, pages 1 thru 18, include flood crest elevations and peak discharges for the 10-, 50-, 100-, and 500-year floods. Tabulated information is intended for use in conjunction with the water surface profiles and flood hazard area maps. The information is compatible with reach numbers and cross-section designations.

FLOOD POTENTIAL - FUTURE CONDITIONS

The effects of watershed land use changes anticipated within the next 10 to 20 years were analyzed in relation to future flood heights. Information regarding land use and expected developments were obtained from the "Chaffee County Comprehensive Plan-1976" prepared by the Upper Arkansas Area Council of Governments and Chaffee County. Comparison of present and future runoff data showed insignificant differences from projected changes in land use. Rationale for these results are: (1) Potential developments are located in the lower reaches of the watershed where a slight amount of additional runoff has a minor effect on the magnitude of major flood flows (i.e., the 100-year frequency flood), and (2) the major portion of runoff originates in the San Isabel National Forest where a small amount of land use change is anticipated.

Of upmost importance is the possibility of encroachment on the existing flood plains. Developments within the flood plain could obstruct the flow of flood water, raise the flood elevations, and create hazardous velocities. Encroachment is a far more significant factor than the additional runoff created by proposed upstream developments.

The National Flood Insurance Act of 1968 (Title XIII of the Housing and Urban Development Act, P.L. 90-448) recognized the necessity for flood plain management. This act makes federally subsidized insurance available to citizens in communities that adopt regulations controlling

future developments of their flood plain. In respect to encroachment on the flood plain, the regulations require:

> New residential construction or substantial improvement of existing homes must have the lowest floor level above the elevation of the 100-year flood.
>
> Non-residential construction must meet the same standard or be flood proofed to that level.

The 1968 act benefits owners of structures already in the flood-prone areas by providing insurance that had been unavailable through private companies. The act created a cooperative program of insurance against flood damage by the private flood insurance industry and the federal government.

FLOOD PLAIN MANAGEMENT

The need for adequate floodways to carry the flows of Cottonwood Creek has been recognized by town officials and county planners. Subdividers and developers are required to submit proposed storm drainage plans to the county commissioners for approval. In the past, drainage plans have been prepared singularly or on a plat-by-plat basis. Information contained in this report will be useful in developing a master drainage plan for the study area. This report provides the outline of flood hazard areas on large scale maps specifically for this purpose.

Flood Plain Regulations

This study has been conducted in accordance with state technical requirements as required for review, designation, and approval by the Colorado Water Conservation Board. Section 37-60-106(1)(c), Colorado Revised Statutes 1973 authorizes the Colorado Water Conservation Board "to designate and approve storm or floodwater channels or basins, and to make such designations available to legislative bodies of cities and incorporated towns, to county planning commissions, and to boards of adjustment of cities, incorporated towns, and counties of the state."

In 1974 the General Assembly added a new article 7 to chapter 106, Colorado Revised Statutes 1963, (re-coded as article 65.1 of title 24, C.R.S. 1973 [1975 Supp.]), relating to state and county planning commissions. This new article (H.B. 1041) provides for the designation and regulation of areas and activities of "state interest." Section 24-65.1-201, includes natural hazard areas, such as flood plains, as areas of state interest. A flood plain is defined in the act as being "an area adjacent to a stream, which area is subject to flooding as a result of the occurrence of an intermediate regional flood 2/ and which area thus is so adverse to past, current, or foreseeable construction or land use as to constitute a significant hazard to public health and safety or to property."

2/ The intermediate regional flood is the 100-year frequency flood.

With reference to the administration of flood plains, the act provides that flood plains shall be administered so as to minimize significant hazards to public health and safety or to property; open space activities shall be encouraged; structures shall be designed in terms of use and hazards; disposal sites and systems shall be protected from inundation by floodwaters; and activities shall be discouraged which, in time of flooding, would create significant hazards to public health and safety or to property.

The act further provides that after promulgation of guidelines for land use in flood plains by the Colorado Water Conservation Board, the flood plain shall be administered by local governments in a manner which is consistent with the flood plain guidelines.

Concerning the designation of flood plains, the Colorado Water Conservation Board, acting in cooperation with the Colorado Soil Conservation Board, is charged with the primary responsibility for

1. Making recommendations to local governments and the Colorado Land Use Commission.

2. Providing technical assistance to local governments.

Developmental Policies

In the model flood plain regulations, adopted by the Colorado Water Conservation Board, the statement of purpose is to promote the public health, safety and general welfare by provisions designed to:

1. Permit only such uses within the designated flood plains as will not endanger life, health, public safety or property in times of flood.

2. Prohibit the placement of fill, materials and structures which would significantly obstruct flood flows to the potential damage of others or cause potentially damaging debris to be carried downstream.

3. Protect the public from the burden of avoidable financial expenditures for flood control projects and flood relief measures.

4. Prevent avoidable business and commerce interruptions.

5. Minimize damages to public utilities, streets and bridges.

6. Minimize victimization of unwary home and land purchasers.

7. Minimize the pollution of water by prohibiting the disposal of garbage and other solid waste materials in flood plains.

Flood Insurance

The town of Buena Vista and the unincorporated areas of Chaffee County are participating in HUD's National Flood Insurance Program. Flood insurance is available to owners and occupants of all buildings, mobile homes, and their contents, in these two jurisdictions.

Structural Flood Control Measures

There are no existing or currently planned flood control structures in the Cottonwood Creek watershed; however, there is a possibility that some of the potential flood damages could be alleviated with stream channel enlargement and stream bank renovation. Suggestions regarding structural measures are included in the following report section on "Recommendations."

RECOMMENDATIONS

The following recommendations are included for consideration in reducing potential flood damages.

1. The town of Buena Vista and Chaffee County should submit this Flood Hazard Analyses to the Colorado Water Conservation Board for designation and approval.

2. The town of Buena Vista and Chaffee County should develop a master drainage plan for the study area and watersheds which are tributary to the study area.

3. Several existing road crossings obstruct flows during flood stage. Remedial measures to existing obstructions, and future road crossing design and locations should be compatible with the master drainage plan.

4. Periodic inspections in the study area flood plains should be conducted to assure conformance with permissible uses.

5. A maintenance program on Cottonwood Creek should be implemented to remove debris and repair damaged stream banks.

6. A study on the Cottonwood Creek flood plains should be conducted to determine the feasibility of confining flood flows through stream channel enlargement and stream bank renovation.

7. Residents living within or adjacent to the delineated flood hazard areas should obtain flood insurance coverage on their structures and contents.

Flood Damage Reduction Measures

Potential flood damages to existing developments and possible loss of life can be alleviated or lessened through several nonstructural and structural methods. Nonstructural methods include: flood warning and forecasting systems, flood fighting, and emergency evacuation.

Flood Warning and Flood Forecasting Systems

The National Oceanic and Atmospheric Administration (NOAA) through its National Weather Service (NWS), maintains year-around surveillance of weather and flood conditions. Daily weather forecasts are issued through the NWS and disseminated by radio and television stations. A general alert to the danger of flash flooding is one of the services provided by the National Weather Service.

General forecasts of snowmelt runoff for the Arkansas River are made cooperatively but published separately by the NWS and the Soil Conservation Service. Streamflow forecasting is based on several factors including precipitation, water content in the mountain snowpack, and soil moisture conditions on the watershed. The forecasts are made primarily for estimating water supply for irrigation, industrial, municipal and other uses; however, the data is also used to indicate potential flooding from snowmelt runoff.

Flood Fighting and Emergency Evaluation

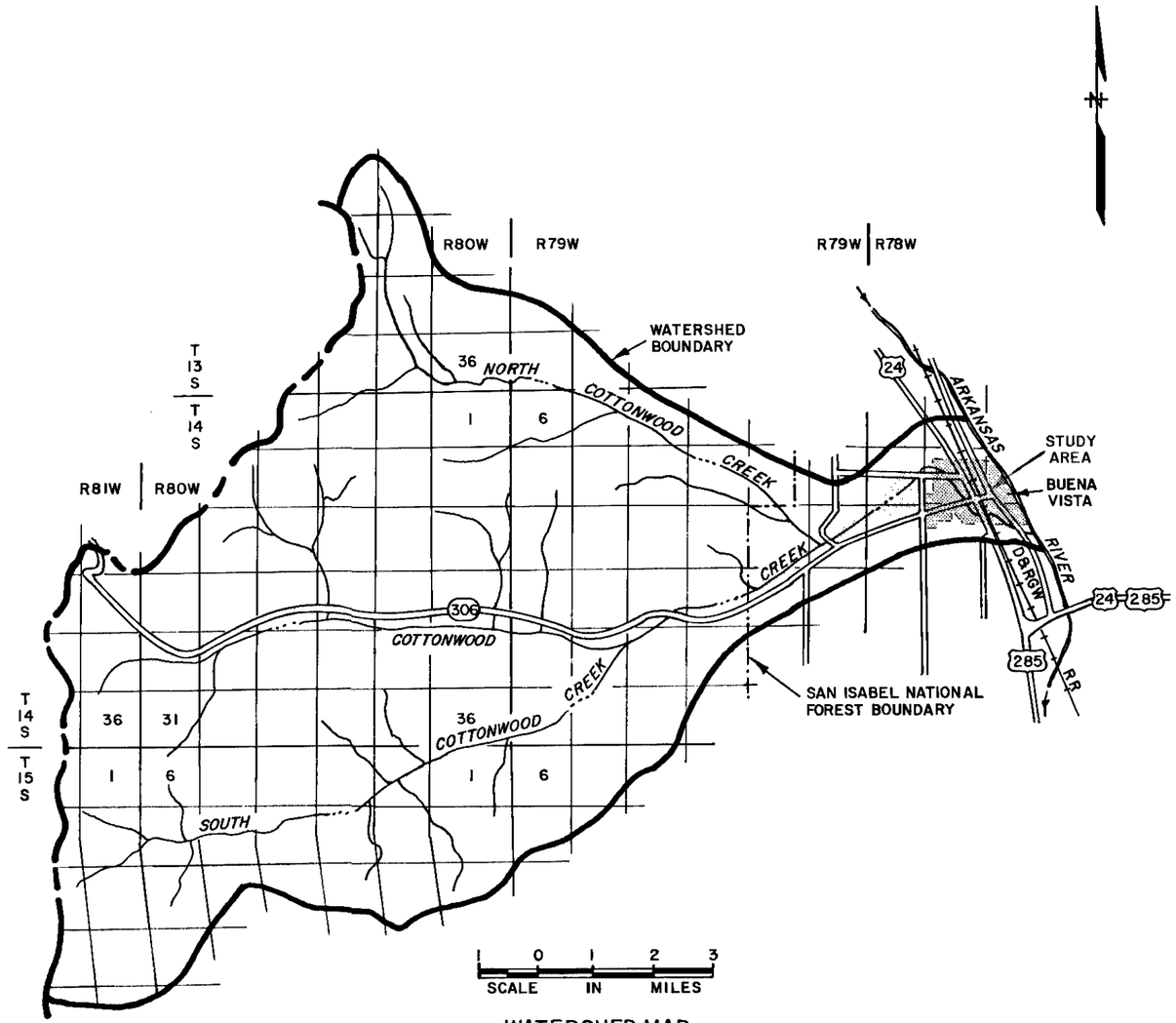
An "Emergency Evacuation and Operation Plan" should be developed by Buena Vista and Chaffee County. Implementation of this plan would provide for alerting the public of potential flooding and coordinating community and county services during an emergency.

Plan implementation during the time of an emergency requires cooperation of the general public as well as local officials. This is especially

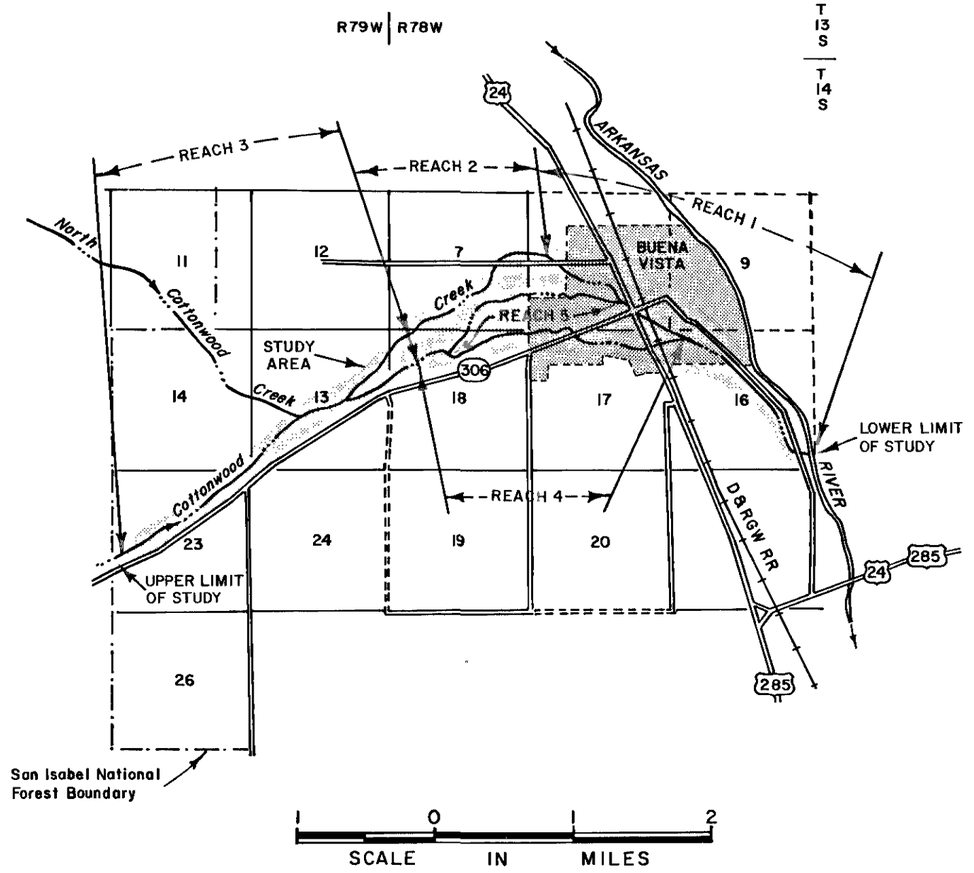
important for flood fighting, evacuation, and rescue operations. Too often, an uninformed public becomes a detriment to emergency operations. It is recommended that public information and education program on "Flood Hazards" be disseminated through the news media and be a part of the total community effort towards lessening the losses caused by flooding.

Structural Measures

Portions of the flood hazard areas could be protected by confining flood flows within the boundaries of a predetermined floodway. Typical structural measures could include: stream channel enlargement, stream bank renovation, and road crossing improvements. Of special concern would be the assurance of maintaining aesthetic values and the natural stream integrity. Implementing structural protection requires detailed engineering studies, funding arrangements, and agreed upon actions by governing bodies.



WATERSHED MAP

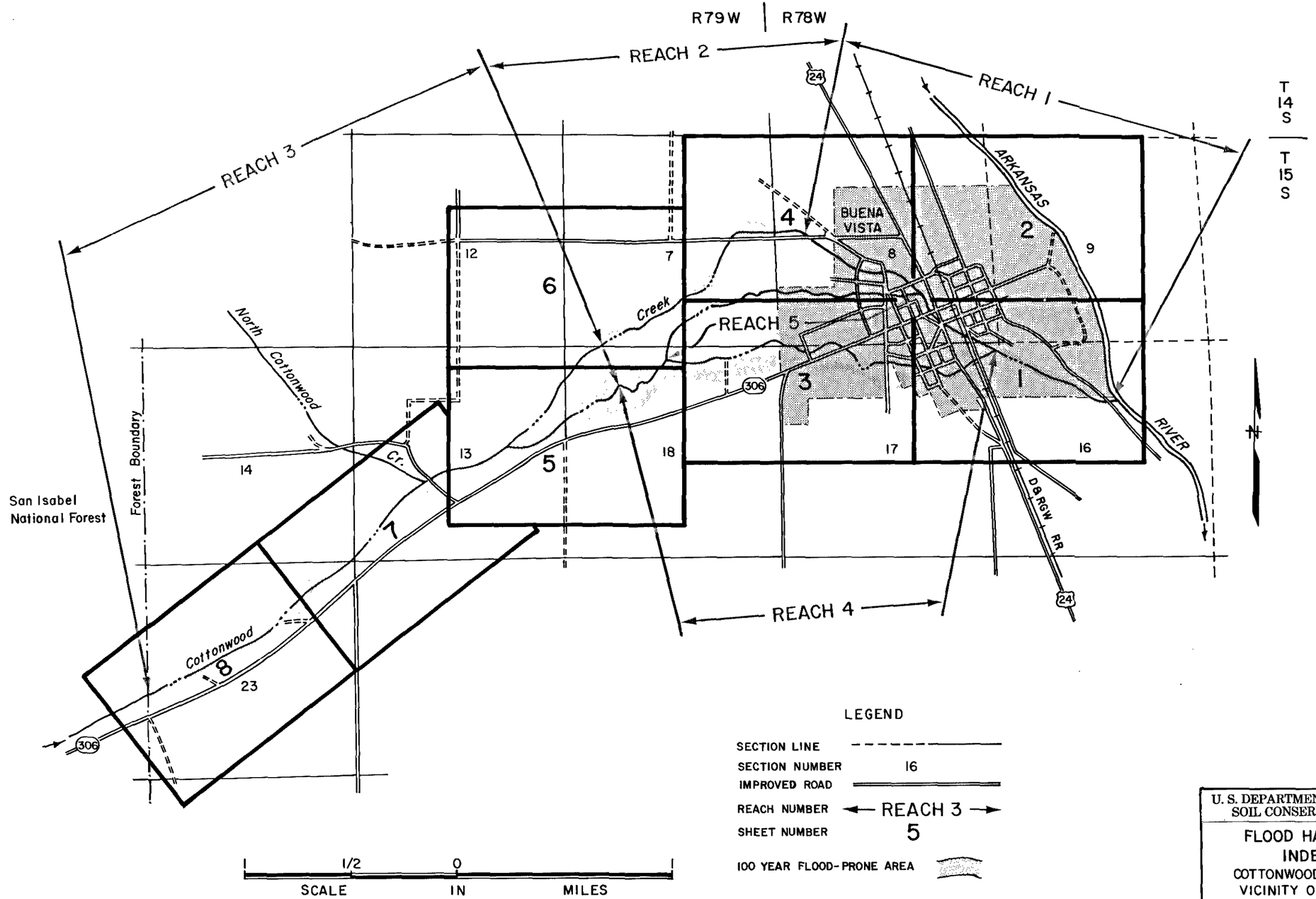


STUDY AREA MAP

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD HAZARD STUDY AREA
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO

USDA-SCS-PORTLAND, OR. 1978



LEGEND

SECTION LINE

SECTION NUMBER 16

IMPROVED ROAD

REACH NUMBER ← REACH 3 →

SHEET NUMBER 5

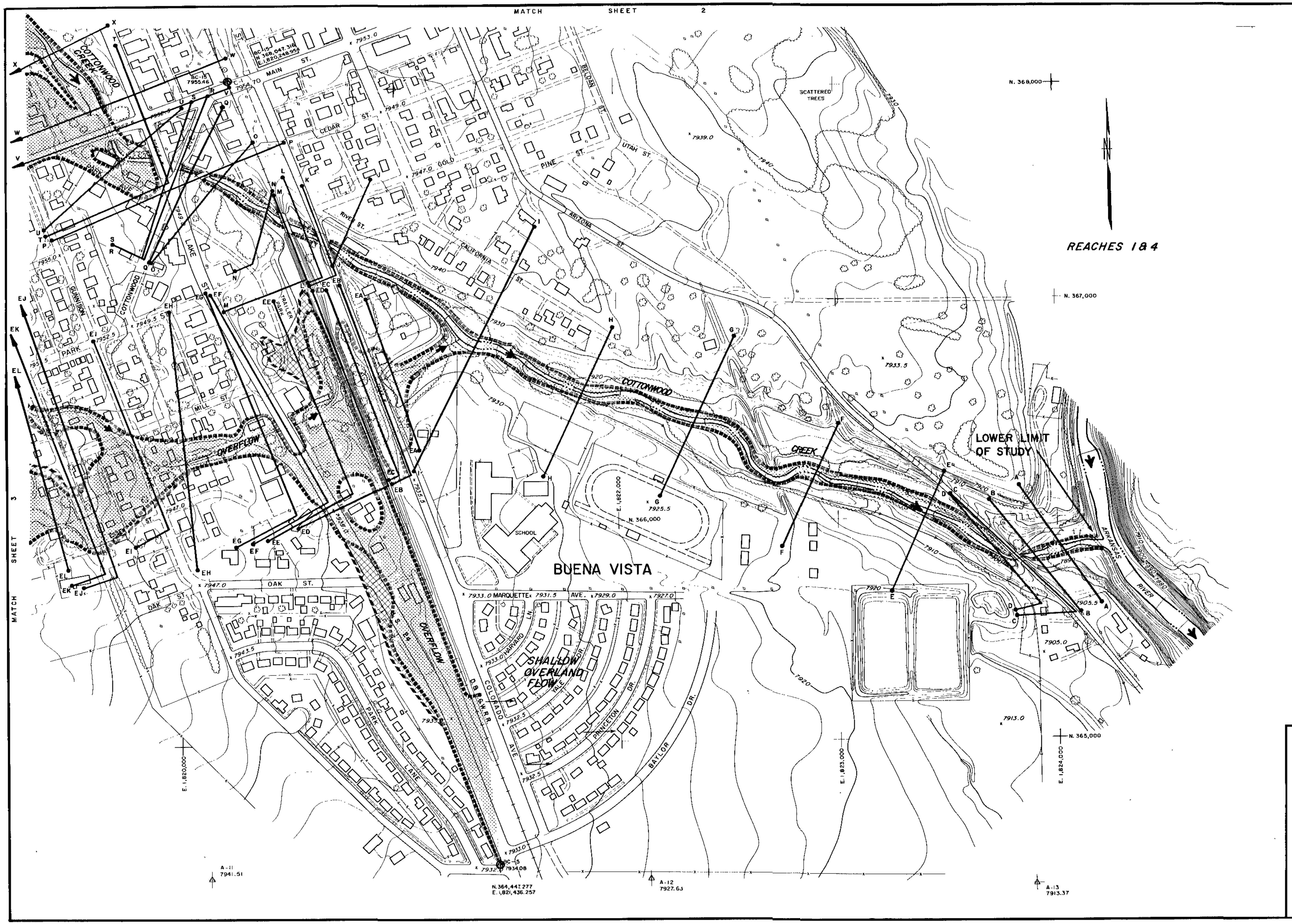
100 YEAR FLOOD-PRONE AREA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD HAZARD AREA INDEX MAP

COTTONWOOD CREEK IN THE VICINITY OF BUENA VISTA

CHAFFEE COUNTY, COLORADO



LEGEND

FLOOD PLAIN LIMITS

100 YEAR FLOOD
500 YEAR FLOOD

GROUND ELEVATION IN FEET MEAN SEA LEVEL DATUM — 8160
CONTOUR, Interval 2.0'
CROSS SECTION — A A
CROSS SECTION CONTINUED — AB AB
PERENNIAL STREAM
PERMANENT BENCH MARK
HORIZONTAL CONTROL
VERTICAL CONTROL
PHOTO CENTER
GRID POINT
POWER POLE
FENCE

BASIS OF CONTROL:
THE COLORADO STATE COORDINATE SYSTEM, CENTRAL ZONE. ESTABLISHED FROM U. S. DEPARTMENT OF COMMERCE, COAST & GEODETIC SURVEY POINT "WINTERS" LATITUDE = 38° 47' 47.878". LONGITUDE = 106° 06' 55.247". Y= 351,415.86 X= 1,824,620.50
CONVERSION FACTORS:
ELEVATION AT "WINTERS = 7910." ELEVATION FACTOR= 20,906,000 / 20,913,910 = .999621783 SCALE FACTOR = .999949923 COMBINED FACTOR = .999949923 x .999621783 = .999571725.
VERTICAL CONTROL BASED ON U.S.G.S. BM H-49, ELEV. = 8594.145 U.S.C. & G.S. BM V-339, ELEV. = 8004.341 AND U.S.C. & G.S. AND U.S.G.S. BM H-47, ELEV. 7954.666.

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 6" C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN NOVEMBER 6, 1975.

PHOTOGRAMMETRY BY
BELL MAPPING COMPANY, DENVER, COLORADO

FLOOD HAZARD AREAS ARE FOR EXISTING CONDITIONS- NOVEMBER 1975.

FLOOD AREA OUTLINES WERE DETERMINED BY MATCHING FLOOD PROFILE ELEVATIONS WITH TOPOGRAPHY.

REVISION	DATE	BY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD HAZARD AREAS COTTONWOOD CREEK IN THE VICINITY OF BUENA VISTA CHAFFEE COUNTY, COLORADO

200 0 200 400 600
SCALE IN FEET

SHEET 1 OF 8

USDA-SCS-PORTLAND, OR. 1976

LEGEND

FLOOD PLAIN LIMITS

100 YEAR FLOOD

500 YEAR FLOOD

GROUND ELEVATION IN FEET MEAN SEA LEVEL DATUM — 8160

CONTOUR, Interval 2.0'

CROSS SECTION A — A

CROSS SECTION CONTINUED AB — AB

PERENNIAL STREAM

PERMANENT BENCH MARK

HORIZONTAL CONTROL △

VERTICAL CONTROL ○

PHOTO CENTER

GRID POINT ×

POWER POLE

FENCE —x—

BASIS OF CONTROL:
THE COLORADO STATE COORDINATE SYSTEM, CENTRAL ZONE. ESTABLISHED FROM U. S. DEPARTMENT OF COMMERCE, COAST & GEODETIC SURVEY POINT "WINTERS" LATITUDE = 38° 47' 47.878". LONGITUDE = 106° 06' 55.247". Y = 351,415.86 X = 1,824,620.50

CONVERSION FACTORS:
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TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 6" C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN NOVEMBER 6, 1975.

PHOTOGRAMMETRY BY
BELL MAPPING COMPANY, DENVER, COLORADO

FLOOD HAZARD AREAS ARE FOR EXISTING CONDITIONS- NOVEMBER 1975.

FLOOD AREA OUTLINES WERE DETERMINED BY MATCHING FLOOD PROFILE ELEVATIONS WITH TOPOGRAPHY.

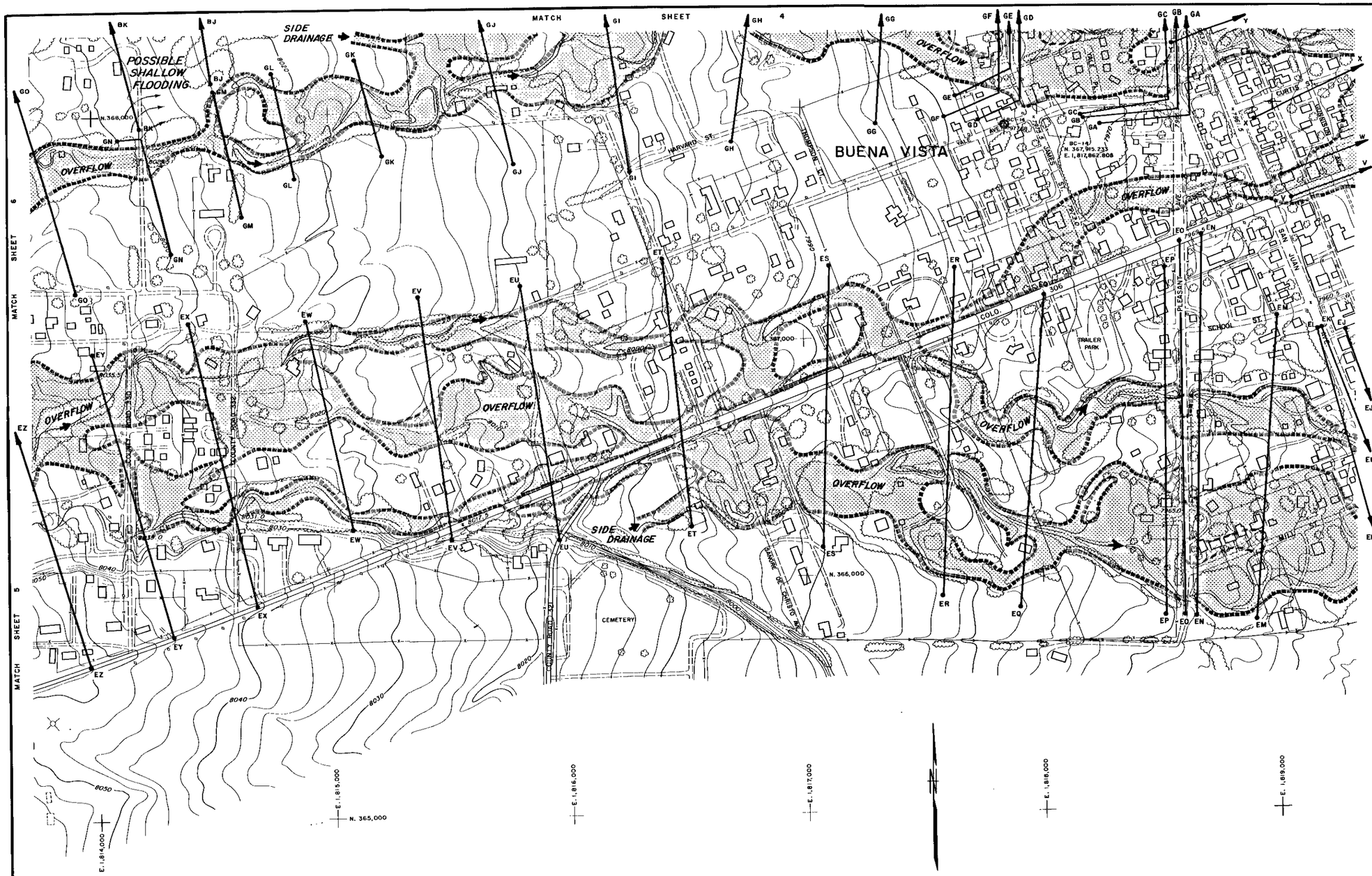
REVISION	DATE	BY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD HAZARD AREAS COTTONWOOD CREEK IN THE VICINITY OF BUENA VISTA CHAFFEE COUNTY, COLORADO

200 0 200 400 600
SCALE IN FEET

SHEET 2 OF 8



LEGEND

FLOOD PLAIN LIMITS

100 YEAR FLOOD

500 YEAR FLOOD

GROUND ELEVATION IN FEET MEAN SEA LEVEL DATUM — 8160

CONTOUR, Interval 2.0'

CROSS SECTION — A — A

CROSS SECTION CONTINUED — AB — AB

PERENNIAL STREAM

PERMANENT BENCH MARK

HORIZONTAL CONTROL

VERTICAL CONTROL

PHOTO CENTER

GRID POINT

POWER POLE

FENCE

BASIS OF CONTROL:
THE COLORADO STATE COORDINATE SYSTEM, CENTRAL ZONE. ESTABLISHED FROM U. S. DEPARTMENT OF COMMERCE, COAST & GEODETIC SURVEY POINT "WINTERS" LATITUDE = 38° 47' 47.878". LONGITUDE = 106° 06' 55.247". Y= 351,415.86 X= 1,824,620.50

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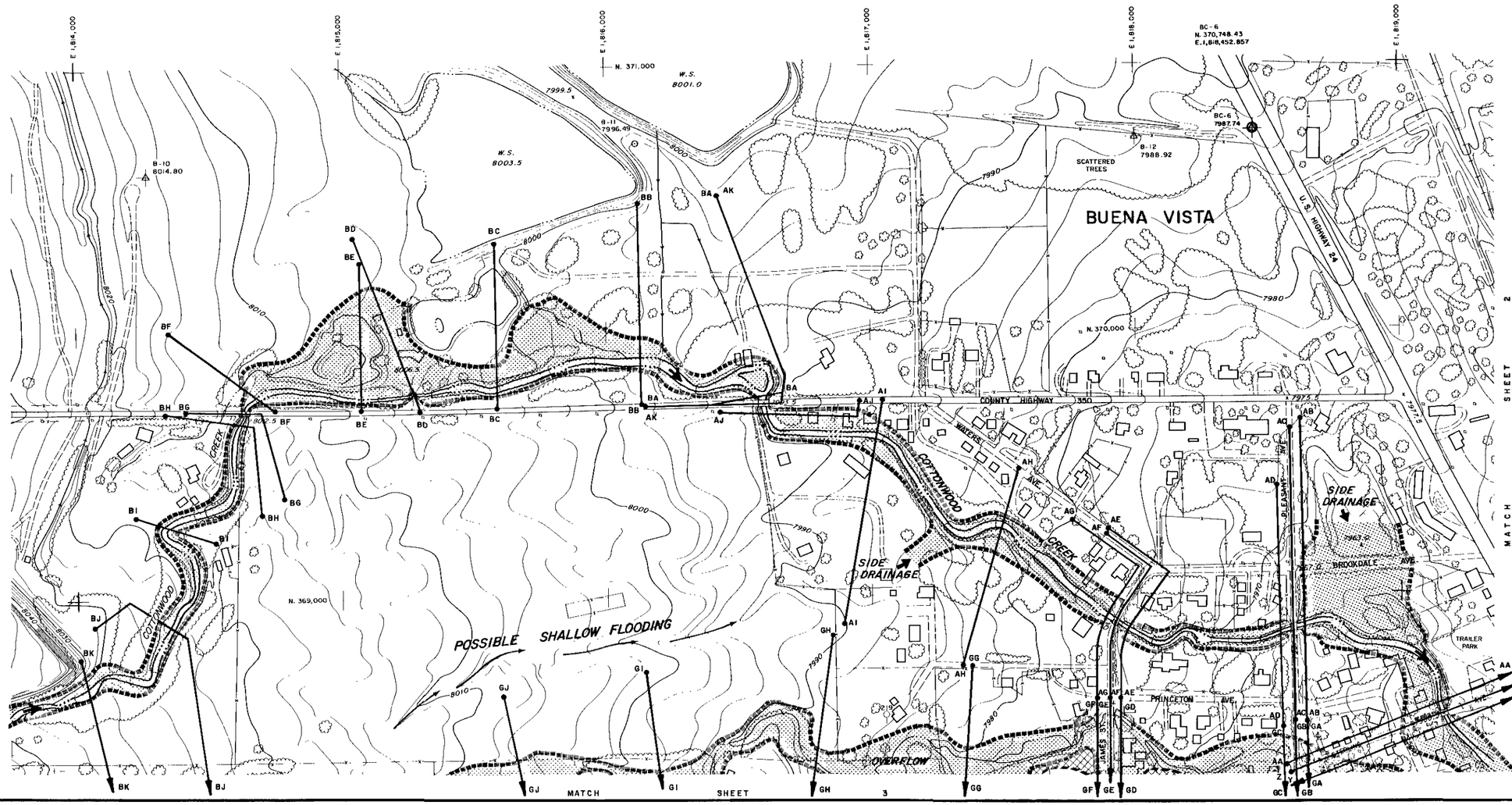
FLOOD HAZARD AREAS COTTONWOOD CREEK IN THE VICINITY OF BUENA VISTA CHAFFEE COUNTY, COLORADO

200 0 200 400 600
SCALE IN FEET

SHEET 3 OF 8

USDA-SCS-PORTLAND, OR. 1978

REACHES - 1, 2 & 5



LEGEND

FLOOD PLAIN LIMITS

100 YEAR FLOOD

500 YEAR FLOOD

GROUND ELEVATION IN FEET MEAN SEA LEVEL DATUM	8160
CONTOUR, Interval 2.0'	
CROSS SECTION	A — A
CROSS SECTION CONTINUED	AB — AB
PERENNIAL STREAM	
PERMANENT BENCH MARK	
HORIZONTAL CONTROL	△
VERTICAL CONTROL	○
PHOTO CENTER	
GRID POINT	×
POWER POLE	
FENCE	—x—

BASIS OF CONTROL:
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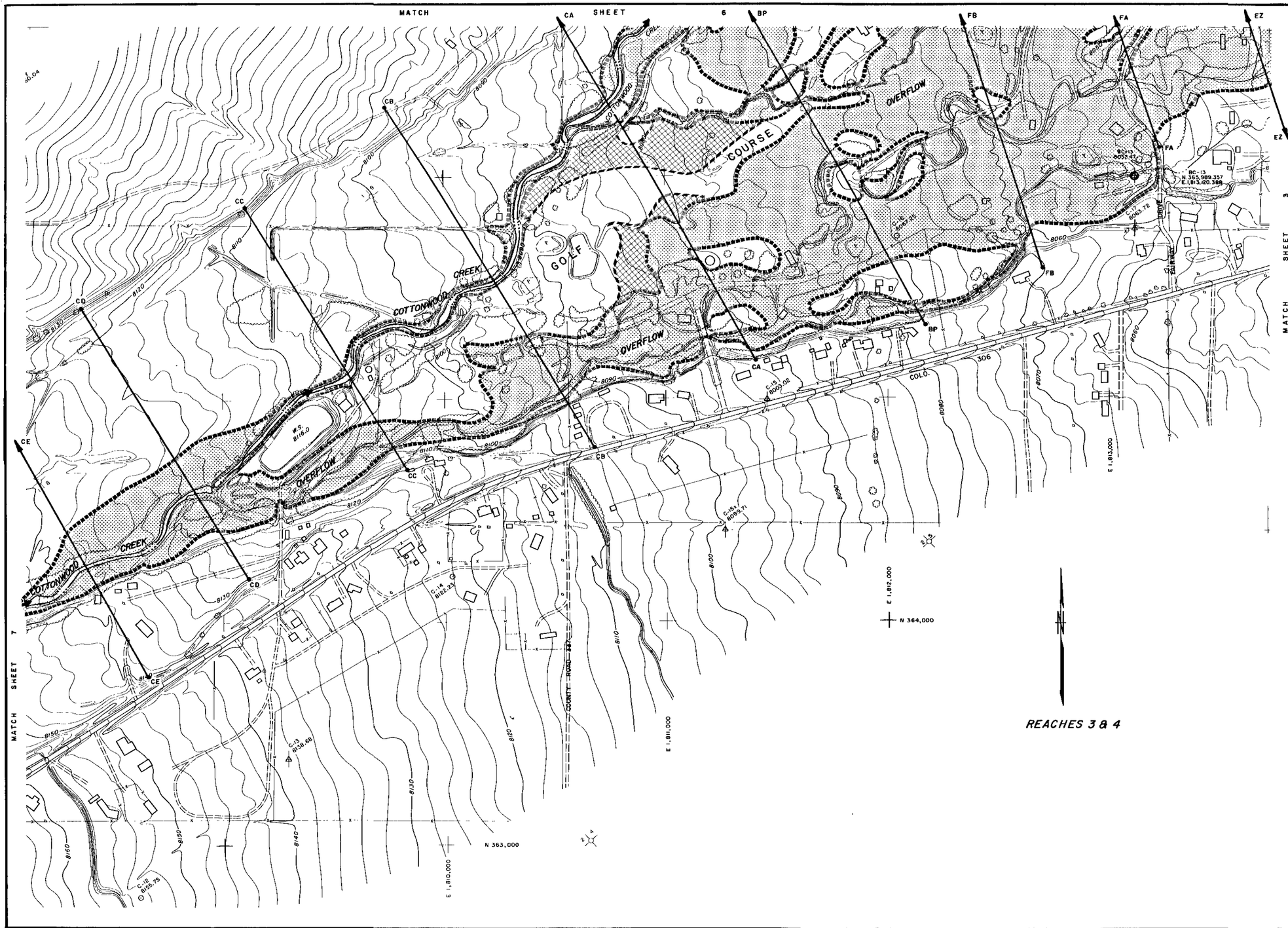
FLOOD HAZARD AREAS COTTONWOOD CREEK IN THE VICINITY OF BUENA VISTA CHAFFEE COUNTY, COLORADO

200 0 200 400 600

SCALE IN FEET

SHEET 4 OF 8

USDA-SCS-PORTLAND, OR. 1976



LEGEND

FLOOD PLAIN LIMITS

100 YEAR FLOOD

500 YEAR FLOOD

GROUND ELEVATION IN FEET MEAN SEA LEVEL DATUM — 8160

CONTOUR, Interval 2.0'

CROSS SECTION — A — A

CROSS SECTION CONTINUED — AB — AB

PERENNIAL STREAM

PERMANENT BENCH MARK

HORIZONTAL CONTROL

VERTICAL CONTROL

PHOTO CENTER

GRID POINT

POWER POLE

FENCE

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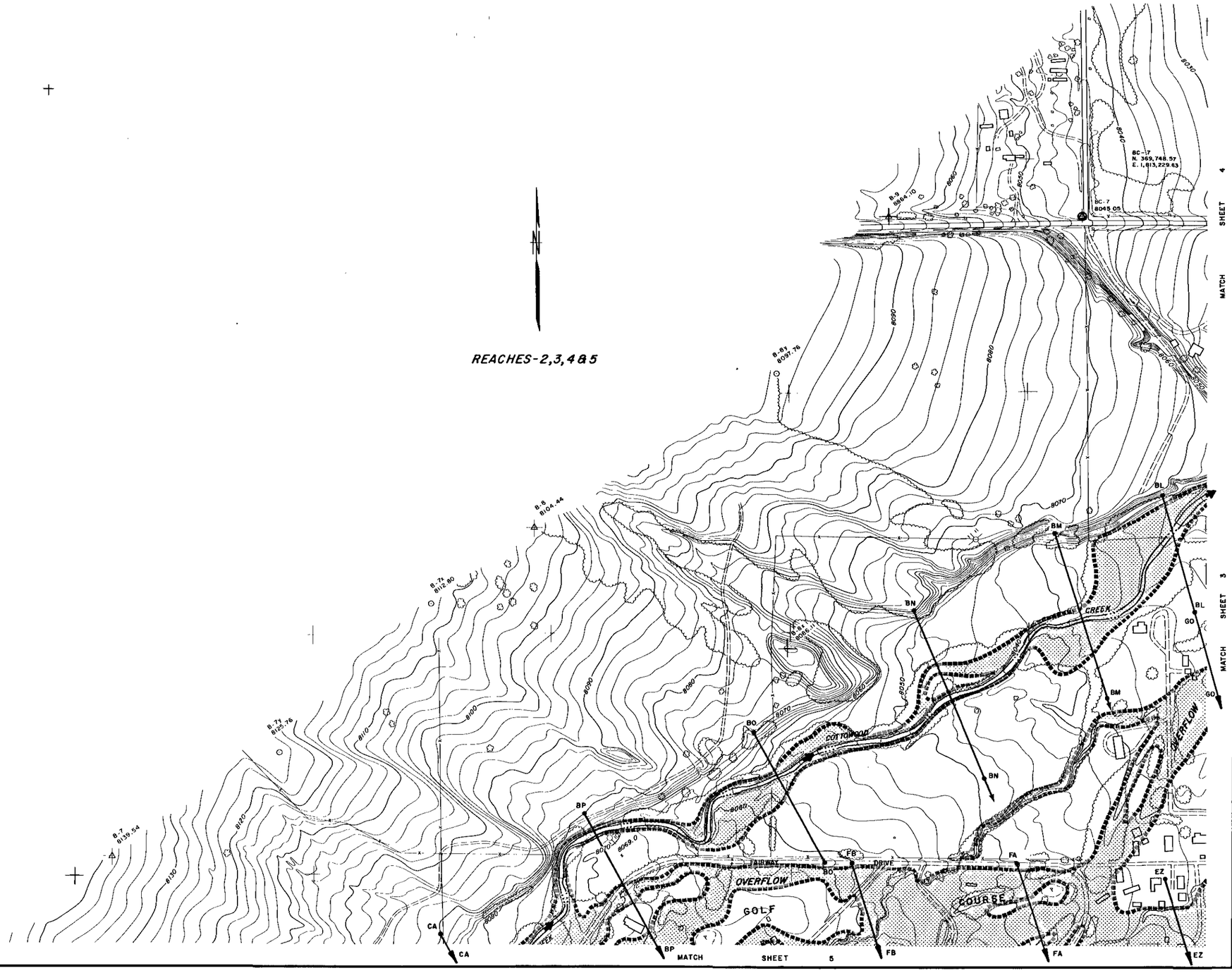
200 0 200 400 600
SCALE IN FEET

SHEET 5 OF 8

USGA-SCS-PORTLAND, OR. 1978

REACHES-2,3,4&5



LEGEND

FLOOD PLAIN LIMITS

100 YEAR FLOOD

500 YEAR FLOOD

GROUND ELEVATION IN FEET MEAN SEA LEVEL DATUM — 8160

CONTOUR, Interval 2.0'

CROSS SECTION — A — A

CROSS SECTION CONTINUED — AB — AB

PERENNIAL STREAM

PERMANENT BENCH MARK

HORIZONTAL CONTROL △

VERTICAL CONTROL ○

PHOTO CENTER 114

GRID POINT ×

POWER POLE

FENCE —x—

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200 0 200 400 600
SCALE IN FEET

SHEET 6 OF 8

USDA-SCS-PORTLAND, OR. 1978

REACH-3

B-4 8242.40

B-4x 8230.44

B-4y 8212.78

B-5 8196.17

B-5y 8188.43

B-6 8174.69

BC-12 8163.74 N 365,845.080 E 1,807,761.028

BC-11 8193.60 N 362,739.168 E 1,805,404.533

C-8 8234.91

C-9 8212.63

C-10 8194.17

C-11 8174.19

C-12 8155.75

C-13 8138.68

NORTH FORK

COTTONWOOD CREEK

COUNTY HIGHWAY 306

COLO. 306

MATCH SHEET 8

MATCH SHEET 5

LEGEND

FLOOD PLAIN LIMITS

100 YEAR FLOOD

500 YEAR FLOOD

GROUND ELEVATION IN FEET MEAN SEA LEVEL DATUM — 8160

CONTOUR, Interval 2.0'

CROSS SECTION A — A

CROSS SECTION CONTINUED AB — AB

PERENNIAL STREAM

PERMANENT BENCH MARK

HORIZONTAL CONTROL △

VERTICAL CONTROL ○

PHOTO CENTER 1/4

GRID POINT ×

POWER POLE

FENCE —x—

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200 0 200 400 600
SCALE IN FEET

SHEET 7 OF 8

USDA-SCS-PORTLAND, OR. 1978

REACH - 3

UPPER LIMIT OF STUDY

D-2 8359.24
D-3 8334.00
D-4 8312.82
D-6 8263.07
BC-9 N 361,785.45 E 1,802,536.62 8281.38
BC-10 (D-1) 8382.40 N 358,955.81 E 1,800,071.06
BC-10 (D-1) 8362.40

C-2 8359.22
C-3 8340.05
C-4 8320.95
C-5 8301.70
C-6 8282.13
C-7 8263.57

E 1,801,000 N 357,000
E 1,802,000 N 358,000
E 1,803,000
E 1,804,000 N 359,000
E 1,805,000 N 36

COTTONWOOD CREEK
DRY CREEK
COLO. 306
CHAFFEE COUNTY

DA DB DC DD CU CV CW CX CY CZ

SHEET 7
MATCH

LEGEND

FLOOD PLAIN LIMITS

100 YEAR FLOOD
500 YEAR FLOOD

GROUND ELEVATION IN FEET MEAN SEA LEVEL DATUM — 8160
CONTOUR, Interval 2.0'
CROSS SECTION — A — A
CROSS SECTION CONTINUED — AB — AB
PERENNIAL STREAM
PERMANENT BENCH MARK
HORIZONTAL CONTROL △
VERTICAL CONTROL ○
PHOTO CENTER 1 | 4
GRID POINT ×
POWER POLE ◊
FENCE —x—

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SOIL CONSERVATION SERVICE

FLOOD HAZARD AREAS COTTONWOOD CREEK IN THE VICINITY OF BUENA VISTA CHAFFEE COUNTY, COLORADO

200 0 200 400 600
SCALE IN FEET

SHEET 8 OF 8

92

USDA-SCS-PORTLAND, OR. 1978

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

MAP INDEX
SHEET 1

ELEVATION IN FEET (M.S.L.)

7915
7910
7905
7900
7895
7890
7885
7880
7875

CONFLUENCE WITH ARKANSAS RIVER

A
B
C-ARIZONA STREET
D
E
F
G
H

C-ARIZONA STREET
- ROAD EL 7898.1
- CULVERT
- TOP OF WATERWAY EL. 7884.0

0+00
4+00
8+00
12+00
16+00
20+00
24+00

FEET ABOVE MOUTH

EXHIBIT A-1
FLOOD PROFILES
REACH 1 - COTTONWOOD CREEK
STA 0+00 to 25+50
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

MAP INDEX
SHEET 1

ELEVATION IN FEET (M.S.L.)

7950
7945
7940
7935
7930
7925
7920
7915
7910

24+00
28+00
32+00
36+00
40+00
44+00
48+00

FEET ABOVE MOUTH

H
J
K - COLORADO AVENUE
L
M - D&RGW RR
N
O
P - CEDAR STREET
Q
R
S
T
U

K-COLORADO AVENUE
- DECK EL. 7940.0
- BRIDGE
- TOP OF WATERWAY EL. 7929.1

M-D&RGW RAILROAD
- DECK EL. 7946.7
- BRIDGE
- TOP OF WATERWAY EL. 7933.0

P-CEDAR STREET
- DECK EL. 7946.0
- BRIDGE
- TOP OF WATERWAY EL. 7938.6

R-COTTONWOOD AVENUE
- DECK EL. 7947.0
- BRIDGE
- TOP OF WATERWAY EL. 7938.7

T-LAKE STREET-U.S. 24
- DECK EL. 7949.9
- BRIDGE
- TOP OF WATERWAY EL. 7942.0

EXHIBIT A-1a
FLOOD PROFILES
REACH 1- COTTONWOOD CREEK
STA 25+50 to 48+55
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS

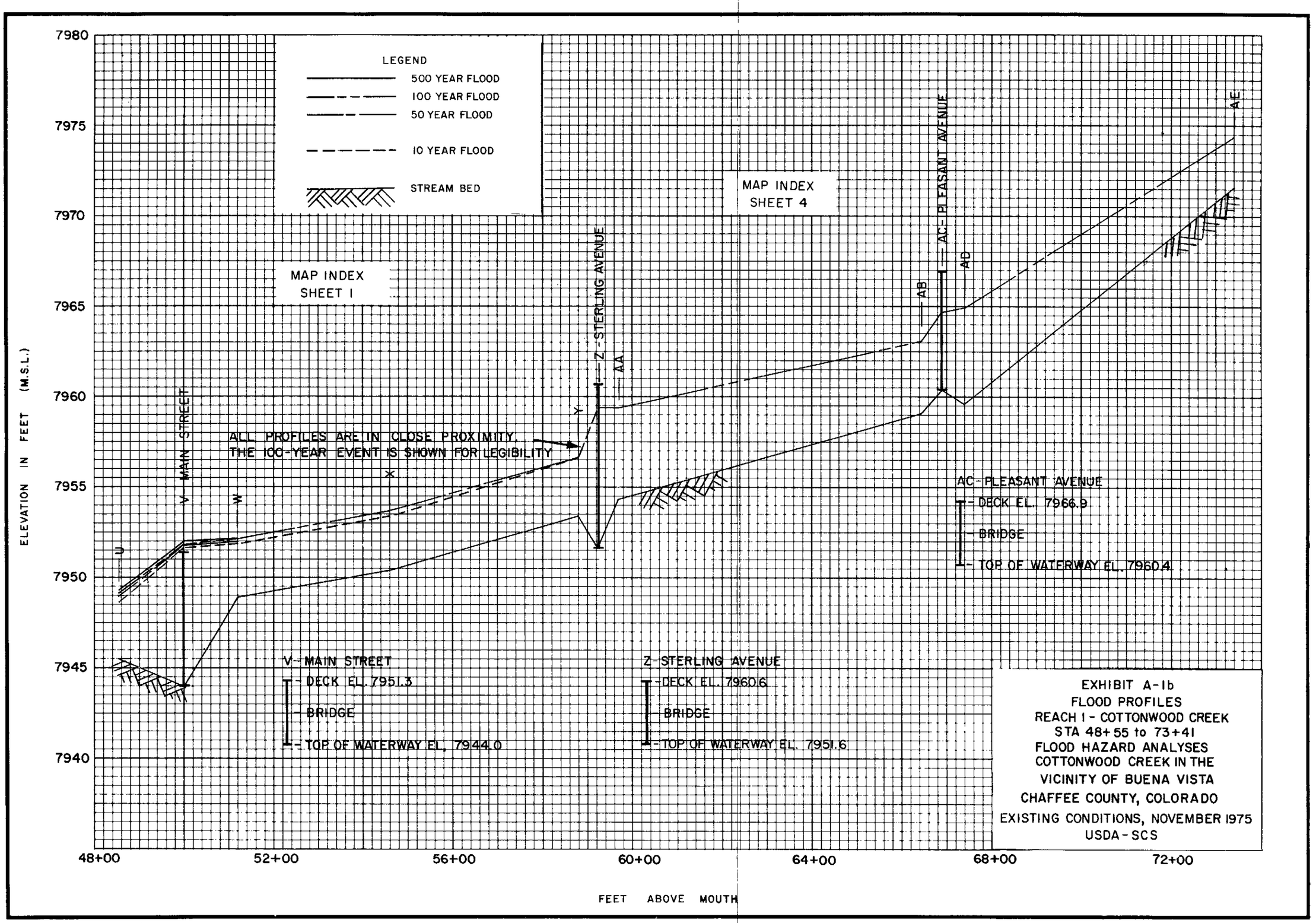


EXHIBIT A-1b
FLOOD PROFILES
REACH 1 - COTTONWOOD CREEK
STA 48+55 to 73+41
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA - SCS

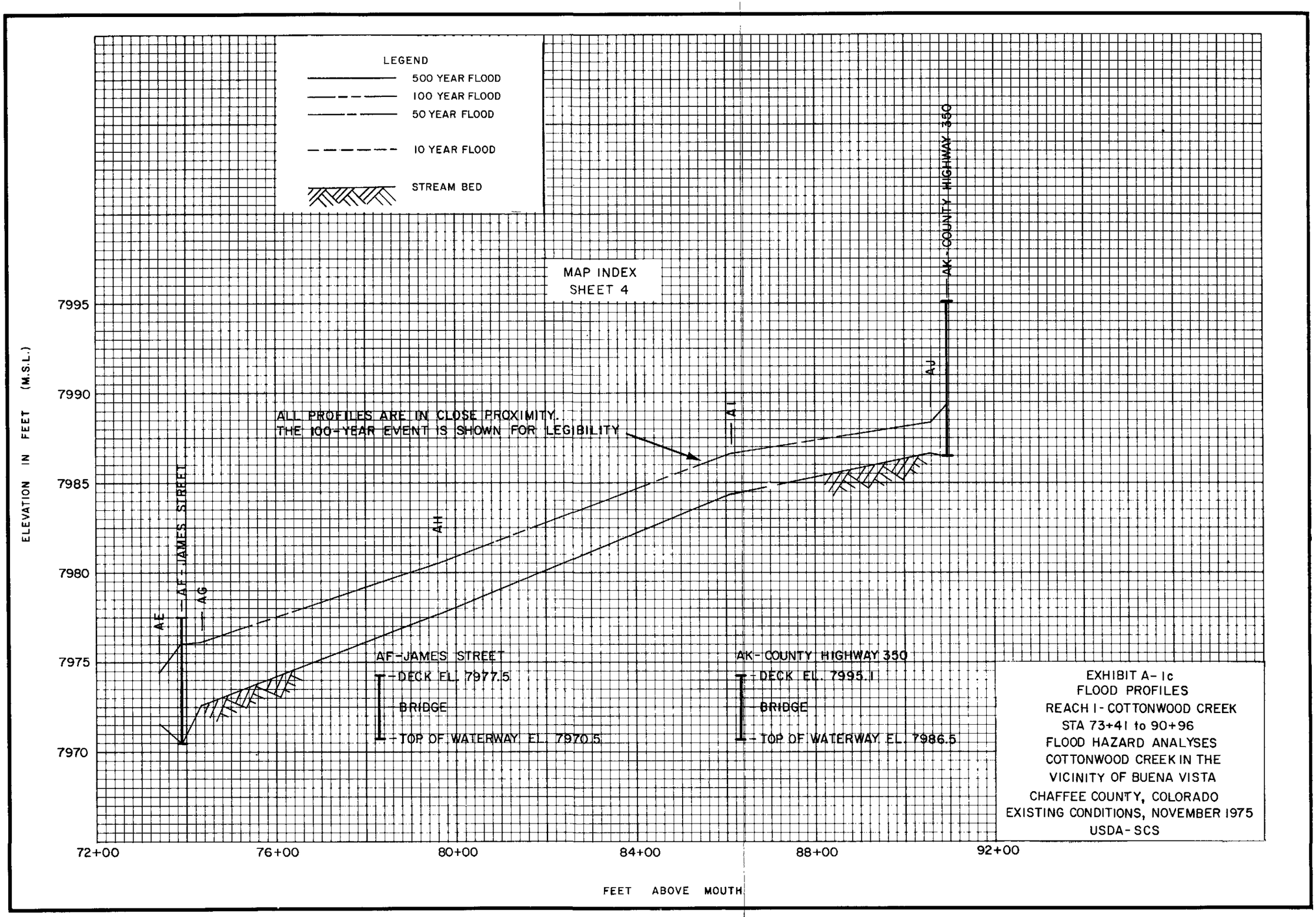
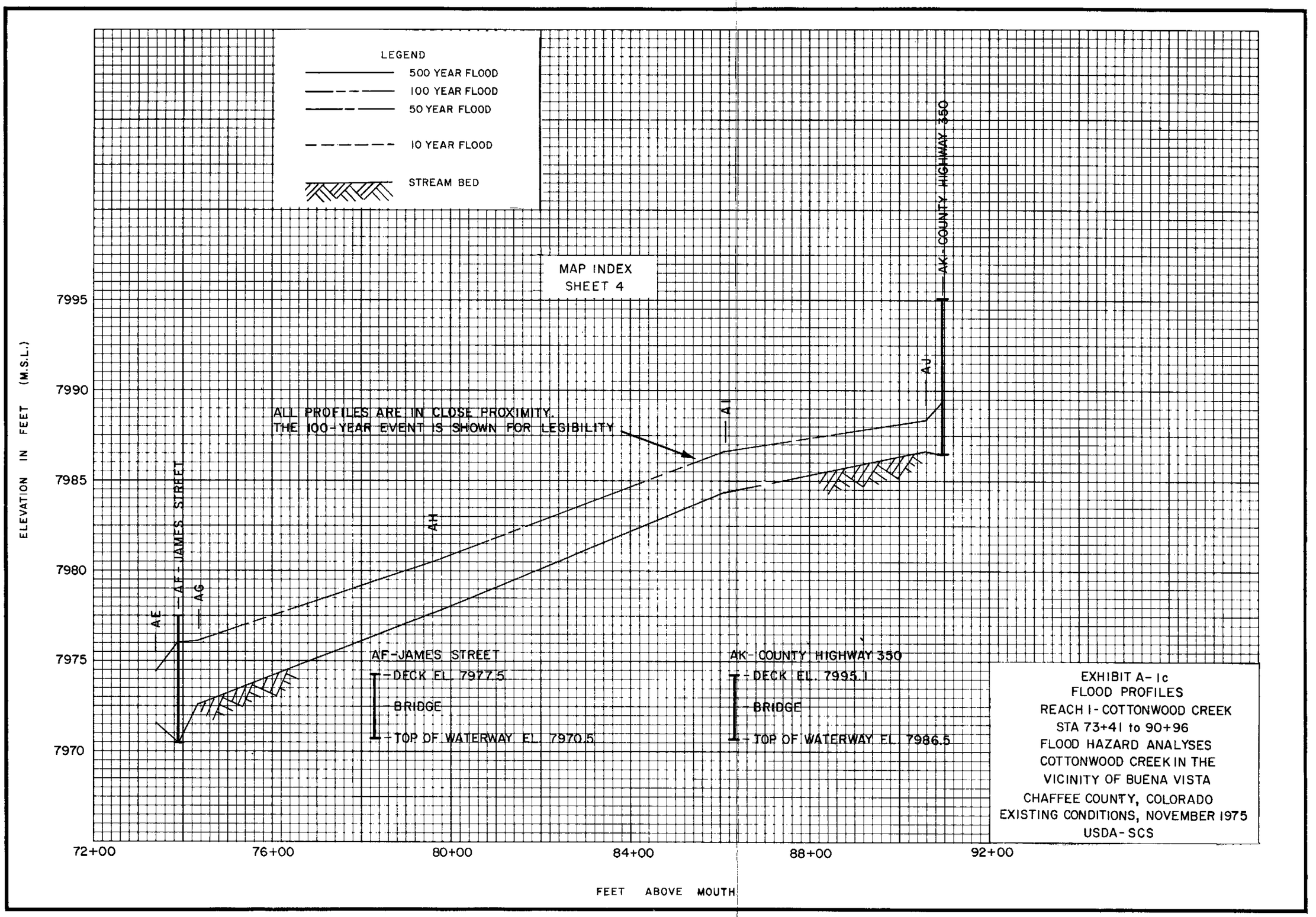


EXHIBIT A-1c
FLOOD PROFILES
REACH 1 - COTTONWOOD CREEK
STA 73+41 to 90+96
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS


LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
MAP INDEX
SHEET 4
ALL PROFILES ARE IN CLOSE PROXIMITY.
THE 100-YEAR EVENT IS SHOWN FOR LEGIBILITY
AK-COUNTY HIGHWAY 350
AJ
AI
AH
AG
AF-JAMES STREET
AE
AF-JAMES STREET
DECK EL. 7977.5
BRIDGE
TOP OF WATERWAY EL. 7970.5
AK-COUNTY HIGHWAY 350
DECK EL. 7995.1
BRIDGE
TOP OF WATERWAY EL. 7986.5
7995
7990
7985
7980
7975
7970
ELEVATION IN FEET (M.S.L.)
72+00
76+00
80+00
84+00
88+00
92+00
FEET ABOVE MOUTH
EXHIBIT A-1c
FLOOD PROFILES
REACH 1-COTTONWOOD CREEK
STA 73+41 to 90+96
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

MAP INDEX
SHEET 4

ALL PROFILES ARE IN CLOSE PROXIMITY.
THE 100-YEAR EVENT IS SHOWN FOR LEGIBILITY

AK-COUNTY HIGHWAY 350
- DECK EL. 7995.1
- BRIDGE
- TOP OF WATERWAY EL. 7986.5

BD-LANE
- DECK EL. 8006.5
- BRIDGE
- TOP OF WATERWAY EL. 7997.7

BG-COUNTY HIGHWAY 350
- DECK EL. 8012.0
- BRIDGE
- TOP OF WATERWAY EL. 8003.2

EXHIBIT A-2
FLOOD PROFILES
REACH 2-COTTONWOOD CREEK
STA 90+96 to 113+01
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS

ELEVATION IN FEET (M.S.L.)

8015
8010
8005
8000
7995
7990
7985

90+00
94+00
98+00
102+00
106+00
110+00
114+00

FEET ABOVE MOUTH

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

MAP INDEX
SHEET 4

MAP INDEX
SHEET 6

ALL PROFILES ARE IN CLOSE PROXIMITY.
THE 100-YEAR EVENT IS SHOWN FOR LEGIBILITY

BL

BK

BJ

BI

BH

ELEVATION IN FEET (M.S.L.)

8035
8030
8025
8020
8015
8010
8005

112+00
116+00
120+00
124+00
128+00
132+00
136+00

FEET ABOVE MOUTH

EXHIBIT A-2a
FLOOD PROFILES
REACH 2 - COTTONWOOD CREEK
STA 113+01 to 132+76
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

8060

8055

8050

8045

8040

8035

8030

ALL PROFILES ARE IN CLOSE PROXIMITY.
THE 100-YEAR EVENT IS SHOWN FOR LEGIBILITY

MAP INDEX
SHEET 6

BO

BN

BM

BL

132+00

136+00

140+00

144+00

148+00

152+00

156+00

FEET ABOVE MOUTH

EXHIBIT A-2b
FLOOD PROFILES
REACH 2- COTTONWOOD CREEK
STA 132+76 to 153+26
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

MAP INDEX
SHEET 6

ELEVATION IN FEET (M.S.L.)

8075

8070

8065

8060

8055

8050

ALL PROFILES ARE IN CLOSE PROXIMITY,
THE 100-YEAR EVENT IS SHOWN FOR LEGIBILITY

BP

BO

152+00

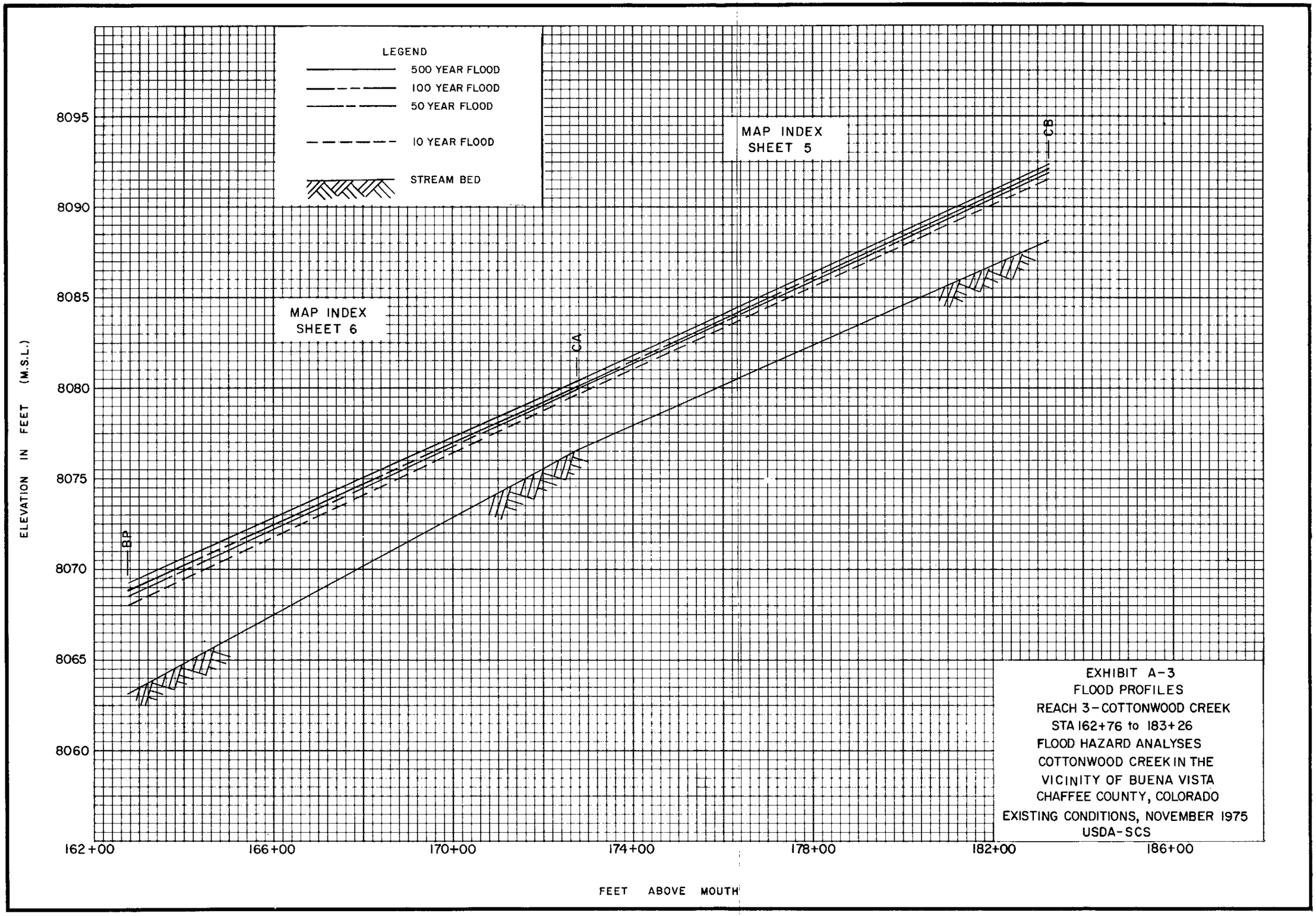
156+00

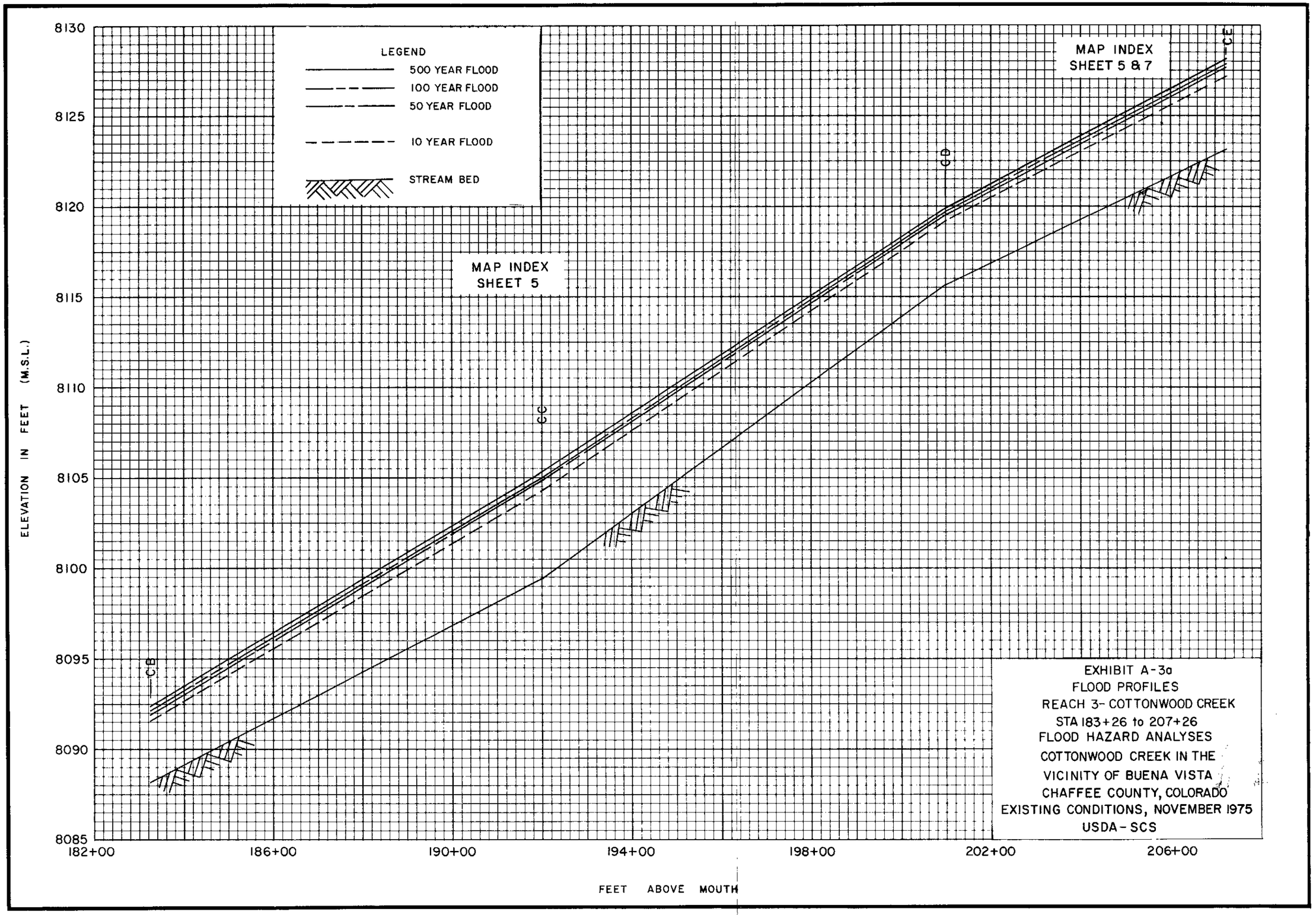
160+00

164+00

FEET ABOVE MOUTH

EXHIBIT A-2c
FLOOD PROFILES
REACH 2- COTTONWOOD CREEK
STA 153+26 to 162+76
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS


LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
MAP INDEX
SHEET 5
MAP INDEX
SHEET 6
C-B
C-A
B-P
8095
8090
8085
8080
8075
8070
8065
8060
ELEVATION IN FEET (M.S.L.)
162+00
166+00
170+00
174+00
178+00
182+00
186+00
FEET ABOVE MOUTH
EXHIBIT A-3
FLOOD PROFILES
REACH 3-COTTONWOOD CREEK
STA 162+76 to 183+26
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS


LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
MAP INDEX
SHEET 5
MAP INDEX
SHEET 5 & 7
CE
CB
CB
CE
ELEVATION IN FEET (M.S.L.)
8130
8125
8120
8115
8110
8105
8100
8095
8090
8085
182+00
186+00
190+00
194+00
198+00
202+00
206+00
FEET ABOVE MOUTH
EXHIBIT A-3a
FLOOD PROFILES
REACH 3- COTTONWOOD CREEK
STA 183+26 to 207+26
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS

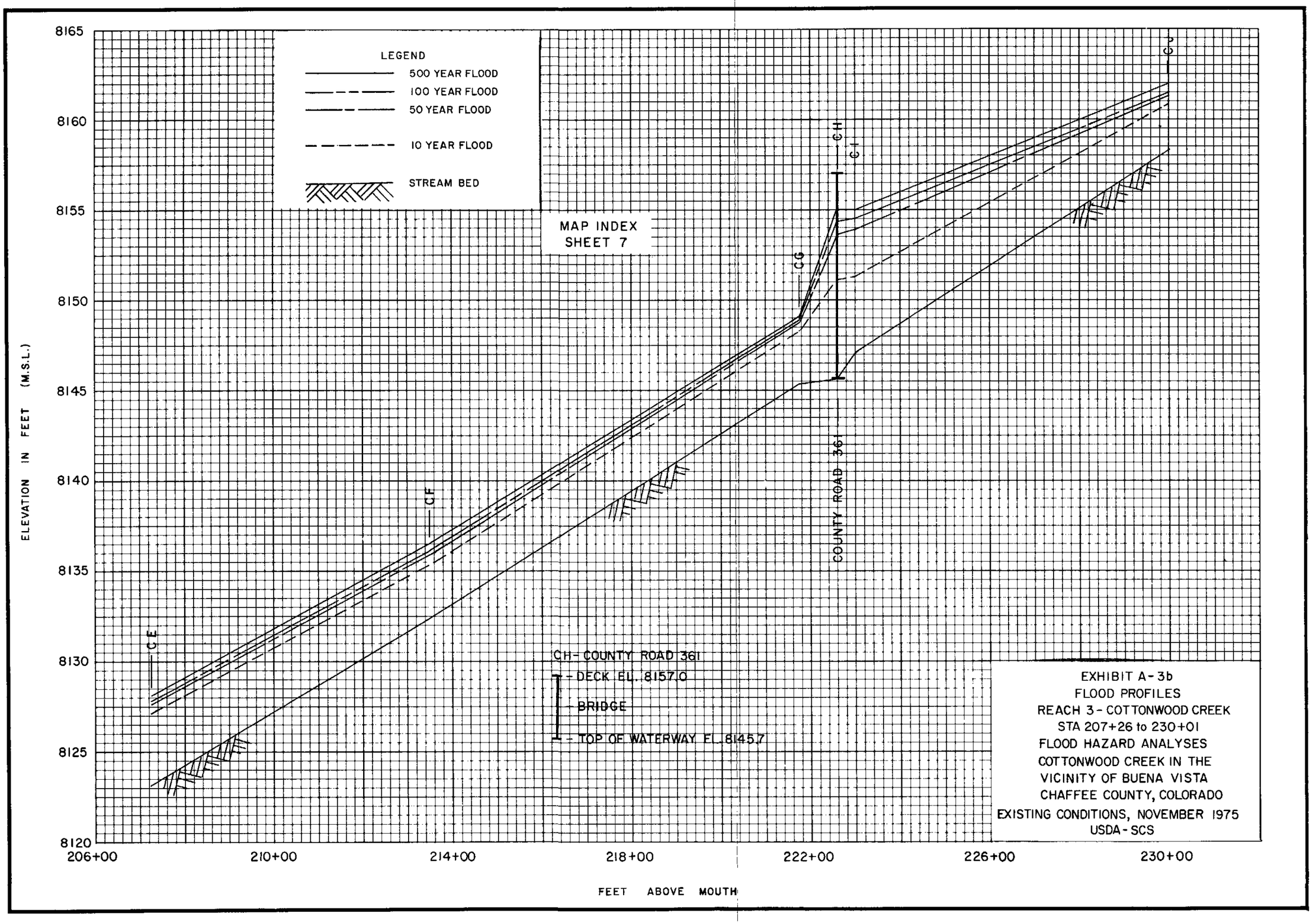
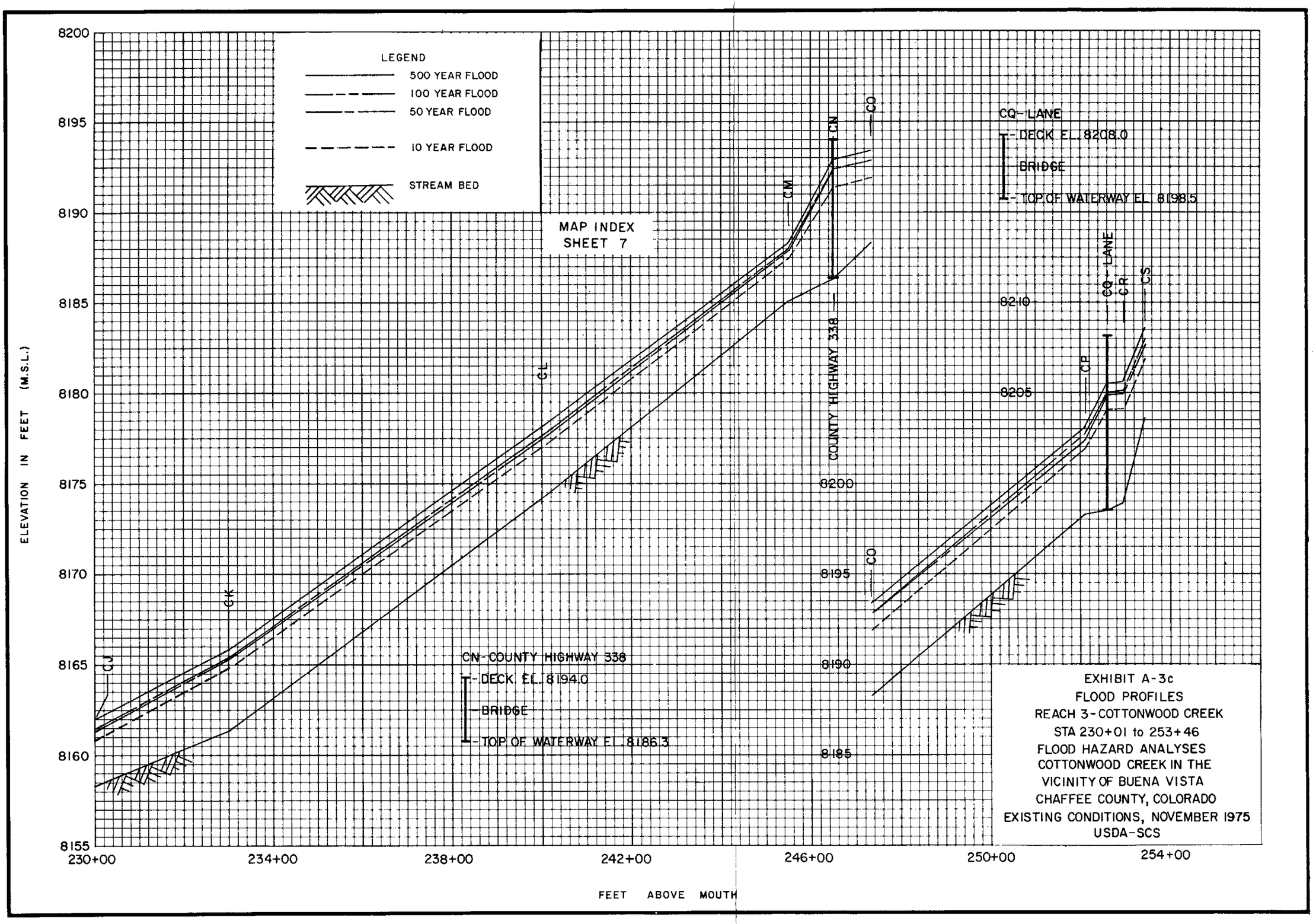
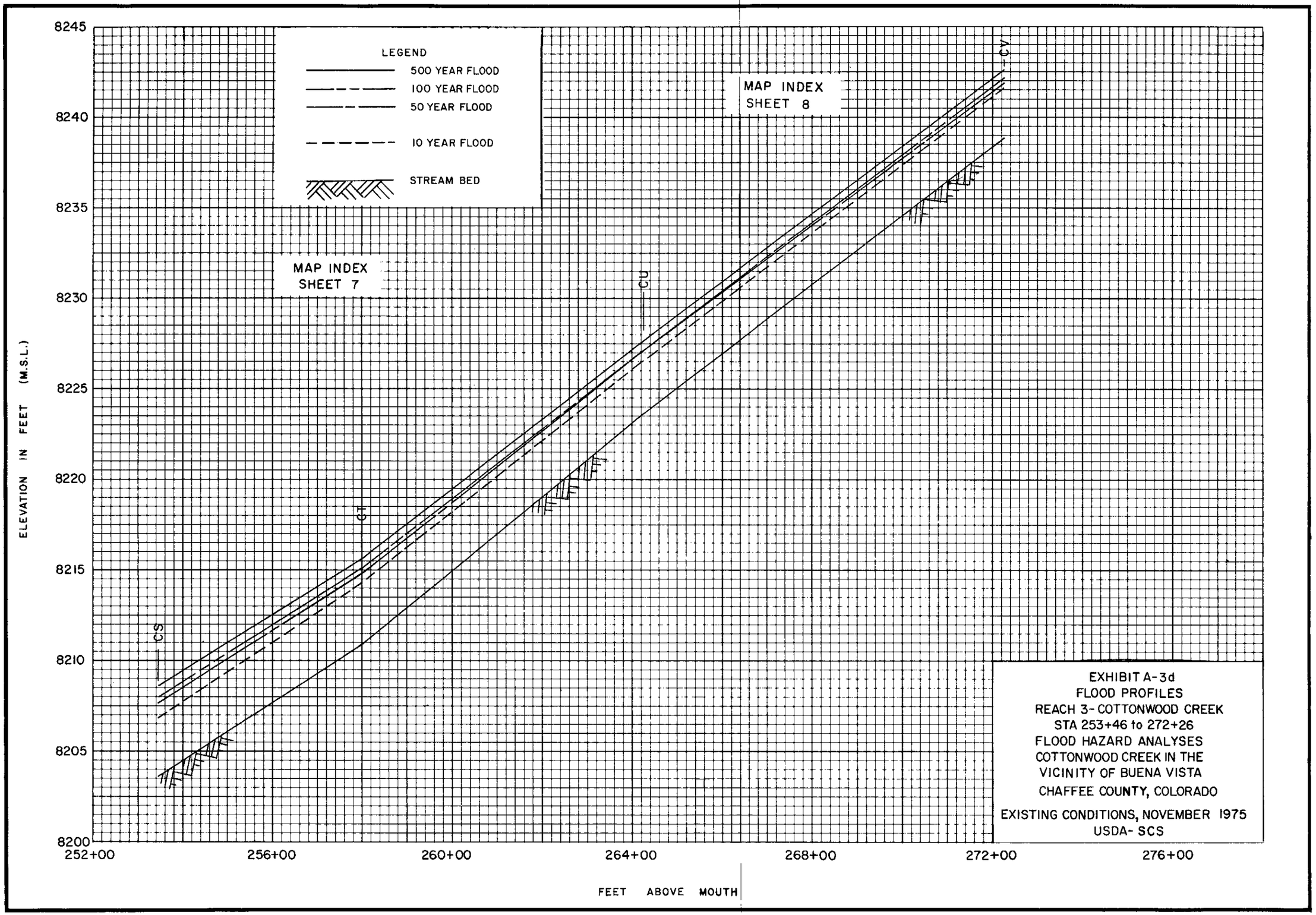
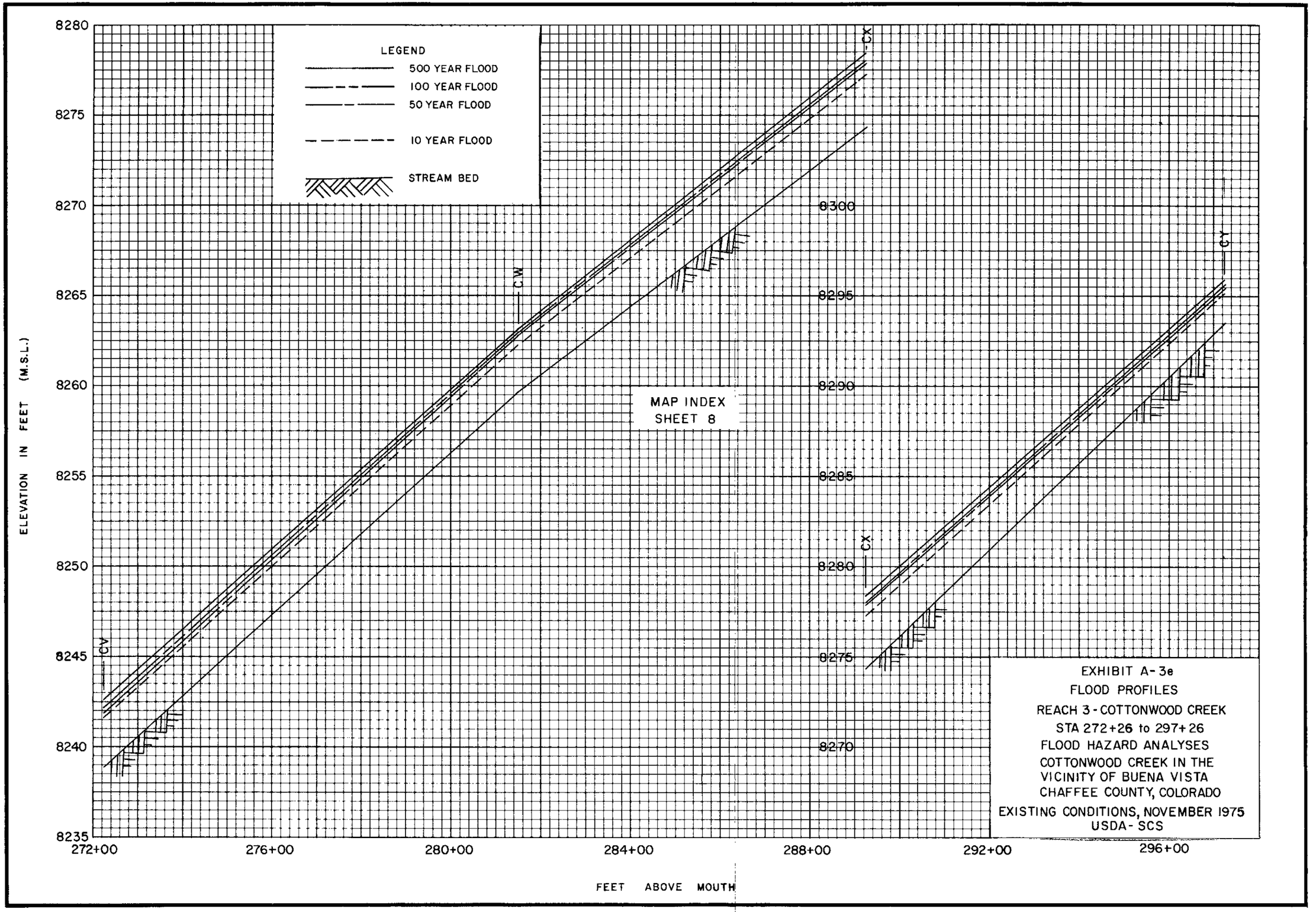
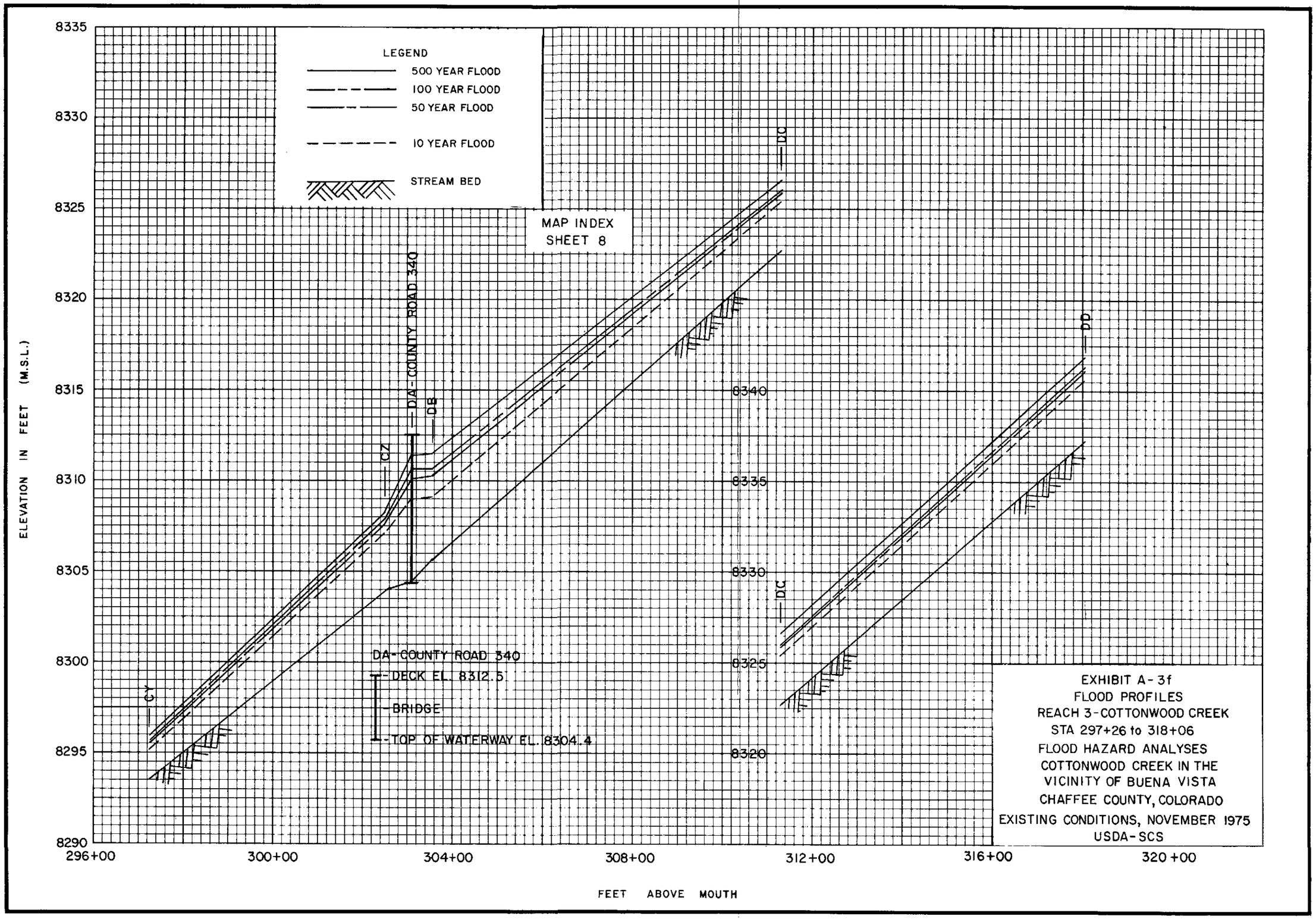


EXHIBIT A-3b
FLOOD PROFILES
REACH 3 - COTTONWOOD CREEK
STA 207+26 to 230+01
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA - SCS


LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
MAP INDEX
SHEET 7
ELEVATION IN FEET (M.S.L.)
8200
8195
8190
8185
8180
8175
8170
8165
8160
8155
230+00
234+00
238+00
242+00
246+00
250+00
254+00
FEET ABOVE MOUTH
CJ
CK
CL
CM
CN
CO
CP
CQ
CR
CS
CN-COUNTY HIGHWAY 338
DECK EL. 8194.0
BRIDGE
TOP OF WATERWAY EL. 8186.3
CQ-LANE
DECK EL. 8208.0
BRIDGE
TOP OF WATERWAY EL. 8198.5
8210
8205
8200
8195
8190
8185
EXHIBIT A-3c
FLOOD PROFILES
REACH 3-COTTONWOOD CREEK
STA 230+01 to 253+46
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS


LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
MAP INDEX
SHEET 7
MAP INDEX
SHEET 8
CS
CT
CU
CV
ELEVATION IN FEET (M.S.L.)
8245
8240
8235
8230
8225
8220
8215
8210
8205
8200
252+00
256+00
260+00
264+00
268+00
272+00
276+00
FEET ABOVE MOUTH
EXHIBIT A-3d
FLOOD PROFILES
REACH 3- COTTONWOOD CREEK
STA 253+46 to 272+26
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA- SCS


LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
MAP INDEX
SHEET 8
ELEVATION IN FEET (M.S.L.)
8280
8275
8270
8265
8260
8255
8250
8245
8240
8235
8300
8295
8290
8285
8280
8275
8270
CV
CW
CX
CY
272+00
276+00
280+00
284+00
288+00
292+00
296+00
FEET ABOVE MOUTH
EXHIBIT A-3e
FLOOD PROFILES
REACH 3 - COTTONWOOD CREEK
STA 272+26 to 297+26
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS


LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
MAP INDEX
SHEET 8
DA-COUNTY ROAD 340
DECK EL. 8312.5
BRIDGE
TOP OF WATERWAY EL. 8304.4
DA
DB
DC
DD
8335
8330
8325
8320
8315
8310
8305
8300
8295
8290
8340
8335
8330
8325
8320
296+00
300+00
304+00
308+00
312+00
316+00
320+00
ELEVATION IN FEET (M.S.L.)
FEET ABOVE MOUTH
EXHIBIT A-3f
FLOOD PROFILES
REACH 3-COTTONWOOD CREEK
STA 297+26 to 318+06
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

MAP INDEX
SHEET 1

ELEVATION IN FEET (M.S.L.)

7955
7950
7945
7940
7935
7930
7925
7920
7915

0+00
4+00
8+00
12+00
16+00
20+00
24+00

FEET ABOVE MOUTH

EB - COLORADO AVENUE
EC
ED - D&RGW RR
EE
EF - LAKE STREET - U.S. 24
EG
EH
EI - GUNNISON AVENUE
EJ
EK - SAN JUAN AVENUE
EL
EA
EI

ALL PROFILES ARE IN CLOSE PROXIMITY, THE 100-YEAR EVENT IS SHOWN FOR LEGIBILITY.

CONFLUENCE WITH REACH II

EK - SAN JUAN AVENUE
- ROAD EL. 7952.0
- CULVERT
- TOP OF WATERWAY EL. 7947.3

EF - LAKE STREET - U.S. 24
- ROAD EL. 7940.3
- CULVERT
- TOP OF WATERWAY EL. 7932.7

EI - GUNNISON AVENUE
- ROAD EL. 7945.7
- CULVERT
- TOP OF WATERWAY EL. 7944.0

ED - D&RGW RAILROAD
- DECK EL. 7942.5
- BRIDGE
- TOP OF WATERWAY EL. 7927.4

EB - COLORADO AVENUE
- ROAD EL. 7934.7
- CULVERT
- TOP OF WATERWAY EL. 7925.0

EXHIBIT A-4
FLOOD PROFILES
REACH 4 - COTTONWOOD CREEK
STA 0+00 to 23+05
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA - SCS

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

MAP INDEX
SHEET 183

MAP INDEX
SHEET 3

ELEVATION IN FEET (M.S.L.)

7985
7980
7975
7970
7965
7960
7955
7950
7945

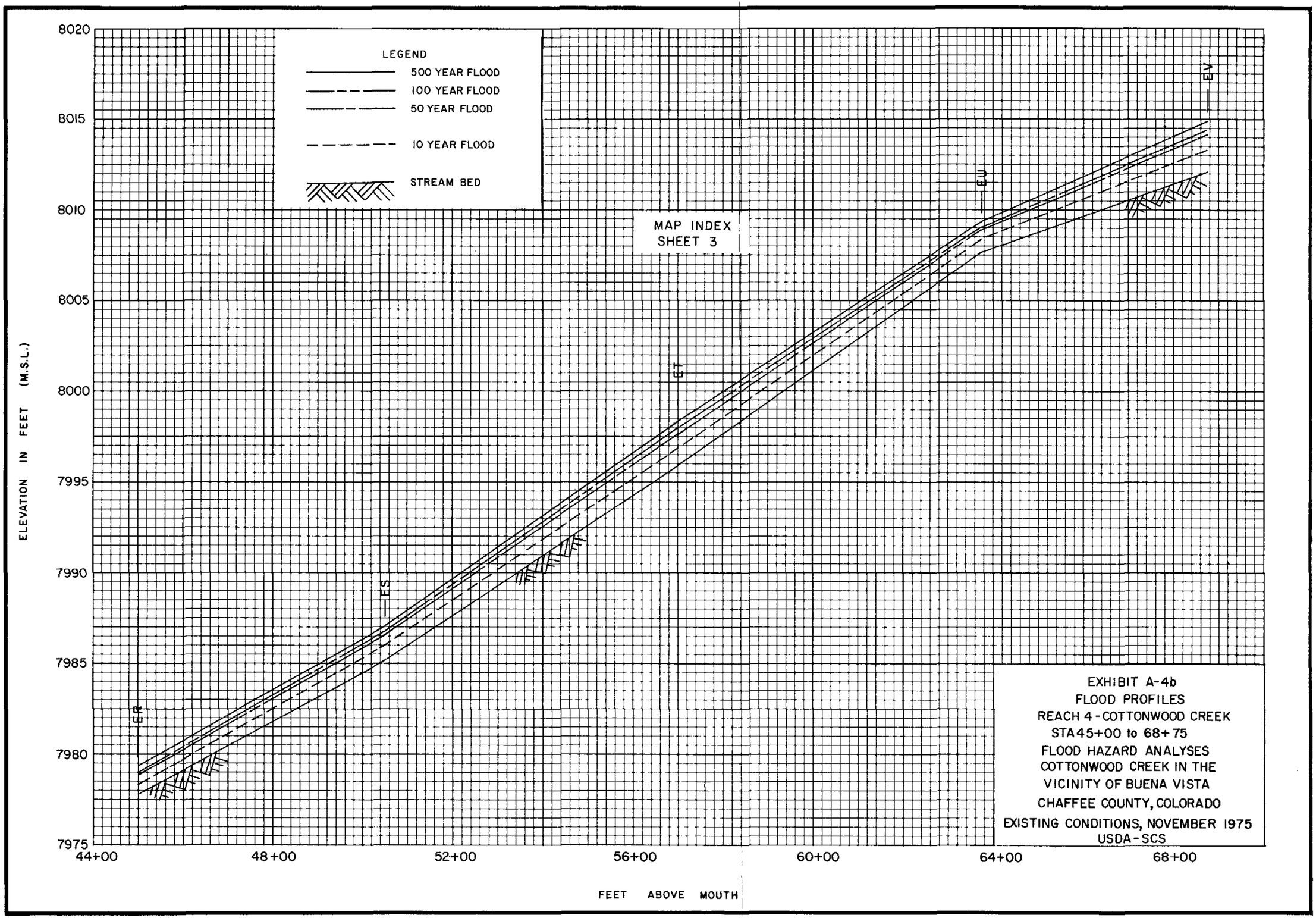
22+00
26+00
30+00
34+00
38+00
42+00
46+00

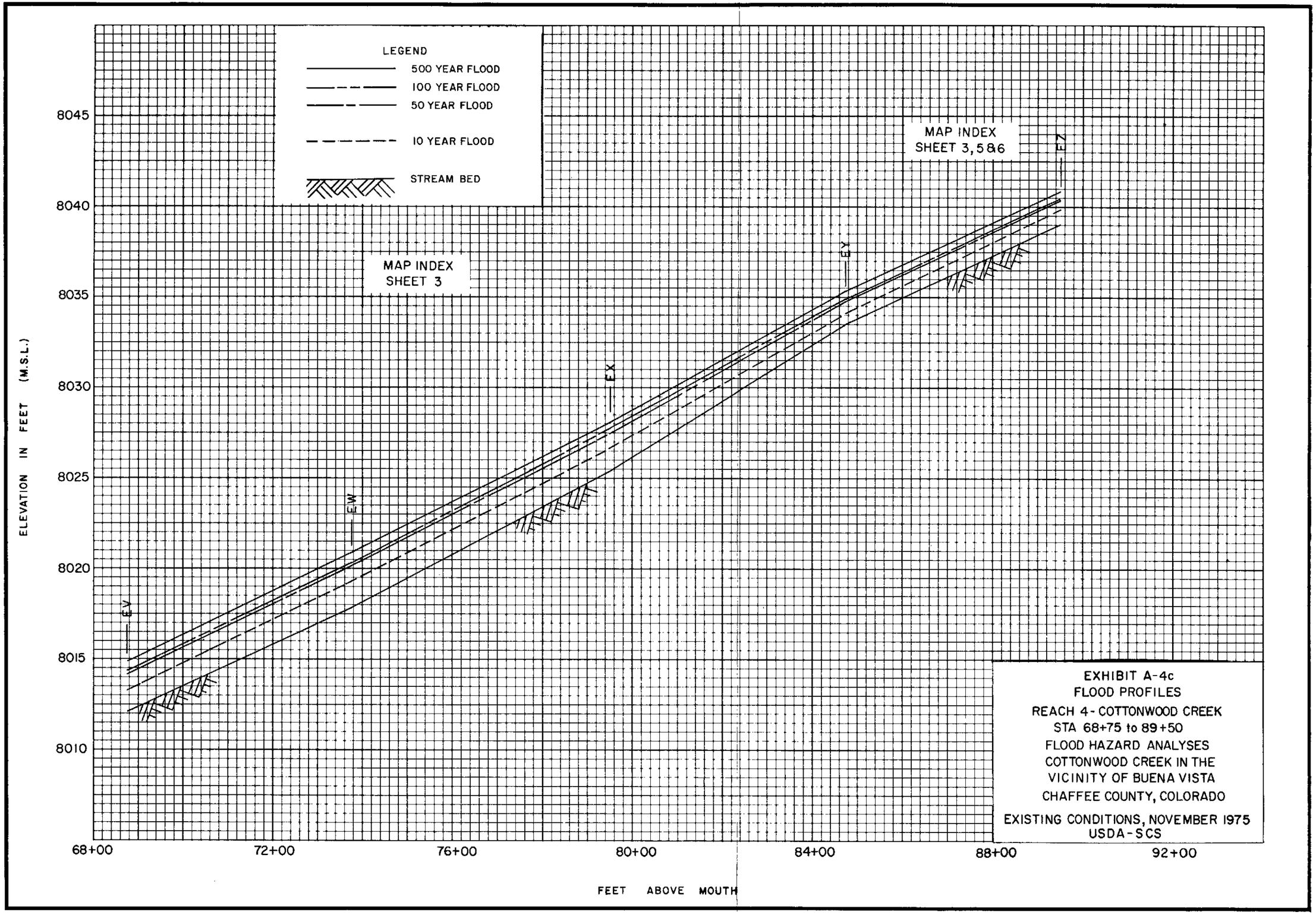
FEET ABOVE MOUTH

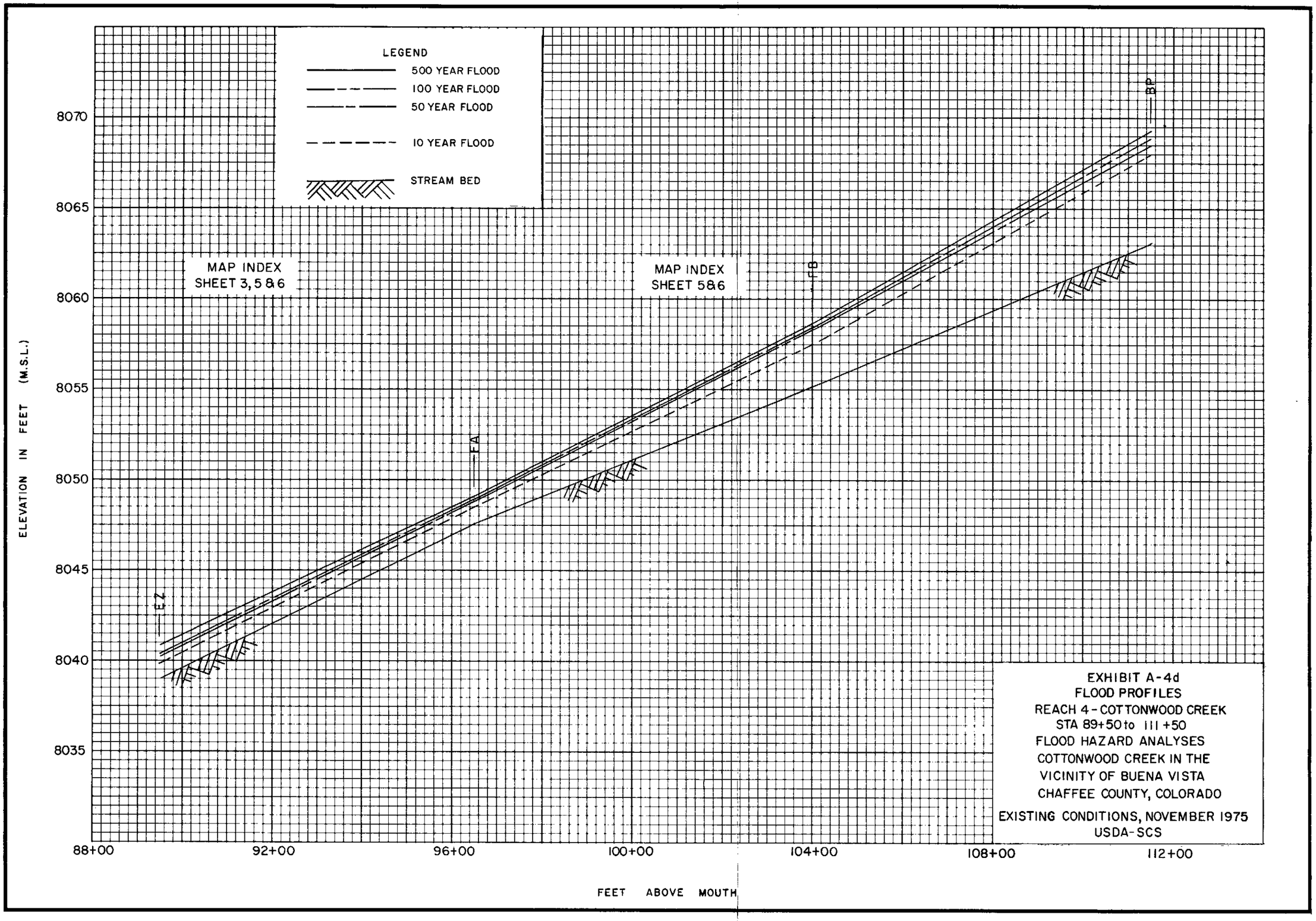
EL
EM
EN
EO - PLEASANT AVENUE
EP
EQ
ER

EO - PLEASANT AVENUE
- ROAD EL. 7964.7
CULVERT
- TOP OF WATERWAY EL. 7961.9

EXHIBIT A-4a
FLOOD PROFILES
REACH 4 - COTTONWOOD CREEK
STA 23+05 to 45+00
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS


LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
MAP INDEX
SHEET 3
EV
EU
ET
ES
ER
8020
8015
8010
8005
8000
7995
7990
7985
7980
7975
ELEVATION IN FEET (M.S.L.)
44+00
48+00
52+00
56+00
60+00
64+00
68+00
FEET ABOVE MOUTH
EXHIBIT A-4b
FLOOD PROFILES
REACH 4 - COTTONWOOD CREEK
STA 45+00 to 68+75
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS


LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
MAP INDEX
SHEET 3
MAP INDEX
SHEET 3,5&6
EV
EW
EX
EY
EZ
ELEVATION IN FEET (M.S.L.)
8045
8040
8035
8030
8025
8020
8015
8010
68+00
72+00
76+00
80+00
84+00
88+00
92+00
FEET ABOVE MOUTH
EXHIBIT A-4c
FLOOD PROFILES
REACH 4 - COTTONWOOD CREEK
STA 68+75 to 89+50
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS


LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
MAP INDEX
SHEET 3, 5 & 6
MAP INDEX
SHEET 5&6
ELEVATION IN FEET (M.S.L.)
8070
8065
8060
8055
8050
8045
8040
8035
EZ
FA
FB
BP
88+00
92+00
96+00
100+00
104+00
108+00
112+00
FEET ABOVE MOUTH
EXHIBIT A-4d
FLOOD PROFILES
REACH 4 - COTTONWOOD CREEK
STA 89+50 to 111+50
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

MAP INDEX SHEET 1 & 3

MAP INDEX SHEET 4

ELEVATION IN FEET (M.S.L.)

7985

7980

7975

7970

7965

7960

7955

7950

7945

X - CONFLUENCE WITH REACH II

GA

GB-PLEASANT AVENUE

GC

GD

GE-JAMES STREET

GF

GG

ALL PROFILES ARE IN CLOSE PROXIMITY, THE 100-YEAR AND 10-YEAR EVENTS ARE SHOWN FOR LEGIBILITY.

GB-PLEASANT AVENUE
- ROAD EL. 7965.1
- CULVERT
- TOP OF WATERWAY EL. 7961.9

GE-JAMES STREET
- ROAD EL. 7975.5
- CULVERT
- TOP OF WATERWAY EL. 7973.0

0+00

4+00

8+00

12+00

16+00

20+00

24+00

FEET ABOVE MOUTH

EXHIBIT A-5
FLOOD PROFILES
REACH 5 - COTTONWOOD CREEK
STA 0+00 to 20+80
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS

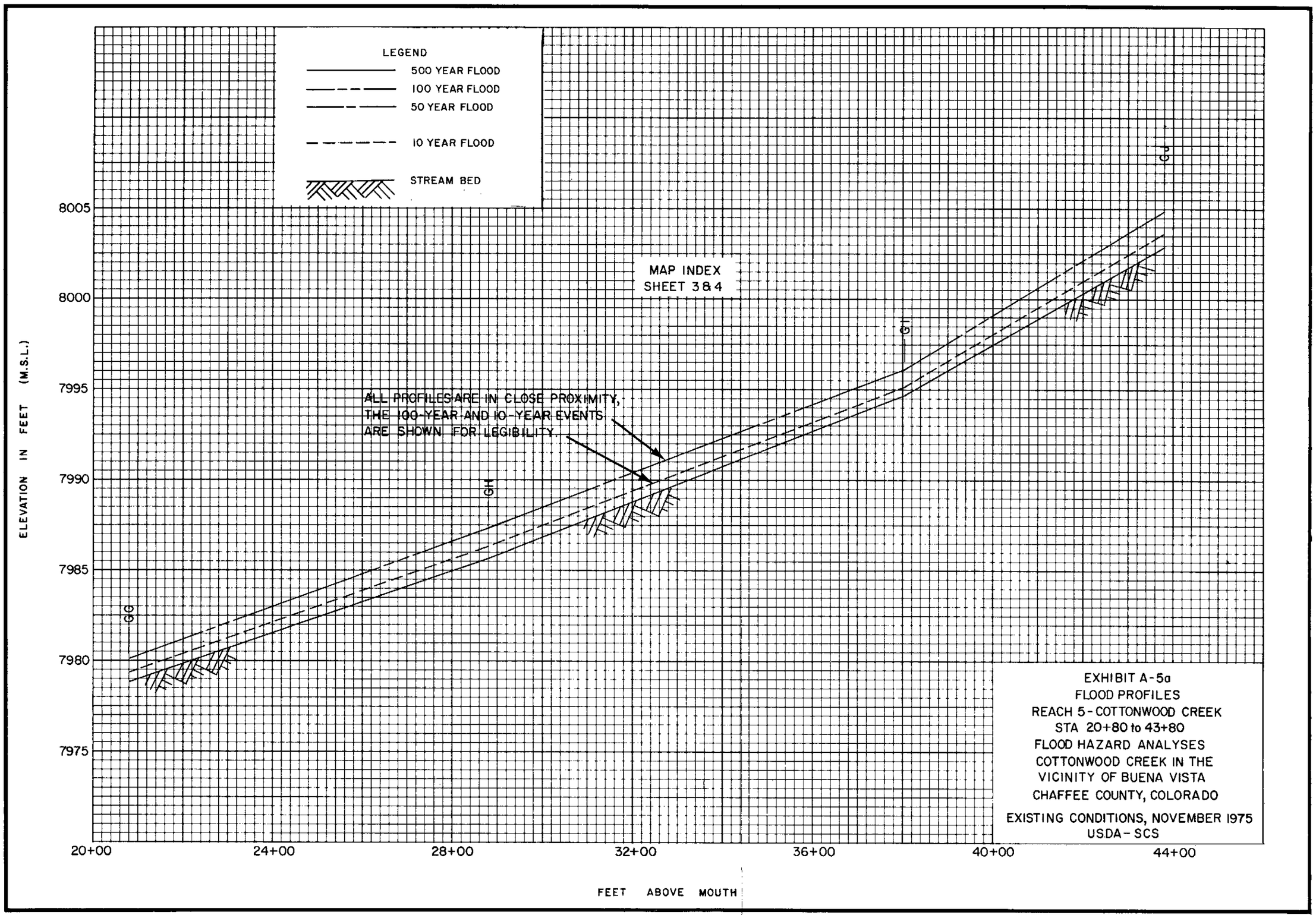


EXHIBIT A-5a
FLOOD PROFILES
REACH 5-COTTONWOOD CREEK
STA 20+80 to 43+80
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO

EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

MAP INDEX
SHEET 3&4

MAP INDEX
SHEET 3

MAP INDEX
SHEET 3&6

ALL PROFILES ARE IN CLOSE PROXIMITY, THE 100-YEAR AND 10-YEAR EVENTS ARE SHOWN FOR LEGIBILITY

GJ
GK
GL
GM
GN
GO

ELEVATION IN FEET (M.S.L.)

8040
8035
8030
8025
8020
8015
8010
8005
8000

42+00
46+00
50+00
54+00
58+00
62+00
66+00

FEET ABOVE MOUTH

EXHIBIT A-5b
FLOOD PROFILES
REACH 5 - COTTONWOOD CREEK
STA 43+80 to 66+30
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

MAP INDEX
SHEET 3&6

ELEVATION IN FEET (M.S.L.)

8040

8035

8030

BM

GO

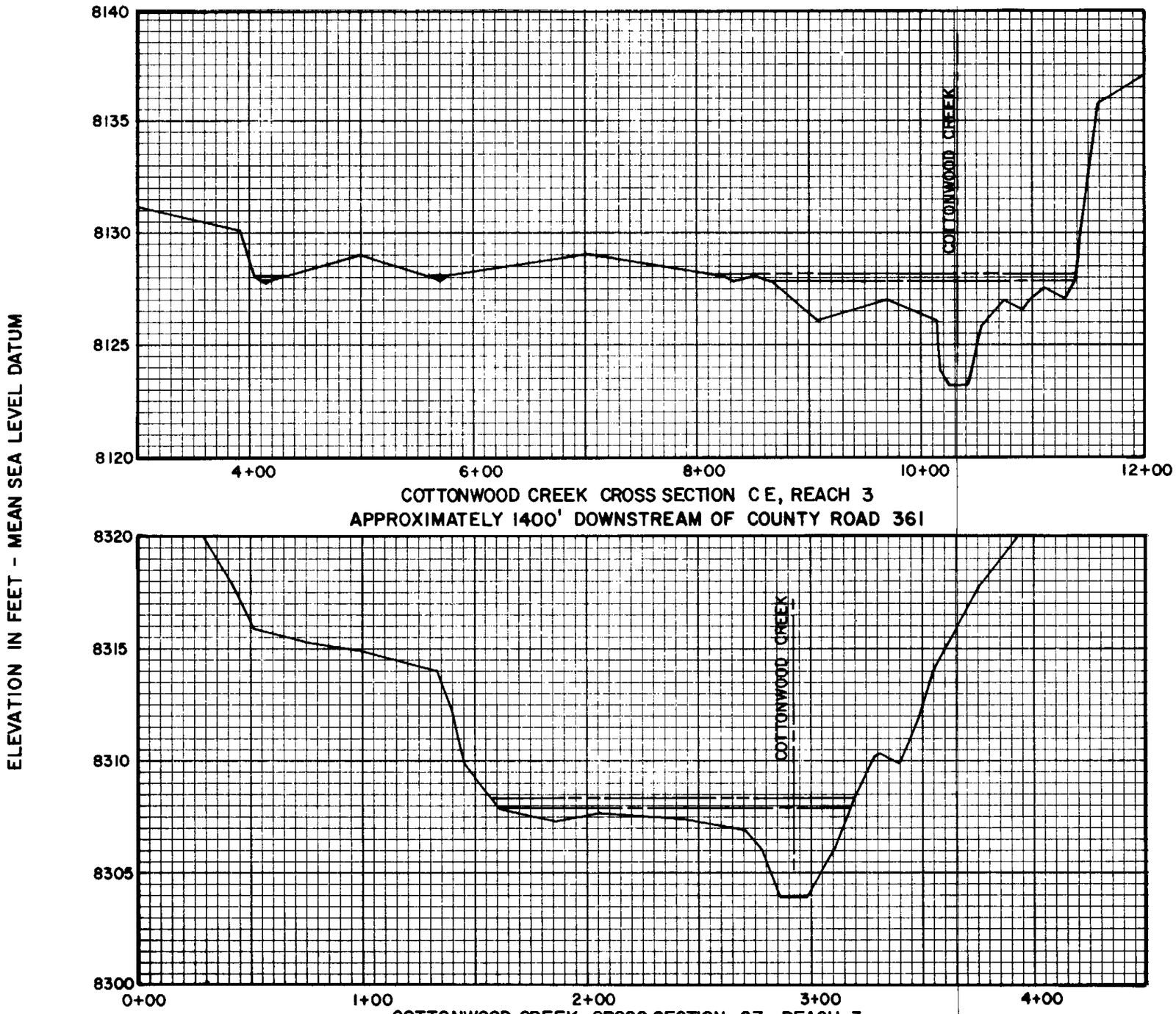
66+00

70+00

74+00

FEET ABOVE MOUTH

EXHIBIT A-5c
FLOOD PROFILES
REACH 5-COTTONWOOD CREEK
STA 66+30 to 70+80
FLOOD HAZARD ANALYSES
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
CHAFFEE COUNTY, COLORADO
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS



LEGEND

500 Year Flood

100 Year Flood

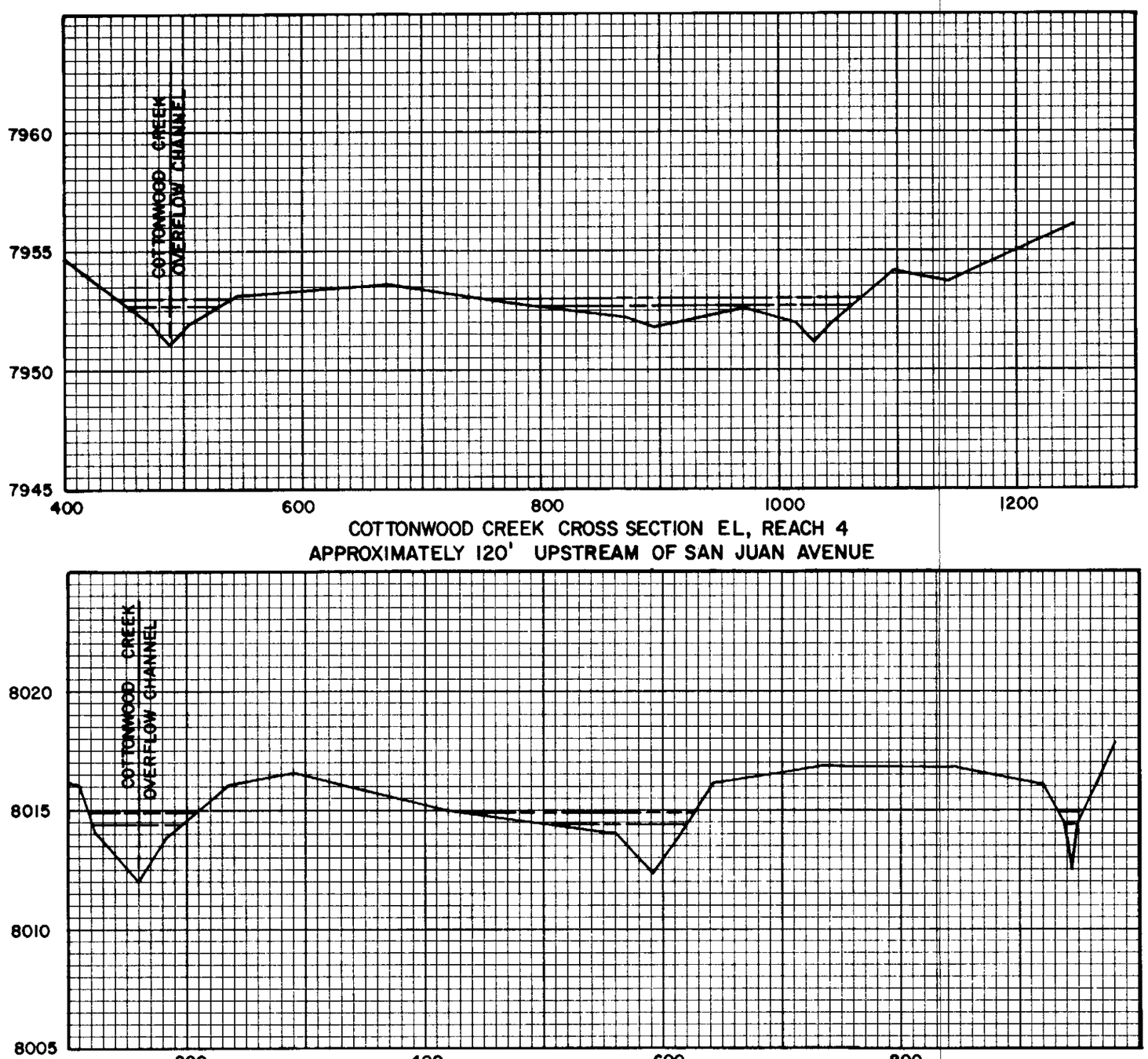
Approximate Ground Line

NOTE

Cross Sections are viewed in direction of flow.

EXHIBIT B-1
TYPICAL VALLEY CROSS SECTIONS
COTTONWOOD CREEK IN THE VICINITY OF BUENA VISTA
FLOOD HAZARD ANALYSES
CHAFFEE COUNTY, COLORADO

EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS



COTTONWOOD CREEK CROSS SECTION EL, REACH 4
APPROXIMATELY 120' UPSTREAM OF SAN JUAN AVENUE

COTTONWOOD CREEK CROSS SECTION EV, REACH 4
APPROXIMATELY 800' DOWNSTREAM OF COUNTY ROAD 332

ELEVATION IN FEET - MEAN SEA LEVEL DATUM

HORIZONTAL DISTANCE IN FEET

LEGEND

500 Year Flood
100 Year Flood
Approximate Ground Line

NOTE

Cross Sections are viewed in direction of flow.

EXHIBIT B-2
TYPICAL VALLEY CROSS SECTIONS
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
FLOOD HAZARD ANALYSES
CHAFFEE COUNTY, COLORADO

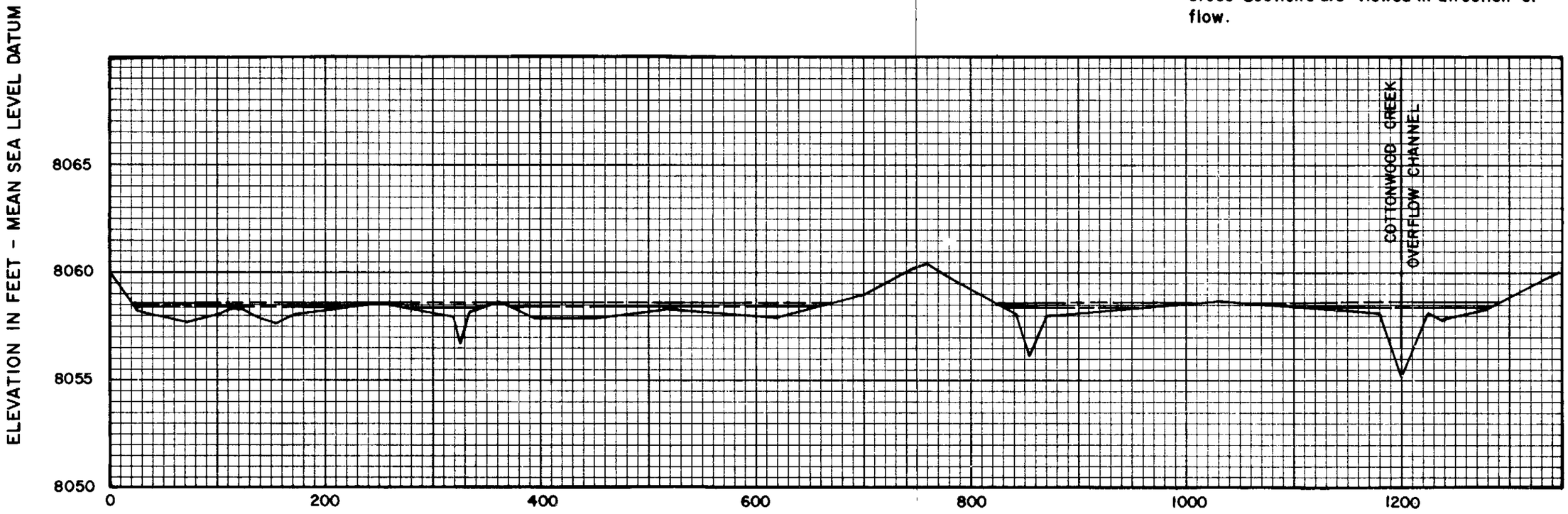
EXISTING CONDITIONS, NOVEMBER 1975
USDA-SCS

LEGEND

——— — — ——— 500 Year Flood
——— — — ——— 100 Year Flood
——————————— Approximate Ground Line

NOTE

Cross Sections are viewed in direction of flow.



COTTONWOOD CREEK CROSS SECTION FB, REACH 4
ON GOLF COURSE, APPROXIMATELY 650' UPSTREAM OF FAIRWAY DRIVE

HORIZONTAL DISTANCE IN FEET

EXHIBIT B-3
TYPICAL VALLEY CROSS SECTIONS
COTTONWOOD CREEK IN THE
VICINITY OF BUENA VISTA
FLOOD HAZARD ANALYSES
CHAFFEE COUNTY, COLORADO

EXISTING CONDITIONS, NOVEMBER 1975
USDA - SCS

INVESTIGATIONS, ANALYSES, AND TECHNICAL DATA

Maps

Watershed and drainage area maps were developed from U. S. Geological Survey topographic maps (scale 1:62,500). Flood hazard areas are plotted on photogrammetric maps prepared especially for this study. Topography, planimetry, and cross-section data were compiled by photogrammetric methods from low level aerial photography taken November 6, 1975. The photogrammetry is by Bell Mapping Company, 500 Kalamath, Denver, Colorado. Funds for the mapping were provided by Chaffee County with contracting for services through the Colorado Water Conservation Board (CWCB). The maps were reproduced on a scale of 1" = 200' and reduced to 1" = 400' for report purposes. Contour interval is 2-feet and the datum is mean sea level. The map topography complies with national map accuracy standards. Map mylars on a scale of 1" = 200' are on file at the Soil Conservation Service, 2490 West 26th Avenue, Denver, Colorado 80217, telephone (303) 837-5653.

Surveys

Engineering field surveys for horizontal and vertical control were conducted by Bell Mapping Co. Horizontal control is based on the Colorado State Coordinate System, Central Zone, established from U. S. Department of Commerce, Coast & Geodetic Survey point "winters". The vertical control is based on U. S. Coast and Geodetic Survey sea-level datum of 1929. Field survey was conducted during the summer and fall of 1975, prior to the aerial photography.

Most of the data for the 127 cross-sections in the study were obtained photogrammetrically. Cross-section data at road and bridge crossings were surveyed by the Soil Conservation Service. Survey crew assistance was provided by Chaffee County and the town of Buena Vista. These surveys were conducted during the period of January through March 1977.

Elevation Reference Marks

During the winter and spring of 1977, several of the temporary reference marks used for photogrammetric mapping were replaced with permanent markers consisting of brass caps imbedded in concrete. This work was done by survey crews employed by Bell Mapping Company. Survey notes of the original horizontal and vertical control are on file with the Colorado Water Conservation Board. Following is a tabulation of the permanent reference marks used for this study.

TABLE 2

ELEVATION REFERENCE MARKS 1/

Flood Hazard Map Sheet Number	Reference Mark	Elevation	Coordinate
2	BC-5	7934.08	N 364,477.277 E 1,821,436.257
2	BC-15	7955.46	N 368,047.316 E 1,820,248.954
3	BC-14	7977.68	N 367,915.233 E 1,817,862.808
4	BC-6	7987.74	N 370,748.43 E 1,818,452.857
5	BC-13	8052.47	N 365,989.357 E 1,813,120.388
6	BC-7	8045.05	N 369,748.57 E 1,813,229.63
7	BC-11	8193.60	N 362,239.166 E 1,805,404.533
7	BC-12	8163.74	N 365,845.080 E 1,807,761.028
8	BC-10 (D-1)	8382.40	N 358,955.81 E 1,800,071.06
8	BC-9	8281.38	N 361,785.45 E 1,802,536.62

1/ The above Elevation Reference Marks are shown on the Flood Hazard Area Maps (Sheets 1-8).

Hydrology and Hydraulics

Hydrology - This phase of the study includes the development of peak discharge values for various flood frequencies at selected locations. A frequency analysis of streamgage records was made in accordance with Water Resources Council Bulletin 17. These values were compared with data from Colorado Water Conservation Board (CWCB) Technical Manual No. 1. Discharge values obtained using the CWCB Manual were slightly higher and were selected for use in this study. This procedure provided peak discharge-frequency values at the Cottonwood Creek streamgage site. Values at several locations along the stream were determined and a drainage area vs. peak discharge curve was developed for convenience and to maintain consistency in selecting flows at other locations..

Hydraulics - The hydraulic analyses were based on the SCS Water Surface Profile Computer Program, WSP-2. Input data for this program includes: cross-section information, reach lengths, contributing drainage area measurements, channel and flood plain roughness coefficients, and discharge values. The cross-section, reach length, and drainage area data was obtained from field surveys and photogrammetric maps prepared especially for this study. Typical "n" values (roughness coefficients) range from 0.045 to 0.110 and were determined from photographs and field inspection.

Through the use of the WSP-2 computer program, flood crest elevations for the 10-, 50-, 100-, and 500-year floods were determined. These

floods have an average occurrence of once in the number of years as indicated. For example, the 100-year frequency flood occurs once in 100 years on the average, and has a one percent chance of being equaled or exceeded in any given year.

Output data from the computer programs were used in developing: the flood profile drawings, flood outlines on the flood hazard maps, and the data for the flood frequency-elevation and discharge tables.

Flood outlines for the 100- and 500-year floods were located on flood hazard area maps using water surface elevations, cross-section data, and by interpolation between the cross-sections. The location of flood lines at road crossings were computed using the normal openings of bridges and culverts. Because of the multitude of possible events in which sediment and debris could cause blockage of bridges and culverts, these considerations were not included in the study. It should be noted that perched channel flow exists through much of the flood plain. This is a higher secondary channel which receives inflow from some location upstream and maintains a flatter slope than the primary channel.

About 0.4 mile downstream from the North Fork confluence, out-of-bank flows from Cottonwood Creek dump into an older channel and then spread out across the flood plain, following several secondary channels in an easterly direction. Flooding is shallow with flow depths averaging less than 2 feet for the 100-year flood. A similar situation occurs about 0.5 mile further downstream from the first location.

Cottonwood Creek continues in a northeasterly direction carrying the remaining flow which is nearly the same for all discharge-frequency values equal to or greater than the channel capacity, approximately 600 c.f.s. For example, the difference in discharge values between the 100-year and 10-year flood is only 20 c.f.s. (600-580=20) at cross section BO in Reach #2 (Table 1, page 7). At the next cross section BP, a short distance upstream, the 100-year flood discharge is 1,300 c.f.s. About 700 c.f.s. is carried by the secondary channels and flood plain, and 600 c.f.s. in the Cottonwood Creek Channel.

Consequently, flood flows enter into Buena Vista by way of several secondary channels in addition to Cottonwood Creek.

Soil Surveys

The Soil Survey for Chaffee-Lake Area (parts of Chaffee and Lake Counties) was published by the USDA-Soil Conservation Service in October 1975. It contains information that can be applied in managing farms, ranches, and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in appraising the value of tracts of land for agriculture, industry, or recreation. Information regarding the soil surveys can be obtained by contacting the Soil Conservation Service, 2490 West 26th Avenue, Denver, Colorado 80217, or the Upper Arkansas SCD Field Office, 223 East Third Street, S-lida, Colorado 81201.

GLOSSARY OF TERMS

Channel - A natural or artificial water course of perceptible extent with definite banks to confine and conduct continuously or periodically flowing water. Channel flow is that water which is flowing within the limits of the defined channel.

Flood - Water from a river, stream, water course, lake or other body of standing water, that temporarily overflows the boundaries within which it is ordinarily confined.

Flood Crest - The maximum stage or elevation reached by the waters of a flood at a given location.

Flood Frequency - A means of expressing the probability of flood occurrences as determined from a statistical analysis of representative stream flow or rainfall and runoff records. The frequency of a particular stage or discharge is usually expressed as occurring once in a specified number of years. The 10-, 25-, 50-, 100-, and 500-year frequency floods have an average frequency of occurrence in the order of once in the number of years as indicated.

10-Year Flood - A flood having an average frequency of occurrence of once in 10 years. It has a 10 percent chance of being equalled or exceeded in any given year.

100-Year Flood - A flood having an average frequency of occurrence of once in 100 years. It has a 1 percent chance of being equalled or exceeded in any given year.

Flood Peak - The highest stage or discharge attained during a flood event; also referred to as peak stage or peak discharge.

Flood Plain - The relatively flat or low land area adjoining a river, stream, watercourse, lake, or other body of standing water which has been or may be covered temporarily by flood water. For administrative purposes the flood plain may be defined as the area that would be inundated by the 100-year flood.

Perched Channel Flow - A condition where the flow elevation in the outer portions of the flood plain is higher than the flow elevation in the primary channel. This condition occurs when a higher secondary channel receives inflow from some location upstream and maintains a flatter slope than the primary channel.

Reach - A hydraulic engineering term used to describe longitudinal segments of a stream or river.

Runoff - That part of precipitation, as well as any other flow contributions, which appears in surface streams of either perennial or intermittent form.

Stream - Any natural channel or depression through which water flows whether continously, intermittently, or periodically, including modification of the natural channel or depression.

Structure - Anything constructed or erected, the use of which requires a more or less permanent location on or in the ground. Includes but is not limited to bridges, buildings, canals, dams, ditches, diversions, irrigation systems, pumps, pipelines, railroads, roads, sewage disposal systems, underground conduits, water supply systems, and wells.

Typical Valley Cross Section - An engineering drawing of a vertical section of a stream channel and adjoining landscape as viewed in a downstream direction. The drawing represents a specified location within a designated stream reach.

Water Surface Profile - (This term is synonymous with - Flood Profile) - a graph showing the relationship of the water surface elevation of a flood event to location along a stream or river.

Watersheds - A drainage basin or area which collects runoff and transmits it usually by means of streams and tributaries to the outlet of the basin.

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TABLE 1

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 1

Existing conditions Nov. 1975.

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
	0+00	Confluence with Arkansas River	7876.0				
A	1+70		7879.7	7881.9 800	7882.0 960	7882.2 1020	7882.3 1100
B	3+05		7882.7	7885.3 800	7885.5 960	7885.7 1020	7885.8 1100
C	3+85	Arizona Street	7884.0	7895.9 800	7898.3 960	7899.3 1020	7900.6 1100
D	4+35		7887.7	7895.9 800	7898.3 970	7899.4 1030	7900.7 1110
E	8+10		7890.7	7896.4 800	7898.8 970	7899.5 1030	7900.8 1110
F	13+50		7900.2	7903.5 810	7903.9 970	7904.1 1030	7904.3 1110
G	20+00		7906.4	7909.8 810	7910.0 970	7910.1 1030	7910.2 1110

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 1

TABLE 1

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 1

Existing conditions Nov. 1975.

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
H	25+50		7911.7	7915.3 810	7915.5 970	7915.7 1030	7915.8 1110
I	30+80		7918.7	7921.3 810	7921.5 970	7921.6 1030	7921.8 1120
J	38+30		7928.8	7931.8 680	7932.0 780	7932.1 830	7932.2 880
K	39+05	Colorado Avenue	7929.1	7933.9 680	7934.3 780	7934.6 830	7934.8 880
L	39+80		7932.9	7934.9 680	7935.2 780	7935.4 830	7935.5 880
M	40+60	D & R.G.W. Railroad	7933.0	7936.0 680	7936.3 780	7936.4 830	7936.5 880
N	41+55		7934.7	7937.5 680	7937.8 780	7937.8 830	7937.9 880
O	44+15		7937.6	7940.5 680	7940.8 780	7940.9 830	7941.0 880

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 2

TABLE 1

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 1

Existing conditions Nov. 1975.

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
P	44+85	Cedar Street	7938.6	7943.1 680	7943.4 790	7943.6 830	7943.9 880
Q	45+45		7939.6	7943.6 680	7943.9 790	7944.0 830	7944.2 880
R	46+00	Cottonwood Ave.	7938.7	7945.4 680	7945.9 790	7946.2 830	7946.4 880
S	46+35		7940.0	7945.4 680	7945.9 790	7946.4 830	7946.4 880
T	46+85	Lake Street & U. S. - 24	7942.0	7946.0 680	7946.5 790	7946.8 830	7947.1 880
U	48+55		7945.5	7948.7 680	7949.0 790	7949.1 830	7949.3 880
V	50+00	Main Street	7944.0	7951.7 680	7951.9 790	7951.9 830	7952.0 880
W	51+21		7948.9	7951.8 690	7952.0 790	7952.1 830	7952.1 880

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 3

TABLE 1

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 1

Existing conditions Nov. 1975.

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
X	54+61		7950.4	7953.4 690	7953.7 790	7953.7 840	7953.8 880
Y	58+81		7953.4	7956.7 640	7956.7 650	7956.7 660	7956.8 670
Z	59+26	Sterling Ave.	7951.6	7959.2 640	7959.3 650	7959.3 660	7959.4 670
AA	59+71		7954.3	7959.2 640	7959.3 650	7959.3 660	7959.4 670
AB	66+46		7959.1	7963.1 640	7963.1 650	7963.1 660	7963.2 670
AC	66+91	Pleasant Ave.	7960.4	7964.7 640	7964.7 650	7964.7 660	7964.7 670
AD	67+41		7959.6	7964.9 640	7964.9 650	7964.9 660	7964.9 670
AE	73+41		7971.6	7974.4 640	7974.4 650	7974.4 660	7974.4 670

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 4

TABLE 1

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 1

Existing conditions Nov. 1975.

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
AF	73+91	James Street	7970.5	7975.9 640	7976.0 650	7976.0 660	7976.0 670
AG	74+36		7972.6	7976.0 640	7976.1 650	7976.1 660	7976.1 670
AH	79+61		7977.7	7980.4 630	7980.5 650	7980.5 650	7980.5 670
AI	86+11		7984.3	7986.6 630	7986.6 650	7986.6 650	7986.6 670
AJ	90+61		7986.7	7988.4 630	7988.4 640	7988.4 650	7988.4 660
AK	90+96	County Highway #350	7986.5	7989.4 630	7989.4 640	7989.4 650	7989.5 660

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 5

TABLE 1

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 2

Existing conditions Nov. 1975.

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
AK	90+96	County Highway #350	7986.5	7989.4 630	7989.4 640	7989.4 650	7989.5 660
BA	91+31		7986.8	7989.6 630	7989.6 640	7989.6 650	7989.7 660
BB	96+31		7992.3	7995.1 620	7995.1 630	7995.1 640	7995.1 650
BC	102+06		7998.2	8001.1 610	8001.2 620	8001.2 630	8001.2 640
BD	105+36	Lane	7997.7	8004.3 600	8004.3 610	8004.3 620	8004.4 630
BE	107+36		8002.8	8006.2 600	8006.3 610	8006.3 620	8006.4 630
BF	111+61		8005.8	8008.6 590	8008.7 600	8008.7 610	8008.7 620
BG	112+51	County Highway #350	8003.2	8009.1 590	8009.1 600	8009.1 610	8009.1 620

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 6

TABLE 1

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 2

Existing conditions Nov. 1975.

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
BH	113+01		8006.3	8009.6 590	8009.6 600	8009.6 610	8009.6 620
BI	118+26		8012.8	8015.4 590	8015.4 600	8015.4 610	8015.6 620
BJ	123+01		8017.6	8020.1 590	8020.2 600	8020.2 610	8020.2 620
BK	127+76		8023.6	8025.8 590	8025.8 600	8025.8 610	8025.8 620
BL	132+76		8030.5	8032.2 590	8032.2 600	8032.2 610	8032.2 620
BM	138+26		8035.6	8038.1 590	8038.1 600	8038.1 600	8038.1 620
BN	145+01		8041.8	8045.1 590	8045.1 600	8045.1 600	8045.1 620
BO	153+26		8053.6	8056.7 580	8056.7 590	8056.7 600	8056.7 610
BP	162+76		8063.2	8068.0 800	8068.5 1140	8068.8 1300	8069.3 1710

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 7

TABLE 1

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 3

Existing conditions Nov. 1975.

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
BP	162+76		8063.2	8068.0 800	8068.5 1140	8068.8 1300	8069.3 1710
CA	172+76		8076.6	8079.7 800	8080.0 1140	8080.1 1300	8080.4 1710
CB	183+26		8088.2	8091.6 800	8091.9 1140	8092.1 1300	8092.4 1710
CC	192+01		8099.4	8104.3 800	8104.9 1140	8105.0 1300	8105.3 1710
CD	201+01		8115.7	8119.2 800	8119.5 1140	8119.6 1300	8119.9 1710
CE	207+26		8123.2	8127.2 800	8127.7 1140	8127.8 1300	8128.2 1710
CF	213+51		8132.4	8135.3 800	8135.9 1140	8136.1 1300	8136.5 1710
CG	221+76		8145.4	8148.3 800	8148.8 1140	8148.9 1300	8149.2 1710

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 8

TABLE 1

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 3

Existing conditions Nov. 1975.

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
CH	222+61	County Road 361	8145.7	8151.2 780	8153.7 1130	8154.4 1280	8155.0 1690
CI	223+01		8147.1	8151.3 780	8153.8 1130	8154.5 1280	8155.0 1690
CJ	230+01		8158.3	8160.8 610	8161.3 880	8161.5 1000	8162.0 1320
CK	233+01		8161.3	8164.8 610	8165.3 880	8165.4 1000	8165.8 1320
CL	240+01		8174.2	8177.0 610	8177.5 880	8177.7 1000	8178.2 1320
CM	245+51		8185.1	8187.4 610	8187.9 880	8188.0 1000	8188.3 1320
CN	246+51	County Highway 338	8186.3	8191.4 610	8192.3 880	8192.3 1000	8192.9 1320
CO	247+36		8188.3	8191.9 610	8192.8 880	8192.8 1000	8193.4 1320

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 9

TABLE 1

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 3

Existing conditions Nov. 1975.

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
CP	252+11		8198.3	8201.9 610	8202.4 880	8202.7 1000	8203.2 1320
CQ	252+61	Lane	8198.5	8204.1 610	8204.8 880	8205.0 1000	8205.5 1320
CR	252+96		8198.8	8204.2 610	8204.9 880	8205.1 1000	8205.6 1320
CS	253+46		8203.6	8206.8 610	8207.7 880	8208.0 1000	8208.6 1320
CT	258+01		8210.8	8214.3 610	8214.8 880	8215.1 1000	8215.6 1320
CU	264+26		8223.7	8226.5 610	8227.1 880	8227.1 1000	8227.7 1320
CV	272+26		8238.8	8241.6 610	8241.9 880	8242.2 1000	8242.6 1320
CW	281+51		8259.7	8262.3 610	8262.8 880	8262.9 1000	8263.2 1320

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 10

		8250.6	8241.5 610	8241.9 880	8242.2 1000	8242.6 1320
CW	281+51	8259.7	8262.3 610	8262.8 880	8262.9 1000	8263.2 1320

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 10

TABLE 1

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 3

Existing conditions Nov. 1975

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
CX	289+26		8274.3	8277.3 610	8277.8 880	8278.0 1000	8278.4 1320
CY	297+26		8293.5	8295.2 610	8295.5 880	8295.6 1000	8295.9 1320
CZ	302+51		8303.9	8307.2 610	8307.7 880	8307.9 1000	8308.3 1320
DA	303+11	County Road 340	8304.4	8309.0 610	8310.2 880	8310.6 1000	8311.4 1310
DB	303+56		8305.7	8309.2 610	8310.3 880	8310.7 1000	8311.5 1310
DC	311+31		8322.7	8325.4 610	8325.9 880	8326.0 1000	8326.6 1310
DD	318+06		8337.3	8340.6 610	8341.1 880	8141.3 1000	8341.9 1310

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 11

TABLE 1

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 4

Existing conditions Nov. 1975.

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
I	0+00	@ Confluence with Reach #1	7918.7	7921.3 810	7921.5 970	7921.6 1030	7921.8 1120
EA	4+25		7925.0	7926.3 130	7926.5 190	7926.6 200	7926.7 240
EB	5+05	Colorado Ave.	7925.0	7934.5 130	7934.8 190	7934.8 200	7934.8 240
EC	5+60		7926.4	7934.5 130	7934.8 190	7934.8 200	7934.8 240
ED	6+25	D & R.G.W. Railroad	7927.4	7935.5 130	7937.7 340	7938.1 460	7939.2 770
EE	8+50		7933.2	7935.6 130	7937.8 340	7938.2 460	7939.3 780

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 12

TABLE 1

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 4

Existing conditions Nov. 1975.

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
EF	10+20	Lake Street & U. S. - 24	7932.7	7937.1 130	7939.9 340	7940.0 460	7940.4 780
EG	11+25		7937.3	7938.9 130	7940.0 340	7940.2 460	7940.6 780
EH	15+00		7939.8	7941.0 130	7942.0 350	7942.3 460	7943.0 790
EI	17+50	Gunnison Ave.	7944.0	7945.1 130	7945.9 350	7946.0 460	7946.4 790
EJ	21+50		7947.7	7949.0 130	7950.0 350	7950.2 460	7950.7 790
EK	22+25	San Juan Ave.	7947.3	7949.2 130	7950.4 350	7950.6 460	7951.0 800
EL	23+05		7951.1	7952.0 130	7952.6 350	7952.7 470	7953.0 800
EM	27+55		7955.6	7957.6 130	7958.1 360	7958.6 470	7958.8 810

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 13

TABLE 2

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 4

Existing conditions Nov. 1975.

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
EN	30+80		7959.8	7961.7 130	7962.1 360	7962.8 470	7963.0 810
EO	31+55	Pleasant Avenue	7961.9	7963.2 130	7964.5 360	7964.9 470	7965.4 810
EP	32+25		7963.8	7964.9 130	7965.7 360	7966.0 470	7966.4 820
EQ	38+75		7970.9	7972.3 140	7973.2 360	7973.5 470	7973.9 820
ER	45+00		7977.7	7978.3 140	7978.9 370	7979.0 470	7979.4 830
ES	50+50		7985.2	7986.0 140	7986.6 370	7986.7 480	7987.1 830
ET	57+00		7995.8	7996.9 140	7997.7 370	7998.0 480	7998.4 830
EU	63+75		8007.7	8008.4 140	8008.9 370	8009.0 480	8009.3 840

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 14

TABLE 1

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 4

Existing conditions Nov. 1975.

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
EV	68+75		8012.1	8013.3 140	8014.2 370	8014.4 480	8014.9 840
EW	73+75		8017.8	8019.3 140	8020.2 380	8020.3 480	8020.8 850
EX	79+50		8025.4	8026.7 140	8027.5 380	8027.7 480	8028.1 850
EY	84+75		8033.5	8034.2 140	8034.8 380	8034.9 490	8035.3 850
EZ	89+50		8039.0	8039.8 140	8040.3 380	8040.4 490	8040.8 860
FA	96+50		8047.6	8048.5 190	8048.8 530	8049.0 690	8049.2 1090
FB	104+00		8055.1	8057.5 190	8058.3 530	8058.4 690	8058.6 1090
BP	111+50		8063.2	8068.0 800	8068.5 1140	8068.8 1300	8069.3 1710

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 15

TABLE 1

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 5

Existing conditions Nov. 1975.

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
X	0+00	@ Confluence with Reach #1	7950.4	7953.4 690	7953.7 790	7953.7 840	7953.8 880
GA	7+50		7962.5	7963.6 50	7963.8 140	7964.0 180	7964.1 200
GB	7+95	Pleasant Ave.	7961.9	7964.5 50	7964.8 140	7965.0 180	7965.1 200
GC	8+45		7964.7	7965.5 50	7965.9 140	7966.1 180	7966.2 210
GD	14+70		7971.7	7973.0 50	7974.9 140	7975.7 180	7976.0 210
GE	15+10	James Street	7973.0	7974.4 50	7975.3 140	7975.8 180	7976.1 210
GF	15+55		7973.2	7974.6 50	7975.5 140	7975.9 180	7976.2 210
GG	20+80		7978.8	7979.3 50	7980.0 140	7980.1 180	7980.2 220

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the main channel due to road crossings, upstream diversions, etc.

Table page 16

TABLE 1

FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA 1/
COTTONWOOD CREEK, REACH 5

Existing conditions Nov. 1975.

Cross Section Designation	Stationing from Mouth Feet	Identification	Stream Bed Elevation ft. M.S.L.	Crest-Elevation ft. M.S.L., and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
GH	28+80		7985.7	7986.3 50	7987.2 140	7987.3 190	7987.4 220
GI	38+05		7994.7	7995.2 50	7995.9 150	7996.1 190	7996.1 220
GJ	43+80		8002.8	8003.6 50	8004.6 150	8004.8 190	8004.8 220
GK	49+80		8011.6	8012.0 50	8012.5 150	8012.7 190	8012.7 230
GL	54+30		8017.7	8018.3 50	8019.1 150	8019.3 190	8019.3 230
GM	57+80		8019.8	8020.4 50	8021.2 150	8021.4 200	8021.5 230
GN	61+30		8026.4	8027.0 50	8027.7 150	8027.9 200	8028.0 230
GO	66+30		8031.1	8031.9 50	8032.8 150	8033.0 200	8033.1 230
BM	70+80		8035.6	8038.1 590	8038.1 600	8038.1 600	8038.1 620

1/ Flood elevations pertain to the main channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations

GLOSSARY OF TERMS

Channel - A natural or artificial water course of perceptible extent with definite banks to confine and conduct continuously or periodically flowing water. Channel flow is that water which is flowing within the limits of the defined channel.

Flood - Water from a river, stream, water course, lake or other body of standing water, that temporarily overflows the boundaries within which it is ordinarily confined.

Flood Crest - The maximum stage or elevation reached by the waters of a flood at a given location.

Flood Frequency - A means of expressing the probability of flood occurrences as determined from a statistical analysis of representative stream flow or rainfall and runoff records. The frequency of a particular stage or discharge is usually expressed as occurring once in a specified number of years. The 10-, 25-, 50-, 100-, and 500-year frequency floods have an average frequency of occurrence in the order of once in the number of years as indicated.

10-Year Flood - A flood having an average frequency of occurrence of once in 10 years. It has a 10 percent chance of being equalled or exceeded in any given year.

100-Year Flood - A flood having an average frequency of occurrence of once in 100 years. It has a 1 percent chance of being equalled or exceeded in any given year.

Flood Peak - The highest stage or discharge attained during a flood event; also referred to as peak stage or peak discharge.

Flood Plain - The relatively flat or low land area adjoining a river, stream, watercourse, lake, or other body of standing water which has been or may be covered temporarily by flood water. For administrative purposes the flood plain may be defined as the area that would be inundated by the 100-year flood.

Perched Channel Flow - A condition where the flow elevation in the outer portions of the flood plain is higher than the flow elevation in the primary channel. This condition occurs when a higher secondary channel receives inflow from some location upstream and maintains a flatter slope than the primary channel.

Reach - A hydraulic engineering term used to describe longitudinal segments of a stream or river.

Runoff - That part of precipitation, as well as any other flow contributions, which appears in surface streams of either perennial or intermittent form.

Stream - Any natural channel or depression through which water flows whether continously, intermittently, or periodically, including modification of the natural channel or depression.

Structure - Anything constructed or erected, the use of which requires a more or less permanent location on or in the ground. Includes but is not limited to bridges, buildings, canals, dams, ditches, diversions, irrigation systems, pumps, pipelines, railroads, roads, sewage disposal systems, underground conduits, water supply systems, and wells.

Typical Valley Cross Section - An engineering drawing of a vertical section of a stream channel and adjoining landscape as viewed in a downstream direction. The drawing represents a specified location within a designated stream reach.

Water Surface Profile - (This term is synonymous with - Flood Profile) - a graph showing the relationship of the water surface elevation of a flood event to location along a stream or river.

Watersheds - A drainage basin or area which collects runoff and transmits it usually by means of streams and tributaries to the outlet of the basin.

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