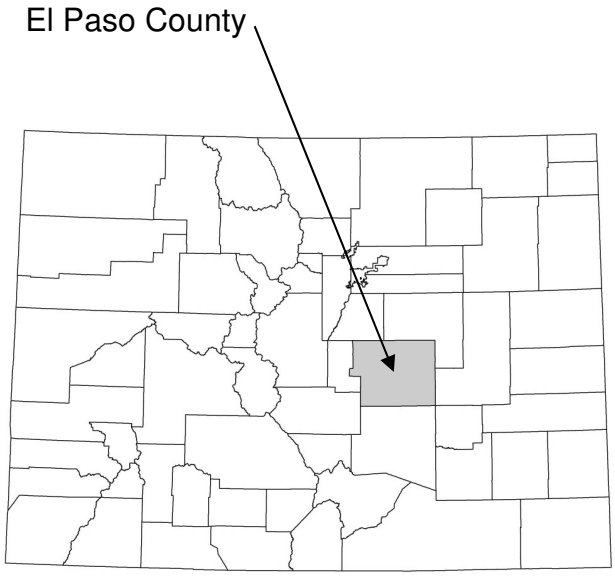
FLOOD INSURANCE STUDY

EL PASO COUNTY, COLORADO, AND INCORPORATED AREAS

VOLUME 1 OF 8



COMMUNITY NAME	COMMUNNITY NUMBER
CALHAN, TOWN OF	080192
COLORADO SPRINGS, CITY OF	080060
EL PASO COUNTY (UNINCORPORATED AREAS)	080059
FOUNTAIN, CITY OF	080061
GREEN MOUNTAIN FALLS, TOWN OF	080062
MANITOU SPRINGS, CITY OF	080063
MONUMENT, TOWN OF	080064
PALMER LAKE, TOWN OF	080065
RAMAH, TOWN OF	080066

Preliminary

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
08041CV001A

NOTICE TO
FLOOD INSURANCE STUDY USERS

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

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

This FIS report was revised on August 23, 1999. Users should refer to Section 10.0, Revisions Description, for further information. Section 10.0 is intended to present the most up-to-date information for specific portions of this FIS report. Therefore, users of this report should be aware that the information presented in Section 10.0 superseded information in Sections 1.0 through 9.0 of this FIS report.

Initial Countywide FIS Report Effective Date: March 17, 1997

Revised Countywide FIS Report Effective Date: August 23, 1999

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FLOOD INSURANCE STUDY
EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and supersedes the FIS reports and/or Flood Insurance Rate Maps (FIRMs) [Flood Boundary and Floodway Maps] in the geographic area of El Paso County, Colorado, including the Cities of Colorado Springs, Fountain, and Manitou Springs, the Towns of Calhan, Green Mountain Falls, Monument, Palmer Lake, and Ramah, and unincorporated areas of El Paso County (hereinafter referred to collectively as El Paso County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates. This information will also be used by El Paso County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

It should be noted that the Town of Green Mountain Falls, which is located in both El Paso and Teller Counties, is included in its entirety in the El Paso County FIS.

This Countywide FIS was prepared by compiling pertinent information for the flood hazard areas in both the incorporated and unincorporated areas of El Paso County, Colorado, from existing technical and/or scientific data, and from new studies. This existing and new data was reviewed by the Federal Emergency Management Agency (FEMA) prior to its use in the development of this FIS to ensure compliance with NFIP regulations.

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

1.2 Authority and Acknowledgments

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

For the Cities of Colorado Springs and Fountain, the Town of Green Mountain Falls, and the unincorporated areas of El Paso County, the hydrologic and hydraulic analyses for the initial studies were performed by the U.S. Army Corps of Engineers (USACE), Albuquerque District, under Interagency Agreement No. H-7-76, Project Order No. 12, Amendments No. 2 and 6, and by Camp Dresser and McKee, Inc., under Contract No. EMW-C-0046, for the Federal Emergency Management Agency (FEMA). These studies were completed in July 1982. The hydrologic and hydraulic analyses for Dry Creek and its tributaries were performed by KKBNA, Inc. This work was completed in January 1984.

For the City of Manitou Springs, the hydrologic and hydraulic analyses for the initial study were performed by PRC Engineering Consultants, Inc., for FEMA, under Contract No. H-4724. This study was completed in September 1979. A detailed study was performed along Beckers Lane Tributary to revise the floodplain due to channel improvements. The hydrologic and hydraulic analyses for this revision were performed independently by Greenhorne & O'Mara, Inc., and were completed in January 1989. All channel improvements for this revision were completed by December 1989.

For the Town of Monument, the hydrologic and hydraulic analyses used to prepare the initial study were performed by the Colorado Water Conservation Board (CWCB). That work was completed in June 1986.

For the Town of Palmer Lake, the hydrologic and hydraulic analyses for the initial study were performed by the U.S. Geological Survey (USGS), Water Resources Division, for the Federal Insurance Administration, under Interagency Agreement No. IAA-H-17-75, Project Order No. 11. This work, which was completed in May 1977, covered all significant flooding sources affecting the Town of Palmer Lake.

As part of the El Paso Countywide Digital Flood Insurance Rate Map (DFIRM) revision in 2009, a section of Fountain Creek within the City of Colorado Springs was re-studied using detailed methods (WHPacific, Inc., 2013). WHPacific, Inc. performed the work and completed these analyses in June 2013 under contract to the City of Colorado Springs. Fountain Creek and Upper Fountain Creek within El Paso County, the City of Fountain, the City of Manitou Springs, and the Town of Green Mountain Falls was re-studied by URS under Contract No. 09 PDA 00081, for the CWCB (URS, 2011). Black Squirrel Creek and several tributaries were re-studied using detailed methods by Anderson Consulting Engineers, Inc. (ACE) as part of the El Paso County FEMA RiskMAP study. ACE was contracted by CWCB and completed the analyses in August 2013.

Except as noted below, the vector base map for El Paso County was provided by El Paso County, the City of Colorado Springs, and the City of Fountain.

Specifically, the El Paso County data was provided in 2006 by the El Paso County GIS Department located at 325 South Cascade Ave., Colorado Springs, CO 80903. The City of Colorado Springs data was supplied by the Colorado Springs Utilities (CSU), 111 South Cascade Ave., Colorado Springs, CO 80903. The City of Fountain data was supplied by the City of Fountain, 116 South Main Street, Fountain CO 80817. The base map data consists of a series of shape files based on the NAD83 horizontal datum, using the UTM Zone 13 projection and includes the following:

a) Transportation coverage – Included in this information is the road centerline and airport information within the county. Road centerline information was obtained from the El Paso County, the City of Fountain, and the CSU GIS Departments. Airports were digitized from the 2006 NAIP aerial photo of the county, [USDA, 2006]. Due to licensing issues, these data were incorporated into the DFIRM as a raster image;

b) Political boundaries – These data include all incorporated community, military and Federal facility, National Forest, and State Park boundaries. These data were obtained from the El Paso County, the City of Fountain, and the CSU GIS Departments and were aligned to the Public Land Survey System (PLSS) lines for the County;

c) Public Land Survey System - These data were obtained from the Bureau of Land Management and includes all section, township, and range information for the County;

d) Hydrography - These data were initially obtained from the El Paso County GIS Department and from CSU, then corrected by Anderson Consulting Engineers, Inc. to coincide with the stream centerlines visible on the 2006 NAIP aerial photograph. For areas where new studies were conducted for the DFIRM conversion project the stream centerline was replaced with the profile baseline utilized in the respective hydraulic study;

e) National Geodetic Survey (NGS) benchmarks – The NGS benchmarks were downloaded from the National Geodetic Survey/National Oceanic and Atmospheric Administration website;

f) United States Geological Survey (USGS) Quad map index – These data were obtained from the USGS and includes the outline of all quad maps encompassed by the County boundary; and

g) New FIRM panel boundaries – This data set was created by Anderson Consulting Engineers, Inc., and displays the outlines of the new DFIRM panels for the county.

The hydraulic structure layer, including bridges and culverts within the extents of the effective hydraulic models, along with dams, weirs, and levees that are present within the county were obtained from the respective hydraulic studies. Dams, weirs, and levees along with the bridges and culverts in the effective hydraulic models that were visible on the 2006 aerial photograph were digitized by Anderson Consulting Engineers, Inc.

The coordinate system used for the production of the digital FIRM is Universe Transverse Mercator referenced to the North American Datum of 1983 and the GRS 80 spheroid, Western Hemisphere.

1.3 Coordination

The following entities were contacted for information pertinent to the individual Flood Insurance Studies:

U.S. Army Corps of Engineers;
Colorado Water Conservation Board;
El Paso County Land Use Administration and Planning Department;
Pikes Peak Area Council of Governments;
City of Colorado Springs Land Use and Public Works Department;
U.S. Department of Agriculture, Soil Conservation Service;
Colorado State Archives;
City of Fountain;
City of Manitou Springs;
Town of Green Mountain Falls;
Town of Monument;
Town of Palmer Lake; and
Land developers, engineering firms, utilities, and private citizens.

During the preparation of the initial Flood Insurance Studies for the individual communities, FEMA representatives held coordination meetings with community officials, representatives of the study contractors for each study, and other interested agencies and citizens. The meetings, referred to as the initial, intermediate, and final Consultation Coordination Officer (CCO) meetings, were held at specified intervals during the preparation of the studies. The comments and issues raised at those meetings were addressed in the Flood Insurance Study for each community. The dates the meetings were held for each community are provided in Table 1.

A pre-scoping meeting for the El Paso Countywide DFIRM conversion project was conducted on February 6, 2007 at the Colorado Springs Public Works Department. The meeting was attended by representatives of FEMA, CWCB, Michael Baker Corporation (Baker; FEMA's National Service Provider), El Paso County, Colorado Springs, Fountain, the Pikes Peak Council of Governments (PPCG), the Pikes Peak Building Department, and Anderson

Table 1. Community Coordination Officer Meetings

Community Name	Coordination Meetings	Initial CCO Meeting or CCO Meeting	Contract or Intermediate Final CCO Meeting
El Paso County, Unincorporated Areas			January 23, 1984
Colorado Springs, City of	May 1975		September 21, 1979
Fountain, City of	January 16, 1984		July 24, 1984
Green Mountain Falls, Town of	January 16, 1984		
Manitou Springs, City of	February 21, 1978	August 14, 1979	January 28, 1982
Monument, Town of	August 7, 1987		

Consulting Engineers, Inc. (ACE), the DFIRM study contractor.

On TBD the results of the El Paso County DFIRM revision project were presented and reviewed at a final community coordination meeting attended by representatives of FEMA, CWCB, El Paso County, Colorado Springs, Fountain, Monument, Palmer Lake, Calhan, Manitou Springs, Green Mountain Falls, Ramah, the PPCG, and the study contractor. All concerns raised during this meeting have been resolved.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the geographic area of El Paso County, Colorado, including the incorporated communities listed in Section 1.1. The streams that were studied by detailed methods are listed in Table 2.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon, by FEMA and individual communities. The streams that were studied by approximate methods are listed in Table 3.

2.2 Community Description

El Paso County is located in central Colorado. The northern county boundary is approximately 40 miles south of Denver, Colorado. The southern boundary is 20 miles north of Pueblo, Colorado. A portion of Pike National Forest is in western El Paso County. The county has an approximate land area of 2,100 square miles.

El Paso County is bordered by the counties of Douglas, Elbert, Lincoln, Pueblo, Fremont, and Teller.

The 1980 population of the county was 309,424, with an estimated 2013 population of 655,044, making it the most populous county in Colorado. The largest concentration of people, other than in Colorado Springs, is in the Fountain/Widefield/Security area.

The City of Colorado Springs, located in west-central El Paso County, is the county seat. The city had a population of 215,150 in 1980, with an estimated 2013 population of 439,886, making it the second most populous city in the state of Colorado.

The City of Fountain is located in the southwestern portion of El Paso County, in central Colorado. The city is bordered by unincorporated areas of El Paso County. The 1980 population of Fountain was reported as 8,342, with the 2010

Table 2. Streams Studied By Detailed Methods

Bear Creek
Beaver Creek
Beckers Lane Tributary
Big Valley
Black Forest Creek
Black Forest Creek – Baptist Road Tributary
Black Forest Creek – Middle Tributary
Black Squirrel Creek
Black Squirrel Creek – Haegler Basin - Sage Creek
Black Squirrel Creek – Right Split Flow Path
Black Squirrel Creek – Upstream of U.S. Highway 24
Black Squirrel Creek – West Fork Bennett Ranch Basin
Book Ranch Creek
Butler Canyon
Calhan East Tributary
Calhan Fairground Tributary
Calhan Main Channel
Camp Creek
Carpenter Creek
Catamount Creek
Cheyenne Creek
Cheyenne Run
Corral Tributary
Cottonwood Creek
Crystal Creek
Crystal Creek - Split Flow Channel
Dirty Woman Creek
Dirty Woman Creek - Lake Fork
Dirty Woman Creek - Middle Fork
Dirty Woman Creek - North Fork
Dirty Woman Creek - South Fork
Douglas Creek North
Douglas Creek South
Dry Creek
East Cherry Creek
East Tributary to Black Squirrel Creek
East Tributary to Black Squirrel Creek –
West Fork Bennett Ranch Basin
Ellicott Consolidated
Ellicott – East Tributary
Ellicott – Highway Split Flow Path Downstream
Ellicott – Highway Split Flow Path Upstream
Ellicott – Left Split Flow Path
Ellicott – Sanborn Split Flow Path
Ellicott – Split Flow Path 2
Fairfax Creek
Fisher's Canyon
Fisher's Canyon – Above Loomis Avenue
Fisher's Canyon – South Branch
Fountain Creek
Fountain Creek – North Overflow Path
Franceville Tributary – Jimmy Camp Creek
Haegler Ranch Tributary 2
Haegler Ranch Tributary 3
Haegler Ranch Tributary 4
Jackson Creek
Jimmy Camp Creek
Jimmy Camp Creek - East Tributary
Jimmy Camp Creek - West Tributary
Jimmy Camp Creek - West Tributary South Overflow
Kettle Creek
Lower Big Springs Creek
Lower Big Springs Creek - Right Split Flow Path
Mesa Basin
Mines Subtributary to Corral Tributary
Monument Creek
Monument Creek Tributary
North Beaver Creek
North Channel Dry Creek
North Monument Creek
North Pine Creek
Peterson Field Drainage
Pine Creek
Pine Creek Tributary
Piñon Lake Tributary
Rockrimmon Basin
Ruxton Creek
Sand Creek
Sand Creek Center Tributary
Sand Creek Center Tributary Overflow
Sand Creek East Fork
Sand Creek East Fork Subtributary
Sand Creek South
Sand Creek Split Flow
Sand Creek West Fork
Security Creek
South Shooks Run
South Tributary to Black Squirrel Creek
Spring Creek
Spring Creek East Fork
Spring Run
Spring Run Overflow
Sutherland Creek
Teachout Creek
Telephone Exchange
Telephone Exchange - Lower Split Flow Path
Telephone Exchange - Middle Split Flow Path
Templeton Gap Floodway
Templeton Gap - Lower Tributary
Templeton Gap - South Overflow
Templeton Gap - South Tributary
Templeton Gap - Upper Tributary
Tributary to East Cherry Creek
Tributary to Sand Creek - East Fork Reach No. 6

Table 2. Streams Studied by Detailed Methods (cont.)

Unnamed Tributary to Black Squirrel Creek
Unnamed Tributary to Black Squirrel Creek No. 2
Unnamed Tributary to Jimmy Camp Creek
Unnamed Tributary to Teachout Creek
Upper East Tributary to Chico Creek
Upper Fountain Creek
West Fork Squirrel Creek - Solberg Ranch - West Unnamed Tributary
West Tributary to Black Squirrel Creek
Widefield Creek
Williams Canyon
Windmill Gulch
Windmill Gulch - Dix Circle Overflow
Windmill Gulch - Grand Boulevard Overflow
Windmill Gulch - Libby Court Overflow

Table 3. Streams Studied By Approximate Methods[1]

Antelope Creek
Big Sandy Creek
Big Springs Creek
Black Squirrel Creek
Brackett Creek
Calhan Main Channel
Chico Creek
Crystal Creek
East Branch Brackett Creek
East Cherry Creek
Geick Ranch Tributary 1
Geick Ranch Tributary 2
Geick Ranch West Tributary
Hay Creek
Horse Creek
Jimmy Camp Creek
Kiowa Creek
Little Fountain Creek
Little Horse Creek
Little Turkey Creek
Mines Subtributary to Corral Tributary
Mustang Creek
North Fork Horse Creek
Pond Creek
Ramah Reservoir
Red Creek
Rock Creek
Ruxton Creek
Sand Creek East Fork
Sand Creek South
Smith Creek
Snipe Creek
Steels Fork
Turkey Creek
Unnamed Tributary to Black Squirrel Creek
Unnamed Tributary to Black Squirrel Creek No. 2
Upper East Tributary to Chico Creek
West Bijou Creek
West Cherry Creek
West Fork Squirrel Creek – Solberg Ranch – West Unnamed Tributary
West Kiowa Creek
Williams Creek

[1] There are numerous unnamed streams scattered throughout El Paso County. A large number of these streams have effective, approximate (Zone A) floodplains. Users of this report are encouraged to reference the Flood Insurance Rate Maps for the most up to date flood hazard information related to their area.

population being 25,846.

The Town of Green Mountain Falls is located in western El Paso County and eastern Teller County. Tourism is the economic base of Green Mountain Falls. The year-round population in Green Mountain Falls has increased from 359 in 1970 to 644 in 1980, an increase of approximately 80 percent. The 2010 population of the town was 640.

The City of Manitou Springs is located in western El Paso County, 70 miles south of Denver and immediately west of Colorado Springs. The city covers an area of 3.04 square miles and had a population of 5,675 in 1990. In 2010, the population of the city was 4,992. The city is bordered by the City of Colorado Springs to the northeast, and by unincorporated areas of El Paso County.

The Town of Monument is located approximately 20 miles north of Colorado Springs. According to 1980 census data, Monument had a population of 690, an increase of 297 from 1970. According to 2010 census data, the town had a population of 5,530.

The Town of Palmer Lake, which is located in the northwest corner of El Paso County, had a population of 947 in 1970 and 1,130 in 1980. The 2010 population of the town was 2,420. Palmer Lake is a rural, residential community, and the majority of the population work outside the community.

The Town of Ramah, which is located in the northeast corner of El Paso County, had a population of 123 in 2010.

The Town of Calhan is located in northeastern El Paso County. The town has an area of 0.85 square miles, and the 2010 population was 780.

The economy of the county is primarily based on tourism, skiing, light industry, commerce, farming, and ranching. Also, the economy benefits from the Fort Carson Military Reservation, Peterson Field Air Force Base, the U.S. Air Force Academy, and the NORAD installation. Major tourist attractions of the area include the Garden of the Gods, Pike National Forest, Manitou Springs, the U.S. Air Force Academy, and the Broadmoor Hotel.

Interstate Highway 25, U.S. Highway 85-87, State Highways 24, 83, 94, 115, and County Road 38 are located in the floodplains of the county. Rail lines serving the county are the Denver and Rio Grande Western Railroad Company; Chicago, Rock Island, and Pacific Railroad Company; and the Atchison, Topeka, and Santa Fe Railway Company.

The growth rate of Colorado Springs has been among the highest in the nation since 1970. Development is continuing at a relatively high rate. Most of the residential development is along the northeastern and eastern corporate limits.

Major housing developments are planned for the Pine Creek, Kettle Creek, Cottonwood Creek, Jimmy Camp Creek, and Sand Creek basins.

Beckers Lane Tributary flows parallel to Beckers Lane in the eastern part of the City of Manitou Springs and drains an area of 0.85 square mile. The stream flows in an area of the city that is less developed than the floodplain of the other drainageways.

Butler Canyon flows eastward from the hills onto an alluvial fan and into Palmer Lake. Palmer Lake discharges northward into Carpenter Creek, which flows northward for approximately 10 miles before joining East Plum Creek at Larkspur. The floodplains are generally limited to narrow boundaries along each side of the low-water channel and lake.

Camp Creek originates in the Pike National Forest northwest of Colorado Springs approximately 5 miles northwest of Glen Eyrie, continues south approximately 3 miles to Colorado Springs, and joins Fountain Creek near 30th Street. The creek flows in a concrete lined channel in residential areas.

Cottonwood Creek, an east bank tributary of Monument Creek, originates near the Black Forest and has an approximate drainage area of 18 square miles above its confluence with Monument Creek. The upper reach has an approximate gradient of 193 feet per mile. The lower reach, which is flat and wide, has an approximate gradient of 88 feet per mile. The stream along most of its course is deeply eroded into rock outcrops and, in the lower reach, is lined with willows. Within the corporate areas of Colorado Springs, developers have confined Cottonwood Creek to a sand-bottom, riprap-sided channel.

Douglas Creek (North and South) drains an area in and adjacent to northwestern Colorado Springs. The stream flows southeasterly for approximately 8 miles to join Monument Creek near the Templeton Gap Floodway outlet. Lower portions of Douglas Creeks North and South have been channelized into concrete-lined drainage structures.

Dry Creek and its tributaries drain the Dry Creek Basin. The Dry Creek Basin is bounded on the west by the Front Range of the Rocky Mountains, on the south and north by ridges, and on the east by Monument Creek. It slopes from west to east toward Monument Creek, rising from an elevation of 6,250 feet to an elevation of 9,250 feet. The western portion of the basin is heavily forested, mountainous terrain, drained by three major tributaries of Dry Creek. The central portion of the basin is characterized by gently rolling wide valleys, separated by foothill ridges and mesas. Through the central portion of the basin, Dry Creek is poorly defined and flows through broad, gently sloping meadows. The eastern portion of the basin is fully developed, and Dry Creek flows through well-defined and eroded channels as well as greenbelt

areas. For the most part, flow in Dry Creek and its tributaries is intermittent.

Fountain Creek originates approximately 5 miles northwest of Green Mountain Falls in Teller County. From its headwaters, Fountain Creek flows southeasterly for approximately 18 miles, often exceeding a gradient of 150 feet per mile, to join Monument Creek. The headwaters are fed from glacial snow packs and springs of the alpine canyons of Pikes Peak. Glacial deposits remain in many of the valleys above the 9,500-foot elevation. The aspen-, spruce-, and pine-covered narrow canyons are straight, steep-walled, and well drained. The bedrock creek channel, strewn with boulders, averages 50 feet in width above the foothills.

The foothills are a narrow transition from the mountains to the high plains. The transitional area varies from rough parallel ridges to narrow, gently sloping mesas with pine, pinion, cedar, and oak cover. The stream emerges on the high plains in Colorado Springs. South of Colorado Springs, the watershed west of the creek is in the foothills, while the eastern watershed is primarily high plains. This area to the El Paso-Pueblo County line averages a gradient of 26 feet per mile. The rolling high plains terrain is rough, broken, and sparsely vegetated. The sparse vegetation is typical of the semiarid high plains -- predominantly brush, cactus, and native grasses. The floodplain is comprised of narrow-strip irrigated farms, clumps of cottonwood trees, salt cedar, and other thick undergrowth. The approximate drainage area above the confluence with the Arkansas River is 917 square miles. For reporting purposes, the stream segment above the northern corporate boundary of Manitou Springs was labeled Upper Fountain Creek.

Jimmy Camp Creek originates in the high plains approximately 7 miles northeast of Colorado Springs. The watershed is approximately 17 miles long and averages approximately 4 miles wide. Jimmy Camp Creek main tributaries are: Corral, Franceville, and Jimmy Camp West and East Tributaries, which are typically sandy, flat, and wide. Above its confluence with Fountain Creek, just south of the City of Fountain, the drainage basin is approximately 66 square miles. The topography of the area is characterized by rolling hills and ridges which are generally steeper in the upper reaches of the watershed. A fourth stream, Mines Subtributary, has its confluence at Corral Tributary.

Kettle Creek, a left-bank tributary to Monument Creek, has its headwaters on the western slope of the Black Forest, northeast of Colorado Springs. A 2-mile segment of the lower reach is within the U.S. Air Force Academy boundaries. Typically, the creek cuts a narrow, deep canyon. It has a drainage area of approximately 17 square miles, and is subject to urban development throughout much of the basin.

Mesa Basin is located in western Colorado Springs. It is bounded on the north

by Garden of the Gods Road, on the west by Mesa Road, on the south by Unitah Street, and on the east by Monument Creek. The main channel in this basin drains the western portion of the basin. It flows southeasterly through the basin, passes under Interstate Highway 25 between Caramillo and Buena Ventura Streets, and joins Monument Creek.

Monument Creek originates in northwestern El Paso County, west of the community of Palmer Lake, and flows 35.7 miles to join Fountain Creek in southwestern Colorado Springs. Monument Creek has a drainage area of approximately 238 square miles. From its source, this perennial stream flows easterly for approximately 8 miles, descending from a 9,350-foot elevation through precipitous canyons and transitional foothills to emerge near Palmer Lake at the 7,100-foot elevation. It then turns south and parallels the mountains for the remaining distance to its confluence with Fountain Creek. Fountain Creek is generally entrenched, with an average slope of approximately 30 feet per mile.

Within the City of Colorado Springs, Fountain Creek has been channelized for approximately 7,000 feet. West of the main stem of the creek, the rough and broken mountain terrain vegetation ranges from mixed coniferous trees to hardy shrubs and typical mountain grasses. East of the main stem, the high plateau descends gradually to generally rolling land covered by grass with some shrubs and brushes. Both coniferous and deciduous trees grow along the creek banks.

Monument Creek Tributary flows southerly into the upper reach of Monument Creek near the community of Palmer Lake. The terrain consists of transitional foothills with poorly drained soils, which are covered with vegetation ranging from mixed coniferous trees to scrub oaks and grasses. The floodplains are generally limited to narrow strips along each side of the low-water channel and lake. There is limited development, with most residential and commercial development located outside the limits of the floodplain.

The Peterson Field Drainage is a left-bank tributary of Sand Creek, entering Sand Creek approximately 0.25 mile from its confluence with Fountain Creek. The upper one-third of the basin is characterized by shallow swales that convey overland flow across Peterson Airfield in Colorado Springs. Detention ponds within the airfield boundaries substantially limit peak flows from this area. The lower portions of the drainage are characterized by light industrial and residential development, with the channel being concrete-lined from Monica Drive to the confluence with Sand Creek.

Pine Creek, a narrow, deep stream, joins Monument Creek just north of Colorado Springs. The Pine Creek basin is 7 miles long and has a drainage area of approximately 10 square miles. The upper reach of Pine Creek is an area of potential development. The lower reach borders the U.S. Air Force

Academy. Heavy commercial development has taken place in the lower portions of the Pine Creek basin.

The Rockrimmon Basin lies in northwestern Colorado Springs. The basin is oriented in a southeasterly direction to the outfall points along Monument Creek near the Woodman Road Interchange on Interstate Highway 25. The basin is drained by one major defined channel with many minor contributing branches and, except after a storm, all channels are dry. Lower portions of the drainageway flow are confined in a concrete channel.

Ruxton Creek drains the eastern slope of Pikes Peak and has a drainage area of 17.6 square miles at its confluence with Fountain Creek in Manitou Springs. The drainage basin above Manitou Springs is characterized by steep slopes and forests; within the city, it is characterized by a narrow valley and dense development in the floodplain areas.

Sand Creek has three main tributaries: Center, East Fork Subtributary, and East Fork. East Fork Subtributary is tributary to East Fork Sand Creek, which has not been studied in detail above their confluence. These streams are typically shallow, wide, and sandy. Sand Creek is typical of many ephemeral streams in that the channel tends to meander over a period of years. Historical evidence of meandering is predominant in the lower reaches where there is relatively less topographic relief and the channel broadens into and becomes part of the floodplain. The drainage basin encompasses an area of approximately 53 square miles. Sand Creek runs through the county in two areas: south of Colorado Springs at the confluence with Fountain Creek and east of Colorado Springs. The latter area is one of growth as Colorado Springs develops eastward.

Shooks Run is divided into two separate and distinct reaches: North Shooks Run (Templeton Gap Drainage Basin) and South Shooks Run. The Templeton Gap Drainage Basin (North Shooks Run) originates in northeastern Colorado Springs in a cuplike depression, surrounded by hills. It flows southwesterly along and parallel to Templeton Gap Road, until it is intercepted by the Templeton Gap Floodway and diverted northwesterly to Monument Creek. South Shooks Run begins at the Templeton Gap Floodway, and runs parallel to Templeton Gap Road for approximately 2 miles before flowing southerly for approximately 5 miles to join Fountain Creek near the southern corporate limits, approximately 0.25 mile east of U.S. Highway 85-87. The stream originates in a residential area and throughout its course flows through residential or business areas.

Spring Creek originates in east-southeastern Colorado Springs, flows southwesterly, and drains an area of approximately 8 square miles. At a point 0.5 mile upstream of the confluence with Fountain Creek, Spring Creek enters El Paso County. The Spring Creek valley is relatively wide in the northern two-

thirds of the basin, becoming deep and narrow in the lower one-third. The floodplain is completely developed with long reaches of concrete-lined channels in residential and commercial areas in addition to the Valley Hi Golf Course.

Sutherland Creek begins south of the city in the Pike National Forest and has a drainage area of 5.37 square miles at its mouth. The upper basin is vegetated and the lower reach is moderately developed. In many areas, the stream channel is heavily vegetated with thick stands of scrub oak.

Templeton Gap Floodway drains an area of approximately 8.5 square miles of the northern portion of the Shooks Run basin. This Monument Creek tributary originates in northeastern Colorado Springs, southeast of the Austin Bluffs. A section of unincorporated county land is located in the upper reach of the floodway. This area is a fully developed residential area.

Williams Canyon flows through an area of rugged terrain and steep slopes from its headwaters in the Rampart Range north of Manitou Springs. Williams Canyon above U.S. Highway 24 flows in a narrow, rocky, steep-walled canyon; below U.S. Highway 24, it flows through dense residential development. For the final 1,100 feet near the confluence with Fountain Creek, Williams Canyon is enclosed in a concrete box culvert. Its drainage area at the mouth is 2.68 square miles.

The Security Creek, Widefield Creek, and Windmill Gulch drainage basins are adjacent and drain the areas north and east of the Security-Widefield community. Windmill Gulch drains into Security Creek, which in turn drains into Widefield Creek. Above the Widefield Creek confluence with Fountain Creek, the drainage area is approximately 15 square miles.

The western portion of El Paso County is in the Rampart Range of the Rocky Mountains, while the remainder is in a high-plains region. Elevations range from 14,110 feet to 5,150 feet at the southern county line.

Physiographically, the study area east of Monument and Fountain Creeks is characterized by gently sloping plains; west of the creeks, by mountain ranges and basins. There are some horizontal sedimentary outcrops in the Black Forest area which represent rock formations from the Rocky Mountain uplift some 60 million years ago. Exposed sedimentary rocks along the edge of the mountain front are tilted. Above the sedimentary foothills the pre-Cambrian mountain core is largely of Pikes Peak granite.

Soils of the region exhibit characteristics that are directly related to their physiographic position. The highest of three physiographic positions, semiarid, mountains and foothills, is comprised of rock outcrop and deep (greater than 40 inches to bedrock) to moderately deep (20 to 40 inches to

bedrock) soils formed by material derived from acid igneous rock or hard sedimentary rock. The lesser extensive soils formed through the erosion and weathering of acid igneous rock are 35- to 60-percent cobble with a loamy matrix, while more extensive soils formed with material derived from sedimentary rock generally are loamy with 0- to 25-percent gravel. The lowest of the physiographic positions, semiarid to arid plains, has deep to shallow soils that form in eolian and alluvial deposits as well as material derived from clayey shales. Deep soils forming eolian and alluvial deposits are well-drained, sandy to clayey, and are usually lacking in rock (gravel or cobble) fragments, while shallow soils formed with materials derived from shale are clayey, lacking in significant gravel, and are well-drained. The intermediate physiographic position, semiarid foothills and plains, is dominated by soils derived from hard sedimentary rock, but also has a few soils formed in alluvium and from interbedded sandstone and shale. Soils formed with material derived from hard sedimentary rock are sandy or loamy, well-drained, and have less than 10-percent gravel.

Generally, the mountain and foothill areas have high coefficients of runoff, steep stream gradients, and narrow floodplains. High-plains areas generally have a lower coefficient of runoff, gradual elevation changes, and relatively broad streambeds and floodplains.

Within the region, precipitation varies considerably because of elevations, major wind currents, and local geographic features. Winter storms, typically from the northwest, tend to lose their moisture on the western side of the Rocky Mountains. The major precipitation is due to late spring snows influenced by southeasterly winds on upslopes and from summer thunderstorms. Pikes Peak produces a "rain shadow" which causes a semiarid zone to the east. Annual precipitation varies from a low of 8 inches to a high of 20 inches in the higher elevations. Normal annual precipitation for Colorado Springs is 13.2 inches, with the normal maximum monthly amount of 2.4 inches occurring in July.

2.3 Principal Flood Problems

Most of the flood-producing storms in the study area occur from May through August. The most severe storms occur in late spring or early fall when polar air intrusions are more intense. Isolated summer thunderstorms are frequently severe, but limited in areal extent. Available records do not indicate that snowmelt has contributed significantly to flood occurrences in the study area. Floods are characterized by high peak flows, moderate volumes, and short durations.

Available flood history for El Paso County is almost exclusively concerned with the larger aspects of flooding on Fountain or Monument Creeks in the urbanized areas. Major flooding probably included simultaneous flooding on

the smaller streams as well. References to the smaller streams appeared only rarely in newspaper accounts until recently. Specific information on the intensity, duration, and magnitude of the storms and flood effects is generally lacking.

The May 1935 flood is the largest recorded flood: 55,000 cubic feet per second (cfs) on Fountain Creek above the confluence with Jimmy Camp Creek. This storm, which was concentrated chiefly over the Kettle Creek basin, also caused the largest known flood on Monument Creek, 50,000 cfs. In Colorado Springs, Monument Creek attained its peak flow within 2.5 hours and was back within the banks 3 hours later. The flow rate of this flood exceeded the estimated 0.2-percent-annual-chance peak flow rate of the area.

Below the confluence of Jimmy Camp Creek with Fountain Creek, the June 1965 flood probably exceeded all known floods in El Paso County. This flood was caused primarily by Jimmy Camp Creek. At a point 4.5 miles above the confluence with Fountain Creek, the estimated peak discharge was 124,000 cfs, which is estimated to be a recurrence interval far exceeding 500 years.

The following summaries of floods were taken primarily from a USGS publication and from USACE files.

June 10, 1864. The Colorado Springs Gazette of June 27, 1864, in a series of articles on early happenings, refers to the flood of 1864 as follows:

> *There had been several thundershowers and the creeks were somewhat swollen, though not so much as to cause any apprehension. But by 4 o'clock... a heavy cloud came up over Cheyenne Mountain and the sky gathered darkness until nearly sundown, when rain and hail began to fall in tremendous torrents... The rain came down, not in drops but in floods, the hail consisted of huge lumps of ice, some of them over 3 inches in diameter; the whole surface of the country was flooded as though it were a vast lake, and in some of the ravines the water rushed along in torrents 20 or 30 feet deep. The storm continued in full violence until about 9 o'clock. The area of the storm was confined within a radius of 3 or 4 miles.*

May 20, 1878. Although the few available precipitation records for 1878 indicate no general storm, a cloudburst near Palmer Lake caused a flood that was reported by the Rocky Mountain News of May 20, 1878, as follows:

Monument and Fountain Creeks swept out bridges. El Paso County Losses very heavy, caused by cloudburst in valley near Divide, followed by hail.

July 26, 1885. This is the earliest flood of record in the Templeton Gap Basin, and apparently the most severe. The Colorado Springs Gazette, July 26, 1885, gives the following account:

> *H. T. Cook, who resides 5 miles northeast of Templeton Gap says that for an hour during the evening (July 25) there was an incessant fall of rain to the extent that a tub near the house filled with water in the space of an hour. This indicates a rainfall of about 16 inches.*
>
> *Immediately the mighty torrent came tearing down the gulch which runs through the ranch below the house and, notwithstanding the house is located 15 feet above the gulch, the water completely surrounded it for a long distance at a depth of several feet. The mighty torrent came rushing down the gulch in massive waves, capped with white foam. After 2 hours, the water having passed off into Sand Creek, 5 miles east of Templeton Gap, the water subsided from the vicinity of the house.*

May 30, 1894. This flood was caused by a general storm which resulted in floods on the South Platte and Arkansas River Basins. From May 21 to 27, precipitation of 2 inches or more in the upper basin of Fountain Creek had prepared the soil for rapid runoff of the intense precipitation of May 29-31, but, as the heaviest precipitation was in the form of snow, the resulting flood was materially reduced. The flood was described in the Denver Republican for June 1, 1894, which quotes the following dispatch, dated May 31, from Colorado City:

> *The flood has done great damage at this place. The Fountain, which flows through this town, has been very high for the past 24 hours. Early this morning the north approach of West First Street Bridge was carried away... The water rose so high by noon that a large amount of bridge timber and other materials was carried away... At 7:30 this evening a two-room house... located at the south end of West First Street Bridge was carried away.*

June 2-7, 1921. This flood was described in the Colorado Springs Gazette on June 4, 1921 as follows:

> *Shooks Run had before 9 p.m. (June 3) become a river. It had spread its waters over the northwestern part of the city, covering several blocks... Sand Creek and Fountain Creek were roaring, (filling) the banks to overflowing, flooding gardens, farms, ranch houses, etc. ... Old timers declared it the worst storm in 25 years.*

May 27, 1922. This flood was produced by an intense local downpour over the Templeton Gap drainage area. A 6-inch rainfall was recorded during the storm. Damage to the extent of $59,700 was caused by the flood in Colorado Springs, where a residential district in the eastern portion of the city was inundated.

July 30, 1932. This is the maximum known flood in the Templeton Gap area. It was greater than the 1922 flood and caused $144,800 worth of damage. No rainfall data are available, and records indicate that this flood was produced by a cloudburst, typical of those occurring in this area. This cloudburst occurred in the Black Forest with a wall of water sweeping down through Templeton Gap, flooding Papetown mining settlements just north of Colorado Springs and flooding most of northern Colorado Springs. Rain during July 27-30, 1932, caused flooding on Fountain Creek from its headwaters to its mouth.

May 31, 1935. This storm was concentrated in the Fountain Creek Basin, chiefly over Kettle Creek.

In describing this flood, which was the greatest known on Monument Creek, the Colorado Springs Gazette, on May 31, 1935, stated:

> *The destructive flood waters from half a dozen cloudbursts swept through Monument Valley ... shortly after noon. Earlier, a cloudburst had sent Sand Creek, east of Colorado Springs, on a tear ... four lives were lost in Colorado Springs and the property damage, exclusive of that suffered by the railroads, was estimated by the city engineer as $1,215,000.00.*

In Colorado Springs, Monument Creek reached flood stage in less than 1 hour, attained its peak 1.5 hours later, receded slightly for 1.5 hours, and was back within its channel 1.5 hours later.

Developments subject to flood damage consist of residential properties and commercial and light industrial establishments. Some bridges and culverts across the streams are constrictive to flood flows and contribute to flooding problems. Generally, the bridges across Fountain and Monument Creeks will pass at least the 1-percent-annual-chance flood, with the most constrictive bridges and culverts being on the smaller streams. Other obstructions to flood flows include landfills and isolated levees that have been constructed to protect

commercial and residential properties from flooding. Large floods are relatively unaffected by these levees. The greatest obstruction is that of houses adjacent to the banks of streams. This usually occurs in the mountainous and hilly basins such as Upper Fountain Creek.

Man-made and natural obstructions in the floodplains impede the flow of water, creating a backwater effect and increasing flood heights. These obstructions in Manitou Springs take the form of trees, brush, and numerous footbridges and planked crossings throughout the study area. This material is carried downstream to create dams at bridges and in areas where the channels are restricted by building foundations and other forms of encroachment.

Severe flooding has occurred several times in Manitou Springs. In July 1882, a cloudburst in the city caused flooding on Fountain Creek, Williams Canyon, and Ruxton Creek. A wall of water came down Williams Canyon and flooded Fountain Creek and the lower part of Ruxton Creek. Most houses in the area sustained some damage and one person was killed in Williams Canyon. Hailstones were found to be 11 inches in circumference.

In May 1894, a rainstorm of several days' duration caused flooding in the area; however, flood heights were not as high as they could have been, had much of the precipitation not fallen as snow. Fountain Creek, Ruxton Creek, and Williams Canyon all flooded. Canon Avenue was described as a mountain torrent with hundreds of tons of rock washing down.

A cloudburst over Williams and Waldo Canyons in May 1947, caused flooding on Williams Canyon and Fountain Creek. Many small bridges were washed out, and the debris created dams that eventually broke and caused further damage.

A correlation between the elevations of previous floods and the elevations of possible future floods as presented in the study for Manitou Springs is difficult to determine because of changes in the streams channels as a result of high flows and subsequent development. At Fountain, Colorado, approximately 25 miles downstream from Manitou Springs, a 40-foot-long bridge spanning Fountain Creek was washed out in a flood in 1902 and was replaced by one 70 feet long. Succeeding floods have widened the channel even more, so that the bridge span now exceeds 200 feet. Due to the changing channel capacities, an estimate of the recurrence intervals of past floods would not be valid.

Severe flooding in the Town of Palmer Lake occurs during the summer months as a result of convective-type cloudburst storms. Snowmelt flooding is minor compared to rainfall-produced floods. Steep slopes and soils with low permeability cause rapid storm runoff with minimal warning time for evacuation of the floodplain. The only documented flood damage occurred during the June 17, 1965, cloudburst-produced flood. Shallow depth flooding

occurs in Butler Canyon due to overland flow on an alluvial fan.

2.4 Flood Protection Measures

Two significant water-regulating facilities in the area are Kettle Creek Diversion Dam and Big Johnson Reservoir. The latter is also called Fountain Valley Reservoir Dam No. 2 and is located east of the Security-Widefield community. Big Johnson Reservoir is privately owned by the Fountain Mutual Irrigation Company for the primary purpose of irrigation. The drainage area is approximately 3.1 square miles and the maximum storage is 7,000 acre-feet. The dam was modeled as having no effect on the 1-percent and 0.2-percent-annual-chance water-surface elevations.

Kettle Creek Diversion Dam, owned by the U.S. Air Force, is located on U.S. Air Force Academy grounds. The earthen dam was constructed for flood control and the reservoir receives water from a drainage area of 16.3 square miles and has a maximum storage of 2,900 acre-feet. The dam was designed to detain flows associated with the Standard Project Flood (SPF) for the Kettle Creek basin and limit the discharge to approximately the 10-percent-annual-chance recurrence interval.

The Peterson Field Drainage is controlled by stream-water detention ponds sited at the Peterson Airfield. These ponds substantially reduce the peak flows from the upper 3.5 square miles of drainageway.

The Templeton Gap Floodway consists of a 10,590-foot-long trapezoidal channel extending from Templeton Gap in a southwesterly direction to Mile 5 on Monument Creek. The floodway has a capacity of approximately 12,000 cfs with no freeboard on the levee along the south side of the channel. The earthen levee, which extends for approximately 1.8 miles, was constructed by the U.S Army Corps of Engineers in 1949 to protect the central portion of Colorado Springs from frequent flooding on the Templeton Gap Wash, which flowed to the southwest through the City towards Fountain Creek.

There are several small earthen dams, stock ponds, canals, and diversion ditches in the study area, but they have no regulatory significance. Generally, the structures divert low flows for irrigation and have little or no effect on major flows.

Portions of several streams in the Colorado Springs area have been channelized in concrete drainageways with sufficient capacity to contain 1-percent-annual-chance peak discharges. Streams where this has occurred are Bear Creek, Camp Creek, Douglas Creek (North and South), Sand Creek, Spring Creek, Peterson Field Drainage, Rockrimmon Basin, and South Shooks Run, Templeton Gap Lower Tributary, and portions of Dry Creek. Streams affecting the county where this has occurred are Sand Creek, Spring Creek,

Peterson Field Drainage, and portions of Dry Creek.

The middle and upper portions of Cottonwood Creek in Colorado Springs have undergone channel improvements consisting of channel widening, riprap channel banks, and levee systems.

The National Oceanic and Atmospheric Administration (NOAA), in cooperation with communities within El Paso County, has established a Flash Flood Warning System consisting of observers and automatic alarm systems.

In the El Paso County Land Development Code, there is a zoning regulation (IV-Section 32, 1980) restricting the construction of structures in the delineated floodplains. The floodplain districts restrict land use to agriculture, grazing, recreation, and parking areas.

Beginning in late 1939, as an aftermath of the destructive May 1935 flood, the City of Colorado Springs sponsored flood-control work that eventually provided 2.6 miles of continuous improved channel on Monument Creek and guide levees at the Templeton Gap outlet. The improved channel's original design capacity of 50,000 cfs has been reduced because of changes in the stream's regimen.

Local interests have constructed a 0.5-mile-long concrete retaining wall to stabilize the Fountain Creek south bank as it extends upstream from the Nevada Avenue Bridge. Downstream from this bridge, several small levees provide minimal protection to privately owned properties.

The city has purchased the land along Monument Creek to prevent development and has established the Monument Valley Park. Located between Filmore Street and Colorado Avenue, the park occupies a considerable portion of the floodplain in this area.

A portion of Monument Creek south of Woodmen Road has been channelized. This improvement has considerably reduced the extent of the 1-percent-annual-chance flooding in this area.

The flood-carrying capacity of the streams in the City of Manitou Springs has been increased through channelization in many areas. For this to be an effective flood protection measure, the entire stream length in flood prone areas must be channelized to the extent necessary to carry low-frequency flows. Because this is not the case in Manitou Springs, the channelization that exists is not sufficient to protect the city from floods of the selected recurrence intervals in all areas.

Manitou Springs has enacted ordinances that are directed at the reduction of flood hazard. These ordinances specify that drainage be designed to reduce

exposure to flood hazard and not to subject other property to flood hazard, and that new construction be reasonably safe from flooding. The city also requires that new and replacement water-supply and sanitary sewage systems be designed to minimize or eliminate infiltration of floodwaters. There are no structural means of flood protection, such as dams or levees, in the city.

3.0 ENGINEERING METHODS

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

3.1 Hydrologic Analyses

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

Four sources of information were used to estimate peak discharge-frequency relationships for the streams studied in detail: (1) hydrology studies designated by the State of Colorado for local use in floodplain regulation; (2) material adopted from a 1976 USACE hydrologic report for El Paso County; (3) new material generated from other existing information and reports; and (4) new hydrologic data developed by Camp Dresser and McKee, Inc.

The hydrologic analyses used for Sand Creek and Sand Creek's tributaries, as well as Jimmy Camp Creek and associated tributaries upstream of Peaceful Valley Road, were obtained from U.S. Department of Agriculture, Soil Conservation Service (SCS), and Flood Hazard Analysis reports. The SCS report used SCS hydrologic methods to develop peak discharges for the 10-percent, 2-percent, and 1-percent-annual-chance recurrence intervals. The 0.2-percent-annual-chance peak discharge was obtained by extrapolating the 10-

percent, 2-percent, and 1-percent-annual-chance peak discharges on log-probability paper. Because of inadequate streamflow data on these streams, a synthetic rainfall-runoff evaluation procedure was used to verify these studies. The SCS studies have been designated by the CWCB as complying with state statutory requirements.

For Jimmy Camp Creek below Peaceful Valley Road, the peak flow rates were developed by the USACE and obtained from the December 1976 Report on Hydrologic Investigations. Synthetic unit hydrographs and rainfall data from the NOAA report, Precipitation-Frequency Atlas of the Western United States, were used to develop the peak discharges.

Flow rates for portions of Fountain Creek, Upper Fountain Creek, and Monument Creek downstream of the U.S. Air Force Academy were adopted from a USACE 1976 hydrology report and USACE Flood Plain Information (FPI) reports. This hydrologic method consists of gage station analysis, whereby stream gaging data have been analyzed to estimate peak flows for the various recurrence intervals. Flow rates for the re-study of Fountain Creek in 2009 were obtained from the 2006 USACE Fountain Creek Watershed Study.

Peak discharges for Bear Creek, Camp Creek, Cheyenne Creek, South Shooks Run, Cottonwood Creek, Security Creek, Widefield Creek, and Windmill Gulch were also obtained from hydrologic information compiled in the 1976 USACE report. In the urban basins and subbasins, synthetic unit hydrographs were used to develop the peak flow rates for the 10-percent, 2-percent, and 1-percent-annual-chance recurrence intervals. Rainfall patterns and amounts were obtained for the basins using the NOAA data. The 0.2-percent-annual-chance peak discharge was obtained through extrapolation of the. 10-percent, 2-percent, and 1-percent-annual-chance flood results on log-probability paper. In the rural areas with natural-flow streams, the peak flow rates were obtained using hydrologic methods outlined in the Manual for Estimating Flood Characteristics of Natural-Flow Streams prepared jointly by the CWCB and the USGS.

Pine Creek, Pine Creek tributaries, Kettle Creek, North Monument Creek, Carpenter Creek, Butler Creek, and Monument Creek upstream of the U.S. Air Force Academy peak discharges were also determined using the CWCB and USGS hydrologic report. The "S" curves used in the synthetic unit hydrograph analysis were obtained using rainfall data from an SCS flood hazard analysis report for El Paso County, with soil survey information being obtained from another SCS report for El Paso County.

The hydrologic results for Douglas Creek (North and South), Mesa Basin, Rockrimmon Basin drainages, Spring Creek, and Templeton Gap Floodway were developed using an SCS report entitled Procedures for Determining Peak

Floods in Colorado. This methodology is consistent with those outlined in the City of Colorado Springs storm runoff criteria manual, and has been used widely to determine design capacities for flood-control projects throughout the city. For these basins, future development conditions were assumed to obtain the 1-percent-annual-chance frequency flow rate. Field checks were carried out to check changes in land use since completion of drainage studies, to verify channel alignments, and to check major hydraulic structures which could affect basin hydrology. The assumption of fully developed conditions in the basins was acceptable for use in the study. Since the drainage reports contained only 1-percent-annual-chance peak discharges, flow rates for the 10-percent, 2-percent, and 0.2-percent-annual-chance recurrence intervals were estimated in accordance with the procedures outlined in the Colorado Springs storm runoff criteria manual and the SCS Procedures for Determining Peak Flows in Colorado. The discharge-frequency relationship for Spring Creek was prepared using the SCS methods in conjunction with the Colorado Springs storm runoff criteria manual. Soil information was obtained from an SCS survey of El Paso County.

Peak flow rates were developed for the Peterson Field Drainage using the Peterson Field Master Drainage Report, and the Colorado Springs Municipal Airport, Runway 17L-35R, Grading and Drainage Plan. Peak flows from the master drainage report were reevaluated by routing flows through the detention basins recommended in the Colorado Springs storm runoff criteria manual.

Peak discharges for Dry Creek and its tributaries were obtained from the Dry Creek Master Drainage Study. Analyses of the peak flow rates for the 10-percent and 2-percent-annual-chance recurrence intervals were not available.

A regional relationship between basin characteristics and stream flow characteristics, as developed by the USGS, was used to define the discharge-frequency data for Monument Creek Tributary. The peak discharges for Monument Creek Tributary were reduced to account for temporary storage upstream from small culverts situated under two railroad embankments. Peak discharges downstream from the railroad embankments were computed by combining the reduced peak discharges through the culverts and the peak discharges from the intervening drainage area. The 0.2-percent-annual-chance peak discharge on Monument Creek Tributary near the mouth also includes the 2,410 cfs that spills out of Monument Creek and flows around the north side of the island near the confluence of the two streams. Based on hydraulic analysis, this overflow channel, called Monument Creek Bypass, would convey floodwater only during the 0.2-percent-annual-chance flood. For the 0.2-percent-annual-chance flood, the water-surface elevation would be high enough on Monument Creek to produce a peak discharge of 2,410 cfs in Monument Creek Bypass. This overflow enters Monument Creek Tributary at Cross Section B and then flows back into Monument Creek approximately 1,100 feet downstream of Cross Section A.

For Fountain Creek, through the City of Manitou Springs, flood discharges were computed by the USACE in the 1974 FPI report. A log-Pearson Type III analysis of streamflow records at the Pueblo gage from 1935, and 1941 to 1965, was used to determine flood frequency. Other gages on Fountain Creek were not used due to short length of record (Colorado Springs and Security) and inaccurate representation of the flood potential of the stream (Fountain).

The SPFs for Fountain Creek at Manitou Springs, Colorado Springs, the El Paso-Pueblo County boundary, and Pueblo were developed by the USACE using the June 1921 storm. The SPF is defined as the flood that may be expected from the most severe combination of meteorological and hydrological conditions that is considered reasonably characteristic of the geographical area in which the drainage basin is located, excluding extremely rare combinations. Drainage areas above an elevation of 9,000 feet were not included in the SPF computations for Fountain Creek because they do not make a significant contribution to storms of the SPF magnitude. A discharge-drainage area curve was developed and used to compute SPF discharges for Fountain Creek at locations in Manitou Springs.

The SPF discharge of 219,000 cfs at the Pueblo gage is approximately equivalent to the magnitude of the 350-year (approximately 0.29-percent-annual-chance) flood. Based on this, frequency curves for other locations were developed by assigning a recurrence interval of 350 years to each SPF and constructing curves parallel to the frequency curve at the Pueblo gage. These curves were extended to obtain the 0.2-percent-annual-chance discharges for Fountain Creek. From these frequency curves, the 10-percent, 2-percent, 1-percent, and 0.2-percent-annual-chance flood discharges were determined for use in this study.

A frequency analysis of the Pueblo gage based on a log-Pearson Type III distribution was made for this study using flow records of 1935, 1941 to 1965, and 1971 to 1977. In lieu of the computed skew, a regional skew of 0.4 was used in computations of peak discharges and confidence limits. The USACE frequency curve falls within the 50-percent confidence interval of this more recent study for recurrence intervals of greater than 30 years, while the 10-percent-annual-chance flood is only slightly larger than the 0.25 limit. It was concluded that the USACE discharge for Fountain Creek at Manitou Springs would be adopted for this study.

For Sutherland Creek, Williams Canyon, and Ruxton Creek, discharges were determined using the regression equations described in Manual For Estimating Flood Characteristics of Natural-Flow Streams in Colorado. The equations for the Plains Region were applied to the portion of each drainage area below an elevation of 9,000 feet. Above an elevation of 9,000 feet, the equations for the Mountain Region were applied. It was found that the Plains Region portion of each drainage yields much higher discharges than the

Mountain Region portion. Consequently, the 10-percent, 2-percent, 1-percent, and 0.2-percent-annual-chance flood discharges from the respective Plains Region equations were used.

For Beckers Lane Tributary, discharges were determined using the methodology outlined in the Drainage Criteria Manual for Colorado Springs and El Paso County. This manual requires the determination of 2- and 24-hour storms using the SCS method. The storm producing the most severe event for a given recurrence interval was selected. Final calculations were carried out using the USACE HEC-1 hydrologic computer program.

The flood discharges for the upper portions of Beckers Lane Tributary and Williams Canyon were interpolated from a drainage area-discharge curve developed from computed discharges for Williams Canyon and Sutherland Creek.

The hydrologic analysis used for Crystal Creek and Dirty Woman Creek in the Town of Monument was obtained through the Colorado Urban Hydrograph Procedure, developed by the Urban Drainage and Flood Control District. This method is specified for ungaged drainage areas greater than 160 acres in the (preliminary) Storm Drainage Criteria Manual for the Town of Monument. Significant parameters used in the hydrologic calculations are rainfall values for the 10-percent, 2-percent, and 1-percent-annual-chance, 1-hour rainfalls, the SCS soil type, and the percent impervious area. The 0.2-percent-annual-chance peak flow for each basin was derived by an extrapolation of a plotting of the 10-percent, 2-percent, and 1-percent-annual-chance peak flows for each creek on log probability paper. Hydrology for Crystal Creek was consistent with a hydrologic analysis of the 1-percent-annual-chance peak flow performed by Tri-Consultants for Casey's subdivision located along Crystal Creek between Interstate Highway 25 and Beacon Light Road. Tri-Consultants used the SCS method to determine the 1-percent-annual-chance peak flow.

The hydrologic analyses for Beaver Creek, North Beaver Creek, and Piñon Lake Tributary were completed by Kiowa Engineering Corporation in 2004. Final calculations were carried out using the USACE HEC-1 hydrologic computer program.

The hydrologic analyses for Black Squirrel Creek – Haegler Basin – Sage Creek were completed by Kiowa Engineering Corporation in 2005. Final calculations were carried out using the USACE HEC-1 hydrologic computer program.

The hydrologic analyses for Black Squirrel Creek – Upstream of U.S. Highway 24, East Tributary to Black Squirrel Crek, West Tributary to Black Squirrel Creek, and South Tributary to Black Squirrel Creek were completed by URS in 2007.

The 1-percent annual-chance flood was determined for Catamount Creek by using the methodology outlined in Guidelines for Determining 100-Year Flood Flows for Approximate Floodplains in Colorado. The analysis was completed by the Pikes Peak Regional Building Department in Colorado Springs for the Town of Green Mountain Falls in 2004.

The hydrologic analyses for Fairfax Creek were completed by JR Engineering in 2004.

The hydrologic analyses for Jackson Creek and Teachout Creek were completed by Ayres Associates in 2004.

The hydrologic analyses for North Pine Creek were completed by JR Engineering in 2000.

The hydrologic analyses for the Tributary to Sand Creek East Fork (Reach No. 6) were completed by Drexel, Barrell & Co. in 2004.

The hydrologic analyses for the Unnamed Tributary to Black Squirrel Creek were completed by URS in 2002.

The hydrologic analyses for the upper portion of the Unnamed Tributary to Black Squirrel Creek No. 2 (above Woodmen Road) were completed by Kiowa Engineering in 2003. The hydrologic analyses for the lower portion of the Unnamed Tributary to Black Squirrel Creek No. 2 (at U.S. Highway 24) were completed by Springs Engineering in 2008.

The hydrologic analyses for the Upper East Tributary to Chico Creek were completed by Terra Nova Engineering, Inc. in 2004. Final calculations were carried out using the USACE HEC-HMS hydrologic computer program.

The hydrologic analyses for West Fork Squirrel Creek – Solberg Ranch – West Unnamed Tributary were completed by Kiowa Engineering in 2005.

Peak discharges for the re-study of the lower portion of the Templeton Gap Floodway were obtained from a hydrologic analysis of the Templeton Gap Basin, which was completed by the City of Colorado Springs in 2008.

Peak discharges for the re-study of Black Squirrel Creek and tributaries were obtained from a hydrologic analysis of the Black Squirrel Creek Basin, completed by the U.S. Army Corps of Engineers – Albuquerque District in 2010.

Peak discharge-drainage area relationships for streams studied by detailed methods are shown in Table 4.

Table 4. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
Bear Creek					
At confluence with Fountain Creek	10.70	1,140	2,940	4,140	8,200
Beaver Creek					
At Confluence With Monument Creek	26.8	--[1]	--[1]	6,992	--[1]
At Inlet to Bristlecone Lake	22.0	--[1]	--[1]	8,624	--[1]
Beckers Lane Tributary					
At confluence with Fountain Creek	0.85	312	657	784	1,152
Big Valley					
Above confluence with Dry Creek	0.29	--[1]	--[1]	529	687
Black Forest Creek					
At Interstate 25	1.97	--[1]	--[1]	2,090	--[1]
Approximately 4,050 feet downstream of the confluence with Baptist Road Tributary	1.46	--[1]	--[1]	1,520	--[1]
At Gleneagle Drive	0.57	--[1]	--[1]	630	--[1]
Black Forest Creek-Baptist Road Tributary					
At confluence with Black Forest Creek	1.14	--[1]	--[1]	1,230	--[1]
Black Forest Creek-Middle Tributary					
At confluence with Black Forest Creek	0.48	--[1]	--[1]	315	--[1]
At Interstate 25	0.17	--[1]	--[1]	138	--[1]
Approximately 570 feet Upstream of Interstate 25	0.16	--[1]	--[1]	123	--[1]
Approximately 1,280 feet Upstream of Interstate 25	0.16	--[1]	--[1]	313	--[1]
Approximately 2,700 feet Upstream of Interstate 25	0.12	--[1]	--[1]	130	--[1]

[1]Data not available

Table 4. Summary of Discharges (cont.)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
Black Squirrel Creek					
At confluence with Book Ranch Creek	--[1]	--[1]	--[1]	46,640	--[1]
At confluence with Telephone Exchange	--[1]	--[1]	--[1]	40,000	--[1]
Downstream of confluence with Ellicott Consolidated	--[1]	--[1]	--[1]	37,400	--[1]
Upstream of confluence with Ellicott Consolidated	--[1]	--[1]	--[1]	29,850	--[1]
Downstream of confluence with Lower Big Springs	--[1]	--[1]	--[1]	29,100	--[1]
Upstream of confluence with Lower Big Springs	--[1]	--[1]	--[1]	25,150	--[1]
Black Squirrel Creek – Haegler Basin – Sage Creek					
Upstream of confluence with Black Squirrel Creek – Haegler Basin – Main Tributary	1.99	--[1]	--[1]	566	--[1]
At Falcon Highway	1.01	--[1]	--[1]	450	--[1]
Black Squirrel Creek – Upstream of US Highway 24					
At Eastonville Road	11.52	--[1]	--[1]	4,778	--[1]
Approximately 2,350 feet Upstream of Latigo Boulevard	9.00	--[1]	--[1]	4,236	--[1]
Black Squirrel Creek – West Fork Bennett Ranch Basin					
Approximately 6,970 feet upstream of Falcon Drive	5.18	--[1]	--[1]	1,073	--[1]
Book Ranch Creek					
At confluence with Black Squirrel Creek	--[1]	--[1]	--[1]	12,000	--[1]
Butler Canyon[2]	0.5	880	1,740	2,260	4,270
Calhan East Tributary	0.28	71	151	186	297
Calhan Fairground Tributary	0.08	20	44	55	88
Calhan Main Channel					
At McIasky Road	3.04	706	1,508	1,862	2,980
At Highway 24	2.55	587	1,255	1,556	2,506
At confluence with Calhan East Tributary	2.15	491	1,052	1,305	2,105

[1]Data not available

[2]Location description not available

Table 4. Summary of Discharges (cont.)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
Camp Creek					
At confluence with Fountain Creek	10.26	30[1]	1,800[1]	2,680[1]	5,810[1]
At Bijou Street	10.26	1,790	3,800	4,700	7,900
Upstream of north end of 31st Street	9.41	1,750	3,700	4,600	7,600
Carpenter Creek[2]	1.30	1,390	2,670	3,460	6,460
Catamount Creek					
At confluence with Upper Fountain Creek	19.70	--[3]	--[3]	9,887	--[3]
Cheyenne Creek					
At confluence with Fountain Creek	22.80	5,600	10,600	13,300	21,500
Cheyenne Run					
At confluence Cheyenne Creek	1.54	670	1,200	1,520	2,400
Corral Tributary					
At confluence with Jimmy Camp Creek	15.90	3,800	6,000	7,300	9,300
Cottonwood Creek					
At confluence with Monument Creek	18.10	3,100	7,300	10,000	20,200
Crystal Creek					
At Monument Lake	1.43	--[3]	--[3]	1,290	--[3]
Just upstream of Interstate 25	0.58	--[3]	--[3]	530	--[3]
Crystal Creek – Split Flow Channel					
At Dirty Woman Creek	0.58	--[3]	--[3]	250	--[3]

[1]Reduction in flow rate due to partial conveyance in storm drain
[2]Location description not available
[3]Data not available

Table 4. Summary of Discharges (cont.)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
Dirty Woman Creek					
At confluence with Monument Creek	4.93	--[1]	--[1]	3,260	--[1]
At Santa Fe Trail	4.49	--[1]	--[1]	2,940	--[1]
At Interstate 25	4.17	920	2,060	2,540	4,500
At State Highway 105	3.96	--[1]	--[1]	2,520	--[1]
At Knollwood Drive	2.57	--[1]	--[1]	2,340	--[1]
At Furrow Road	0.58	--[1]	--[1]	510	--[1]
Dirty Woman Creek – Lake Fork					
At confluence with Dirty Woman Creek	1.19	--[1]	--[1]	480	--[1]
Above Lake Woodmoor	1.19	--[1]	--[1]	1,240	--[1]
Dirty Woman Creek – Middle Fork					
At confluence with Dirty Woman Creek	0.35	--[1]	--[1]	350	--[1]
Dirty Woman Creek – North Fork					
At confluence with Dirty Woman Creek-Middle Fork	0.61	--[1]	--[1]	630	--[1]
Dirty Woman Creek – South Fork					
At confluence with Dirty Woman Creek	0.34	--[1]	--[1]	320	--[1]
Douglas Creek North					
At confluence with Monument Creek	6.20	2,040	3,580	4,560	8,040
Douglas Creek South					
At confluence with Monument Creek	3.50	1,690	1,910	3,680	6,420
Downstream of Holland Park Boulevard	2.93	1,400	2,200	2,700	3,800
Upstream of Holland Park Boulevard	2.30	940	1,540	1,960	2,800
Above Arrowswest Complex	1.83	710	1,170	1,490	2,100
Dry Creek					
Downstream of Orchard Valley Road	2.18	--[1]	--[1]	798	--[1]
At Cascade Avenue	3.48	--[1]	--[1]	1,956	2,938

[1]Data not available

Table 4. Summary of Discharges (cont.)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
East Cherry Creek					
At Walker Road	10.30	--[1]	--[1]	2,000	--[1]
East Tributary to Black Squirrel Creek					
At confluence with Black Squirrel Creek	0.97	--[1]	--[1]	569	--[1]
East Tributary to Black Squirrel Creek – West Fork Bennett Ranch Basin					
At Black Squirrel Creek – West Fork Bennett Ranch Basin	0.40	--[1]	--[1]	230	--[1]
Ellicott Consolidated					
At confluence with Black Squirrel Creek	--[1]	--[1]	--[1]	8,000	--[1]
At confluence with East Tributary	--[1]	--[1]	--[1]	7,019	--[1]
Ellicott Consolidated – East Tributary					
At confluence with Ellicott Consolidated	--[1]	--[1]	--[1]	183	--[1]
Fairfax Creek					
At Research Parkway	0.70	--[1]	--[1]	1,000	--[1]
Fisher's Canyon					
At confluence with Fountain Creek	5.30	1,420	2,590	3,090	4,800
Fisher's Canyon-Above Loomis Avenue					
At West Meadows Drive	3.59	--[1]	--[1]	1,640	--[1]
Upstream of Fisher's Canyon-South Branch	2.36	--[1]	--[1]	440	--[1]
Fisher's Canyon-South Branch					
At confluence with Fisher's Canyon	1.23	--[1]	--[1]	1,290	--[1]

[1]Data not available

Table 4. Summary of Discharges (cont.)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
Fountain Creek					
At El Paso-Pueblo County Line	772.0	21,300	64,000	93,000	215,000
Downstream of confluence with Sand Creek	456.0	12,700	38,000	57,000	132,000
Downstream of confluence with Monument Creek	358.0	9,200	28,500	42,200	98,000
Upstream of confluence with Monument Creek	120.0	4,400	14,000	20,500	47,000
Upstream of City of Colorado Springs corporate limits	71.0	1,300	2,800	3,700	6,510
At El Paso-Teller County Line	7.8	2,200	5,800	7,500	14,000
Franceville Tributary to Jimmy Camp Creek					
At confluence with Jimmy Camp Creek	4.1	1,700	2,800	3,500	4,300
Haegler Ranch Tributary 2					
At confluence with Geick Ranch West Tributary	1.47	--[1]	--[1]	592	--[1]
Haegler Ranch Tributary 3					
At approximately 2,300 feet upstream of the confluence with Haegler Ranch Tributary 4	1.09	--[1]	--[1]	505	--[1]
Haegler Ranch Tributary 4					
At approximately 3,700 feet upstream of the confluence with Haegler Ranch Tributary 3	0.60	--[1]	--[1]	130	--[1]
Jackson Creek					
At Assembly Road	2.44	--[1]	--[1]	1,313	--[1]
Jimmy Camp Creek					
At confluence with Fountain Creek	66.4	8,500	12,400	16,000	20,500
Jimmy Camp Creek – East Tributary					
At confluence with Jimmy Camp Creek	9.2	2,800	4,600	5,500	6,900
Jimmy Camp Creek – West Tributary					
At confluence with Jimmy Camp Creek	3.93	1,160	2,280	2,780	4,500

[1]Data not available

Table 4. Summary of Discharges (cont.)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
Kettle Creek					
At State Highway 83	16.3	2,600	6,600	9,300	19,300
Lower Big Springs					
At confluence with Black Squirrel Creek	--[1]	--[1]	--[1]	4,820	--[1]
Mesa Basin					
At confluence with Monument Creek	2.2	1,260	1,880	2,250	3,470
Mines Subtributary to Corral Tributary					
At confluence with Corral Tributary	9.4	2,200	2,500	4,300	5,400
Monument Creek					
At confluence with Fountain Creek	238.0	11,500	23,500	32,000	57,000
Upstream of City of Colorado Springs corporate limits	196.5	10,200	20,700	27,200	49,000
At northern boundary of U.S. Air Force Academy	74.7	7,400	15,300	19,900	37,200
Monument Creek Tributary					
At Cross Section C	1.4	890	1,620	1,880	2,880
190 feet downstream of Cross Section A	1.4	890	1,620	1,880	5,020[2]
North Beaver Creek					
At Confluence with Beaver Creek	3.5	--[1]	--[1]	1,932	--[1]
North Channel Dry Creek					
Above confluence with Dry Creek	0.27	--[1]	--[1]	140	225
North Monument Creek	16.1	3,360	6,690	8,670	16,200
North Pine Creek					
Approximately 1,800 Feet Upstream of Outfall of Storm Drain System	0.83	190	450	630	1,290

[1]Data not available

[2]Includes Monument Creek Bypass, only 500-year flood

Table 4. Summary of Discharges (cont.)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
Peterson Field Drainage					
At confluence with Sand Creek	8.27	900	2,050	3,590	6,100
Pine Creek					
At confluence with Monument Creek	9.99	840	1,530	2,060	3,300
Upstream of confluence with Pine Creek Tributary	N/A	440	910	1,280	2,160
At Academy Boulevard	5.00	440	910	1,280	2,160
Pine Creek Tributary					
Upstream of Academy Boulevard	2.39	280	430	540	730
Approximately 950 Feet Upstream of Briargate Parkway	1.40	210	480	610	2,690
Approximately 6,150 Feet Upstream of Briargate Parkway	1.25	170	390	490	2,690
Piñon Lake Tributary					
At Confluence With Beaver Creek	0.41	--[1]	--[1]	140	--[1]
Rockrimmon Basin					
At confluence with Monument Creek	1.9	1,510	2,030	2,480	3,640
Ruxton Creek					
At confluence with Fountain Creek	17.6	2,540	4,350	5,330	9,350
Sand Creek					
At confluence with Fountain Creek	53.0	3,520	7,860	10,160	15,790
Upstream of confluence with East Fork Sand Creek	23.2	1,890	4,230	5,660	9,080
Upstream of City of Colorado Springs corporate limits	16.3	1,640	3,470	4,450	6,870
Sand Creek Center Tributary					
At confluence with East Fork Sand Creek	1.82	800	1,300	1,610	2,300
Sand Creek East Fork					
At confluence with Sand Creek	26.3	1,980	4,250	5,420	8,240

[1]Data not available

Table 4. Summary of Discharges (cont.)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
Sand Creek East Fork Subtributary					
At confluence with Sand Creek East Fork	5.92	610	1,480	1,970	3,800
Sand Creek South					
At Boca Raton Heights Road	14.34	--[1]	--[1]	1,786	--[1]
Sand Creek West Fork					
At confluence with Sand Creek[2]	5.17	3,459	4,727	5,162	5,542
Above Platte Avenue	--[1]	3,510	5,490	6,810	9,600
Security Creek					
Upstream of confluence with Windmill Gulch	3.7	2,700	4,300	5,400	10,100
South Shooks Run					
At confluence with Fountain Creek	7.82	2,640	4,230	5,570	8,000
South Tributary to Black Squirrel Creek					
At confluence with Black Squirrel Creek	0.12	--[1]	--[1]	107	--[1]
South Valley Dry Creek					
Above confluence with Dry Creek	0.15	--[1]	--[1]	191	--[1]
Spring Creek					
At confluence with Fountain Creek	6.7	960	1,790	2,340	4,340
Spring Run					
At Interstate 25	3.63	890	1,350	1,660	2,340
Sutherland Creek					
At confluence with Fountain Creek	5.09	1,810	3,400	4,700	7,500
Teachout Creek					
At Santa Fe Trail Railroad	1.72	--[1]	--[1]	794	--[1]

[1]Data not available

[2]Discharges are reduced because of losses at Platte Avenue

Table 4. Summary of Discharges (cont.)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
Telephone Exchange					
At confluence with Black Squirrel Creek	--[1]	--[1]	--[1]	3,230	--[1]
At River Station 4,447	--[1]	--[1]	--[1]	3,100	--[1]
At River Station 8,068	--[1]	--[1]	--[1]	2,570	--[1]
At River Station 19,971	--[1]	--[1]	--[1]	1,800	--[1]
At River Station 29,131	--[1]	--[1]	--[1]	1,030	--[1]
Templeton Gay Floodway					
At Academy Boulevard	2.49	2,820	4,180	5,040	6,800
Approximately 2,300 feet above Academy Boulevard	2.14	2,440	3,610	4,340	5,850
Tributary to East Cherry Creek #1					
At Confluence with East Cherry Creek	0.15	--[1]	--[1]	289	--[1]
Tributary to Sand Creek East Fork (Reach No. 6)					
At confluence with East Fork of Sand Creek	1.13	--[1]	--[1]	551	--[1]
Unnamed Tributary to Black Squirrel Creek					
At mouth	1.62	--[1]	--[1]	675	--[1]
Unnamed Tributary to Black Squirrel Creek No. 2					
At US Highway 24	3.66	--[1]	--[1]	1,225	--[1]
At Rolling Thunder Way	3.60	--[1]	--[1]	1,717	--[1]
At Woodmen Road	3.23	--[1]	--[1]	1,482	--[1]
Upper East Tributary to Chico Creek					
At Barbwire Road	4.6	--[1]	--[1]	705	--[1]
Upper Fountain Creek (see Fountain Creek)					
West Fork Black Squirrel Creek – Solberg Ranch East Tributary					
At confluence with West Fork Black Squirrel Creek – Solberg Ranch Tributary	1.63	--[1]	--[1]	784	--[1]

[1]Data not available

Table 4. Summary of Discharges (cont.)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
West Fork Black Squirrel Creek – Solberg Ranch Tributary					
Above Slocum Road					
At confluence with West Fork Black Squirrel Creek – Solberg Ranch	7.22	--[1]	--[1]	2,184	--[1]
East Tributary	5.59	--[1]	--[1]	1,847	--[1]
West Fork Squirrel Creek – Solberg Ranch – West Unnamed Tributary	1.5	--[1]	--[1]	1,935	--[1]
West Tributary to Black Squirrel Creek					
At confluence with Black Squirrel Creek	0.59	--[1]	--[1]	55	--[1]
Widefield Creek					
At confluence with Fountain Creek	15.1	4,600	7,700	10,000	24,000
Williams Canyon					
At confluence with Fountain Creek	2.68	1,930	3,640	4,710	8,940

[1]Data not available

A LOMR was issued on May 18, 2005, for the unincorporated areas of El Paso County, for a reach of Black Forest Creek – Middle Tributary from Interstate 25 upstream approximately 2,960 feet. The LOMR reflects the effects of installation of underground pipe culverts and a detention pond. The on-line detention pond is the Falconview Subdivision Detention Basin and was analyzed for the 1-percent-annual-chance flood event. Table 5 lists the 1-percent-annual-chance flood elevation for the Falconview Subdivision Detention Pond.

Table 5. Summary of Stillwater Elevations

	Elevations (NAVD)			
Location	10-Year	50-Year	100-Year	500-Year
Falconview Subdivision Detention Basin	--[1]	--[1]	6762.0	--[1]

[1]Data not available

3.2 Hydraulic Analyses

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

Water-surface elevations were developed with the USACE HEC-2 and HEC-RAS water-surface profile computer programs. Flood profiles were drawn showing computed water-surface elevations for the 10-percent, 2-percent, 1-percent, and 0.2-percent-annual-chance recurrence intervals.

Hydraulic analyses were not carried out to provide water-surface elevations for the 10-percent and 2-percent-annual-chance recurrence intervals for Dry Creek and its tributaries.

Cross sections for the backwater analyses of the streams studied in detail were obtained from aerial topographic mapping compiled between 1972 and 1983.

Hydraulic analyses were completed by URS in 2012 for the portion of Fountain Creek from the El Paso-Pueblo county boundary upstream 26.5 miles and the portion of Upper Fountain Creek from the El Paso-Teller county boundary downstream 13.5 miles. The analyses consisted of determining water surface elevations for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events and floodways for the detailed studies. The hydraulic methods used for this analysis include steady flow analysis using HEC-RAS version 4.0. Cross-sections were derived from two foot topography, obtained from Colorado Springs Utilities and field survey data were used to prepare the hydraulic analyses. The horizontal control datum for the study was North American Datum 1983 (NAD83) and the vertical control datum was National Geodetic Vertical Datum 1929 (NGVD29).

Hydraulic analyses were completed by WHPacific in 2013 for the portion of Fountain Creek from the upstream end of the URS study (southern city limit of Colorado Springs) upstream 4.6 miles to the confluences with Monument Creek and Upper Fountain Creek. The analyses consisted of determining water surface elevations for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events and floodway for the detailed study. The hydraulic methods used for this analysis include steady flow analysis using HEC-RAS version 4.1. Cross-sections were derived from topography obtained from Colorado Springs Utilities, Moser & Associates, and field survey data were used to prepare the hydraulic analyses. The vertical control datum was in either the National Geodetic Vertical Datum of 1929 (NGVD29) or the North American Vertical Datum of 1988 (NAVD88); however, all analyses were performed in NGVD29.

Hydraulic analyses were completed by Anderson Consulting Engineers, Inc. in 2013 for the portion of Upper Fountain Creek from the confluences with Monument Creek and Fountain Creek upstream 2.4 miles to the downstream end of the URS study. The analyses consisted of determining water surface elevations for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events and floodway for the detailed study. The hydraulic methods used for this analysis include steady flow analysis using HEC-RAS version 4.0. Cross-sections were derived from two foot topography, obtained from Colorado Springs Utilities and field survey data were used to prepare the hydraulic analyses. The horizontal control datum for the study was North American Datum 1983 (NAD83) and the vertical control datum was National Geodetic Vertical Datum 1929 (NGVD29).

Cross sections for Jimmy Camp Creek and its tributaries were compiled from aerial photographs taken by the SCS in 1973. Cross sections for Sand Creek were obtained from aerial topographic maps prepared by the SCS in 1972, with cross sections of Sand Creek East Fork, Sand Creek Center Tributary, Sand Creek East Fork Subtributary, and portions of Sand Creek being obtained from aerial topographic maps compiled by Landmark Mapping, Ltd.,

in 1981. Cross sections for Cottonwood Creek above Woodmen Road were obtained from topographic maps prepared by the USACE in 1975. Cross sections for Monument Creek below the U.S. Air Force Academy were obtained from topographic maps prepared by Hogan and Olhausen, Inc., in 1975. Cross sections for Camp Creek, Cheyenne Creek, Bear Creek, and South Shooks Run were compiled from aerial topographic photography. Cross sections for Security Creek, Widefield Creek, and Windmill Gulch were compiled from aerial topographic mapping prepared for the USACE by VTN, Inc., in 1976.

Cross sections for Mesa Basin, Douglas Creek South, Douglas Creek North, Rockrimmon Basin, Cottonwood Creek below Woodmen Road, Monument Creek above the U.S. Air Force Academy, Kettle Creek, Pine Creek, Peterson Field Drainage, Spring Creek, and Templeton Gap Floodway were obtained from aerial topographic mapping prepared by Landmark Mapping, Ltd., between 1981 and 1983.

Cross-section data for North Monument Creek, Carpenter Creek, Butler Creek, Monument Creek Bypass, Monument Creek Tributary, and the upper reaches of Monument Creek in the vicinity of Palmer Lake were obtained from aerial photographs compiled by Hogan and Olhausen, Inc., using photogrammetric techniques. All bridges and culverts were surveyed to obtain elevation data and structural geometry.

Cross sections for Templeton Gap Lower Tributary were obtained from "as constructed" channelization plans from the Colorado State Division of Highways. Cross sections used for the backwater analyses of Sutherland Creek, Williams Canyon, Ruxton Creek, and Beckers Lane Tributary were obtained from detailed field surveys of each stream reach. Cross sections used for the backwater analysis of Fountain Creek downstream of the Road to the Cave of the Winds through Manitou Springs were furnished by the USACE from the FPI report for the area published in 1974. For Sutherland Creek, supplemental cross sections were developed from topographic maps at a scale of 1:1,200, with contour intervals of 4 and 20 feet. All bridges, culverts, and other hydraulically significant structures were field checked to obtain elevation data and structural geometry.

For detailed flooding sources within Monument, bridge elevations and sizes of openings were surveyed and measured in the field on February 3 and 4, 1986. These data were combined with cross-section data taken from 5-foot contour mapping of the Town of Monument.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Roughness coefficients (Manning's "n") used in the hydraulic computations (shown in Table 6) were chosen by engineering judgment, based on both aerial photographs and field observation of the channels and floodplain areas.

Starting water-surface elevations were either based on coincident condition elevations, the slope-area method, or elevations of an adjacent study.

Generally, the distances on the flood profiles correspond to distances measured along the centerline of the designated watercourses. Along Williams Canyon, however, the low-flow is carried through a 1,100-foot concrete box culvert under Canon Avenue near to the confluence with Fountain Creek. In this area, the divergence of the low-flow drainage necessitated the use of distances measured along the centerline of the 1-percent-annual-chance flood path. On the maps, this flow line, used to establish profile distances, is delineated and labeled as the Profile Base Line.

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

Supercritical and critical flow conditions predominate in the Upper Monument Creek reach and the Monument Creek Tributary due to steep channels. Water-surface elevations at cross sections in these reaches are based on critical depth. Starting water-surface elevations are based on critical depth or the corresponding water-surface elevations at the confluence of two streams.

A split flow occurs on Pine Creek at the Colorado State Highway 83 crossing due to the limited capacity of the culvert. Because the roadway embankment is sufficiently high to divert flows above 1,200 cfs to the south, all recurrence intervals coincide with the 1-percent-annual-chance flood on the Pine Creek Overflow profile.

For Crystal Creek and Dirty Woman Creek, culvert capacities are sufficient to pass the 1-percent-annual-chance flow at all but two stream crossings. Both Beacon Light Road over Crystal Creek and the Denver Road over Dirty Woman Creek are inadequately sized. The backed-up water temporarily floods only unused barren land and the peak flows downstream from these roads are attenuated to a certain degree during high frequency flooding events (common flood events). Should the land upstream from either road be developed, the culvert size should be increased.

All elevations are referenced to the North American Vertical Datum of 1988 (NAVD). Elevation reference marks and the descriptions of the marks used in this study are shown on the maps.

Table 6. Summary of Manning's "n" Values

Stream Name	Manning's "n" Values Channel	Overbanks
Bear Creek	.013 - .080	.013 - .080
Beaver Creek	.013 - .080	.013 - .100
Beckers Lane Tributary	.020 - .035	.035 - .100
Big Valley	--[1]	--[1]
Black Forest Creek	.015 - .040	.060 - .100
Black Forest Creek – Baptist Road Tributary	.015 - .035	.040 - .060
Black Forest Creek – Middle Tributary	.040	.060
Black Squirrel Creek	.030	.030 - .040
Black Squirrel Creek – Haegler Basin – Sage Creek	.040	.040
Black Squirrel Creek – Right Split Flow Path	.030	.030 - .040
Black Squirrel Creek – Upstream of U.S. Highway 24	--[1]	--[1]
Black Squirrel Creek – West Fork Bennett Ranch Basin	--[1]	--[1]
Book Ranch Creek	.030 - .040	.030 - .040
Butler Canyon	.045 - .055	.060 - .070
Calhan East Tributary	--[1]	--[1]
Calhan Fairground Tributary	.050	.050
Calhan Main Channel	.045 - .055	.045 - .055
Camp Creek	.013 - .080	.013 - .080
Carpenter Creek	.032 - .035	.032 - .040
Catamount Creek	.035	.050
Cheyenne Creek	.013 - .080	.013 - .080
Cheyenne Run	.014 - .040	.016 – .100
Corral Tributary	.030 - .045	.060 - .070
Cottonwood Creek	.013 - .080	.013 - .080
Crystal Creek	.020 - .040	.025 - .045
Crystal Creek – Split Flow Channel	--[1]	--[1]
Dirty Woman Creek	.015 - .050	.025 - .050
Dirty Woman Creek – Lake Fork	.015 - .040	.020 - .045
Dirty Woman Creek – Middle Fork	.020 - .040	.020 - .040
Dirty Woman Creek – North Fork	.040	.035
Dirty Woman Creek – South Fork	.020 - .040	.020 - .040
Douglas Creek North	.013 - .080	.013 - .080
Douglas Creek South	.015 - .040	.035 - .070
Dry Creek	--[1]	--[1]
East Cherry Creek	.030	.045
East Tributary to Black Squirrel Creek	--[1]	--[1]
East Tributary to Black Squirrel Creek – West Fork Bennett Ranch Basin	--[1]	--[1]
Ellicott Consolidated	.030 - .040	.030 - .040
Ellicott Consolidated – East Tributary	.030	.040
Ellicott – Highway Split Flow Path Downstream	.040 - .070	.040 - .070
Ellicott – Highway Split Flow Path Upstream	.040	.040
Ellicott – Left Split Flow Path	.030	.040

[1]Data not available

Table 6. Summary of Manning's "n" Values (cont.)

Stream Name	Manning's "n" Values Channel	Overbanks
Ellicott – Sanborn Split Flow Path	.030	.030 - .040
Ellicott – Split Flow Path 2	.030	.030 - .040
Fairfax Creek	--[1]	--[1]
Fisher's Canyon	.018 - .040	.040
Fisher's Canyon – Above Loomis Avenue	.040 - .050	.030
Fisher's Canyon – South Branch	.013 - .050	.016 - .040
Fountain Creek	.013 - .080	.013 - .100
Fountain Creek – North Overflow Path	--[1]	--[1]
Franceville Tributary - Jimmy Camp Creek	.015 - .065	.020 - .080
Haegler Ranch Tributary 2	--[1]	--[1]
Haegler Ranch Tributary 3	--[1]	--[1]
Haegler Ranch Tributary 4	--[1]	--[1]
Jackson Creek	--[1]	--[1]
Jimmy Camp Creek	.015 - .065	.020 - .080
Jimmy Camp – East Tributary	.015 - .065	.020 - .080
Jimmy Camp – West Tributary	.015 - .065	.020 - .080
Jimmy Camp – West Tributary South Overflow	.015 - .065	.020 - .080
Kettle Creek	.013 - .080	.013 - .080
Lower Big Springs Creek	.030	.030 - .040
Lower Big Springs Creek – Right Split Flow Path	.030	.040
Mesa Basin	.013 - .080	.013 - .080
Mines Subtributary to Corral Tributary	.030 - .040	.030 - .060
Monument Creek	.013 - .080	.013 - .080
Monument Creek Tributary	.015 - .065	.020 - .080
North Beaver Creek	.010	.070
North Channel Dry Creek	--[1]	--[1]
North Monument Creek	.050 - .060	.060 - .070
North Pine Creek	.035	.035
Peterson Field Drainage	.013 - .080	.013 - .080
Pine Creek	.013 - .080	.013 - .080
Pine Creek Tributary	.015 - .035	.020 - .035
Piñon Lake Tributary	.080	.070
Rockrimmon Basin	.013 - .080	.013 - .080
Ruxton Creek	.020 - .035	.035 - .100
Sand Creek	.013 - .080	.013 - .080
Sand Creek Center Tributary	.013 - .080	.013 - .080
Sand Creek Center Tributary Overflow	--[1]	--[1]
Sand Creek East Fork	.013 - .080	.013 - .080
Sand Creek East Fork Subtributary	.015 - .065	.020 - .080
Sand Creek South	--[1]	--[1]
Sand Creek Split Flow	--[1]	--[1]
Sand Creek West Fork	.013 - .040	.016 - .040
Security Creek	.015 - .065	.020 - .080

[1]Data not available

Table 6. Summary of Manning's "n" Values (cont.)

Stream Name	Manning's "n" Values Channel	Overbanks
South Shooks Run	.013 - .080	.013 - .080
South Tributary to Black Squirrel Creek	--[1]	--[1]
Spring Creek	.013 - .080	.013 - .080
Spring Creek East Fork	--[1]	--[1]
Spring Run	.014 - .045	.015 - .060
Spring Run Overflow	.016 - .030	.030 - .035
Sutherland Creek	.020 - .035	.035 - .100
Teachout Creek	--[1]	--[1]
Telephone Exchange	.030 - .035	.030 - .040
Telephone Exchange – Lower Split Flow Path	.035	.040
Telephone Exchange – Middle Split Flow Path	.035	.040
Templeton Gap Floodway	.013 - .080	.013 - .080
Templeton Gap – Lower Tributary	.013 - .080	.013 - .080
Templeton Gap – South Overflow	.025	.050 - .060
Templeton Gap - South Tributary	.015 - .060	.022 - .060
Templeton Gap – Upper Tributary	--[1]	--[1]
Tributary to East Cherry Creek	--[1]	--[1]
Tributary to Sand Creek – East Fork (Reach No. 6)	.030	.030
Unnamed Tributary to Black Squirrel Creek	.030 - .045	.030 - .045
Unnamed Tributary to Black Squirrel Creek No. 2	--[1]	--[1]
Unnamed Tributary to Jimmy Camp Creek	--[1]	--[1]
Unnamed Tributary to Teachout Creek	--[1]	--[1]
Upper East Tributary to Chico Creek	.030	.030
Upper Fountain Creek	.015 - .065	.020 - .080
West Fork Squirrel Creek – Solberg Ranch – West Unnamed Tributary	.035 - .040	.035 - .050
West Tributary to Black Squirrel Creek	--[1]	--[1]
Widefield Creek	.015 - .065	.020 - .080
Williams Canyon	.020 - .035	.035 - .100
Windmill Gulch	.013 - .080	.040 - .050
Windmill Gulch – Dix Circle Overflow	.016	.016 - .040
Windmill Gulch – Grand Boulevard Overflow	.016	.040
Windmill Gulch – Libby Court Overflow	.016	.016 - .040

[1]Data not available

Flood elevations for streams studied by approximate methods in Green Mountain Falls were determined from drainage-area flood depth relationships and topographic maps.

Inadequate channel capacities of Sutherland Creek downstream of Cross Section A, coupled with the inadequate culvert capacity under the U.S. Highway 24 Access Road, result in breakouts of flow greater than the 10-percent-annual-chance flood. Breakout flows occur in both the east and west overbanks. The lack of any defined flow channel results in a complete flow pattern which consists of overland flow and flow along U.S. Highway 24. These flows, joined with the breakout flows from Fountain Creek, cannot be modeled with a one-dimensional backwater model. Therefore, no elevations have been determined for the downstream portion of Sutherland Creek and the flows along U.S. Highway 24 and Manitou Avenue. Therefore, the flood hazard area has been analyzed by approximate methods.

The approximate elevations for the upper portions of Williams Canyon and Beckers Lane Tributary were developed using cross sections taken from a USGS topographic map enlarged to a scale of 1:4,800, with a contour interval of 40 feet and the USACE HEC2 computer program, which generates a top width for each section based on cross section area, drainage area, 1-percent-annual-chance discharge, slope, and roughness values.

For the Black Squirrel drainage basin and all associated tributaries studied in detail (including Book Ranch Creek, Ellicott Consolidated, Ellicott Consolidated – East Tributary, Lower Big Springs, and Telephone Exchange), cross section data was obtained from Kucera International, Inc. The data was delivered to the USACE and included a digital terrain model (DTM) supporting 2-foot contour intervals and limited planimetric features. The DTM included a grid of mass points at an average 35-foot spacing, spot elevations at various high and low points, and breaklines at all linear breaks in grade greater than approximately one foot. The planimetric features compiled included road edges (a breakline feature), cross-county fence lines, primary structures, tree lines, and hydrography (a breakline feature).

3.3 Vertical Datum

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

This report has been updated to reflect a partial countywide map modernization of the FIRM. Flood elevations shown in this FIS report and on the FIRM for panels included in the map modernization are referenced to NAVD88. For these panels, elevations were converted from NGVD29 to NAVD88 by adding a vertical datum conversion factor, described in more detail below. As a result, structure and ground elevations located on updated panels should be referenced to NAVD88 if possible. Flood elevations shown in this FIS report and on the FIRM for panels not included in the map modernization continue to be referenced to NGVD29. It is important to note that adjacent communities may be referenced in either NAVD88 or NGVD29. Depending upon the area, this may result in differences in Base Flood Elevations (BFEs) across the corporate limits between communities. Ground, structure, and flood elevations within El Paso County and Incorporated Areas may be compared and/or referenced to NGVD29 by subtracting the applicable vertical datum conversion factor from the associated elevation in NAVD88. Regardless of area, the applicable datum is clearly marked for all tables and panels in the FIS report and FIRM.

Bench marks shown on the FIRM represent those used during the preparation of this and previous FIS reports. Users should be aware that these elevations may have changed since the publication of this FIS report. To obtain up-to-date elevation information on National Geodetic Survey (NGS) bench marks shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS bench mark monument elevations when using these elevations for construction or floodplain management purposes.

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

Using the multiple conversion factor approach, an average conversion factor for each flooding source was developed by establishing separate conversion factors at the upstream end, at the downstream end, and at an intermediate point of the studied reach. From this data, the average conversion factors for each reach were developed. In some cases, it was necessary to divide each reach into multiple sections in order for the maximum offset from the average conversion factor to be less than or equal to 0.25 feet.

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

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

Conversion factors for each studied reach are shown in Table 7. It should be noted that for Black Squirrel Creek and associated tributaries (Book Ranch Creek, Ellicott Consolidated, Ellicott Consolidated – East Tributary, Lower Big Springs, and Telephone Exchange), a datum conversion was not necessary as the study was completed in the NAVD88 datum.

Table 7. Vertical Datum Conversion Factors

Stream/Reach	Minimum Conversion	Maximum Conversion	Average Conversion	Maximum Offset	Downstream Station		Upstream Station
Bear Creek	3.4	3.7	3.5	0.2		Entire Reach	
Beaver Creek	3.8	4.1	3.9	0.1		Entire Reach	
Beckers Lane Tributary	3.4	3.7	3.5	0.2		Entire Reach	
Big Valley	3.5	3.8	3.6	0.1		Entire Reach	
Black Forest Creek	3.8	4.1	3.9	0.1		Entire Reach	
Black Forest Creek – Baptist Road Tributary	3.8	4.1	3.9	0.1		Entire Reach	
Black Forest Creek-Middle Tributary	3.8	4.1	3.9	0.1		Entire Reach	
Black Squirrel Creek[1]	N/A	N/A	N/A	N/A			
Black Squirrel Creek – Haegler Basin – Sage Creek	3.5	3.8	3.6	0.2		Entire Reach	
Black Squirrel Creek – Upstream of US Highway 24	3.9	3.9	3.9	0.0		Entire Reach	
Black Squirrel Creek – West Fork Bennett Ranch Basin	3.5	3.8	3.6	0.2		Entire Reach	
Book Ranch Creek[1]	N/A	N/A	N/A	N/A			
Butler Canyon	3.8	4.1	3.9	0.1		Entire Reach	
Calhan East Tributary	3.5	3.5	3.5	0.0		Entire Reach	
Calhan Fairground Tributary	3.5	3.5	3.5	0.0		Entire Reach	
Calhan Main Channel	3.5	3.5	3.5	0.0		Entire Reach	
Camp Creek	3.4	3.7	3.5	0.2		Entire Reach	

[1] Detailed study performed in NAVD88.
[2] Stream not included as part of map modernization; vertical datum is NGVD29.
[3] Downstream portion of stream not included as part of map modernization; vertical datum is NGVD29.
[4] The portion of Monument Creek between Cross Section O and downstream of Cross Section AW not included as part of map modernization; vertical datum is NGVD29.
[5] Upstream portion of stream not included as part of map modernization; vertical datum is NGVD29.

Table 7. Vertical Datum Conversion Factors (cont.)

Stream/Reach	Minimum Conversion	Maximum Conversion	Average Conversion	Maximum Offset	Downstream Station		Upstream Station
Carpenter Creek	3.8	4.1	3.9	0.1		Entire Reach	
Catamount Creek	3.7	4.2	4.0	0.2		Entire Reach	
Cheyenne Creek	3.4	3.7	3.5	0.2		Entire Reach	
Cheyenne Run	3.4	3.7	3.5	0.2		Entire Reach	
Corral Tributary	3.3	3.5	3.4	0.2		Entire Reach	
Cottonwood Creek	3.6	4.0	3.8	0.1		Entire Reach	
Crystal Creek	3.8	4.1	3.9	0.1		Entire Reach	
Crystal Creek – Split Flow Channel	3.8	4.1	3.9	0.1		Entire Reach	
Dirty Woman Creek	3.8	4.1	3.9	0.1		Entire Reach	
Dirty Woman Creek – Lake Fork	3.8	4.1	3.9	0.1		Entire Reach	
Dirty Woman Creek – Middle Fork	3.8	4.1	3.9	0.1		Entire Reach	
Dirty Woman Creek – North Fork	3.8	4.1	3.9	0.1		Entire Reach	
Dirty Woman Creek – South Fork	3.8	4.1	3.9	0.1		Entire Reach	
Douglas Creek North[2]	N/A	N/A	N/A	N/A			
Douglas Creek South[3]	3.5	3.8	3.6	0.1	101 Feet Downstream of Cross Section M		Upstream Limit of Detailed Study
Dry Creek	3.5	3.8	3.6	0.1		Entire Reach	

[1] Detailed study performed in NAVD88.
[2] Stream not included as part of map modernization; vertical datum is NGVD29.
[3] Downstream portion of stream not included as part of map modernization; vertical datum is NGVD29.
[4] The portion of Monument Creek between Cross Section O and downstream of Cross Section AW not included as part of map modernization; vertical datum is NGVD29.
[5] Upstream portion of stream not included as part of map modernization; vertical datum is NGVD29.

Table 7. Vertical Datum Conversion Factors (cont.)

Stream/Reach	Minimum Conversion	Maximum Conversion	Average Conversion	Maximum Offset	Downstream Station		Upstream Station
East Cherry Creek	4.1	4.1	4.1	0.0		Entire Reach	
East Tributary to Black Squirrel Creek	3.9	3.9	3.9	0.0		Entire Reach	
East Tributary to Black Squirrel Creek – West Fork Bennett Ranch Basin	3.5	3.8	3.6	0.2		Entire Reach	
Ellicott Consolidated[1]	N/A	N/A	N/A	N/A			
Ellicott Consolidated – East Tributary[1]	N/A	N/A	N/A	N/A			
Fairfax Creek	3.6	4.0	3.8	0.1		Entire Reach	
Fisher's Canyon	3.1	3.5	3.3	0.2		Entire Reach	
Fisher's Canyon – Above Loomis Avenue	3.1	3.5	3.3	0.2		Entire Reach	
Fisher's Canyon – South Branch	3.1	3.5	3.3	0.2		Entire Reach	
Fountain Creek (Lower)	3.1	3.5	3.3	0.2	El Paso – Pueblo County Boundary		Downstream of Sand Creek
Fountain Creek (Middle)	3.4	3.7	3.5	0.2	Upstream of Sand Creek		Downstream of Monument Creek
Franceville Tributary – Jimmy Camp Creek	3.3	3.5	3.4	0.2		Entire Reach	
Haegler Ranch Tributary 2	3.5	3.8	3.6	0.2		Entire Reach	
Haegler Ranch Tributary 3	3.5	3.8	3.6	0.2		Entire Reach	

[1] Detailed study performed in NAVD88.
[2] Stream not included as part of map modernization; vertical datum is NGVD29.
[3] Downstream portion of stream not included as part of map modernization; vertical datum is NGVD29.
[4] The portion of Monument Creek between Cross Section O and downstream of Cross Section AW not included as part of map modernization; vertical datum is NGVD29.
[5] Upstream portion of stream not included as part of map modernization; vertical datum is NGVD29.

Table 7. Vertical Datum Conversion Factors (cont.)

Stream/Reach	Minimum Conversion	Maximum Conversion	Average Conversion	Maximum Offset	Downstream Station		Upstream Station
Haegler Ranch Tributary 4	3.5	3.8	3.6	0.2		Entire Reach	
Jackson Creek	3.8	4.1	3.9	0.1		Entire Reach	
Jimmy Camp Creek	3.3	3.5	3.4	0.2		Entire Reach	
Jimmy Camp Creek – East Tributary	3.3	3.5	3.4	0.2		Entire Reach	
Jimmy Camp Creek – West Tributary	3.3	3.5	3.4	0.2		Entire Reach	
Jimmy Camp Creek – West Tributary South Overflow	3.3	3.5	3.4	0.2		Entire Reach	
Kettle Creek	3.8	4.1	3.9	0.2		Entire Reach	
Lower Big Springs[1]	N/A	N/A	N/A	N/A			
Mesa Basin[3]	3.5	3.8	3.6	0.1	633 Feet Downstream of Cross Section M		Upstream Limit of Detailed Study
Mines Subtributary to Corral Tributary	3.3	3.5	3.4	0.2		Entire Reach	
Monument Creek (Lower)	3.5	3.8	3.6	0.1	Upstream of Upper Fountain Creek		6.5 Feet Upstream of Cross Section O
Monument Creek (Lower)[4]	3.5	3.8	3.6	0.1	225 Feet Downstream of Cross Section AW		South Border of US Air Force Academy

[1] Detailed study performed in NAVD88.
[2] Stream not included as part of map modernization; vertical datum is NGVD29.
[3] Downstream portion of stream not included as part of map modernization; vertical datum is NGVD29.
[4] The portion of Monument Creek between Cross Section O and downstream of Cross Section AW not included as part of map modernization; vertical datum is NGVD29.
[5] Upstream portion of stream not included as part of map modernization; vertical datum is NGVD29.

Table 7. Vertical Datum Conversion Factors (cont.)

Stream/Reach	Minimum Conversion	Maximum Conversion	Average Conversion	Maximum Offset	Downstream Station	Upstream Station
Monument Creek (Upper)	3.8	4.1	3.9	0.1	North Border of US Air Force Academy	Upstream Limit of Detailed Study
Monument Creek Tributary	3.8	4.1	3.9	0.1	Entire Reach	
North Beaver Creek	3.8	4.1	3.9	0.1	Entire Reach	
North Channel Dry Creek	3.5	3.8	3.6	0.1	Entire Reach	
North Monument Creek	3.8	4.1	3.9	0.1	Entire Reach	
North Pine Creek	3.7	3.9	3.7	0.2	Entire Reach	
Peterson Field Drainage	3.4	3.9	3.6	0.3	Entire Reach	
Pine Creek	3.7	3.9	3.7	0.2	Entire Reach	
Pine Creek Tributary	3.7	3.9	3.7	0.2	Entire Reach	
Piñon Lake Tributary	3.8	4.1	3.9	0.1	Entire Reach	
Rockrimmon Basin	3.5	3.8	3.6	0.1	Entire Reach	
Ruxton Creek	3.7	4.2	4.0	0.2	Entire Reach	
Sand Creek	3.4	3.9	3.6	0.3	Entire Reach	
Sand Creek Center Tributary	3.5	3.8	3.6	0.2	Entire Reach	
Sand Creek East Fork	3.5	3.8	3.6	0.2	Entire Reach	
Sand Creek East Fork Subtributary	3.5	3.8	3.6	0.2	Entire Reach	

[1] Detailed study performed in NAVD88.
[2] Stream not included as part of map modernization; vertical datum is NGVD29.
[3] Downstream portion of stream not included as part of map modernization; vertical datum is NGVD29.
[4] The portion of Monument Creek between Cross Section O and downstream of Cross Section AW not included as part of map modernization; vertical datum is NGVD29.
[5] Upstream portion of stream not included as part of map modernization; vertical datum is NGVD29.

Table 7. Vertical Datum Conversion Factors (cont.)

Stream/Reach	Minimum Conversion	Maximum Conversion	Average Conversion	Maximum Offset	Downstream Station		Upstream Station
Sand Creek South	3.1	3.1	3.1	0.0		Entire Reach	
Sand Creek West Fork	3.4	3.9	3.6	0.3		Entire Reach	
Security Creek	3.1	3.5	3.3	0.2		Entire Reach	
South Shooks Run[5]	3.4	3.7	3.5	0.2	Upstream of Fountain Creek		145 Feet Upstream of Cross Section Y
South Tributary to Black Squirrel Creek	3.9	3.9	3.9	0.0		Entire Reach	
South Valley Dry Creek	3.5	3.8	3.6	0.1		Entire Reach	
Spring Creek	3.4	3.7	3.5	0.2		Entire Reach	
Spring Creek East Fork	3.4	3.7	3.5	0.2		Entire Reach	
Spring Run	3.4	3.7	3.5	0.2		Entire Reach	
Sutherland Creek	3.4	3.7	3.5	0.2		Entire Reach	
Teachout Creek	3.8	4.1	3.9	0.1		Entire Reach	
Telephone Exchange[1]	N/A	N/A	N/A	N/A			
Templeton Gap Floodway[3]	3.6	3.7	3.6	0.0	607 Feet Downstream of Cross Section AA		Upstream Limit of Detailed Study
Templeton Gap Floodway – Lower Tributary[2]	N/A	N/A	N/A	N/A			

[1] Detailed study performed in NAVD88.
[2] Stream not included as part of map modernization; vertical datum is NGVD29.
[3] Downstream portion of stream not included as part of map modernization; vertical datum is NGVD29.
[4] The portion of Monument Creek between Cross Section O and downstream of Cross Section AW not included as part of map modernization; vertical datum is NGVD29.
[5] Upstream portion of stream not included as part of map modernization; vertical datum is NGVD29.

Table 7. Vertical Datum Conversion Factors (cont.)

Stream/Reach	Minimum Conversion	Maximum Conversion	Average Conversion	Maximum Offset	Downstream Station		Upstream Station
Templeton Gap – South Tributary	3.6	3.7	3.6	0.0		Entire Reach	
Templeton Gap – Upper Tributary	3.6	3.7	3.6	0.0		Entire Reach	
Tributary to East Cherry Creek	4.1	4.1	4.1	0.0		Entire Reach	
Tributary to Sand Creek East Fork (Reach No. 6)	3.5	3.8	3.6	0.2		Entire Reach	
Unnamed Tributary to Black Squirrel Creek	3.5	3.8	3.6	0.2		Entire Reach	
Unnamed Tributary to Black Squirrel Creek No. 2	3.5	3.8	3.6	0.2		Entire Reach	
Unnamed Tributary to Jimmy Camp Creek	3.3	3.5	3.4	0.2		Entire Reach	
Unnamed Tributary to Teachout Creek	3.8	4.1	3.9	0.1		Entire Reach	
Upper East Tributary to Chico Creek	3.5	3.8	3.6	0.2		Entire Reach	
Upper Fountain Creek	3.4	3.7	3.5	0.2	Upstream of Monument Creek		Downstream of Ruxton Creek
Upper Fountain Creek	3.7	4.2	4.0	0.2	Upstream of Ruxton Creek		Upstream Limit of Detailed Study
West Fork Squirrel Creek – Solberg Ranch East Tributary	3.5	3.8	3.6	0.2		Entire Reach	
West Fork Black Squirrel Creek – Solberg Ranch Tributary	3.5	3.8	3.6	0.2		Entire Reach	

[1] Detailed study performed in NAVD88.
[2] Stream not included as part of map modernization; vertical datum is NGVD29.
[3] Downstream portion of stream not included as part of map modernization; vertical datum is NGVD29.
[4] The portion of Monument Creek between Cross Section O and downstream of Cross Section AW not included as part of map modernization; vertical datum is NGVD29.
[5] Upstream portion of stream not included as part of map modernization; vertical datum is NGVD29.

Table 7. Vertical Datum Conversion Factors (cont.)

Stream/Reach	Minimum Conversion	Maximum Conversion	Average Conversion	Maximum Offset	Downstream Station		Upstream Station
West Fork Squirrel Creek – Solberg Ranch – West Unnamed Tributary	3.5	3.8	3.6	0.2		Entire Reach	
West Tributary to Black Squirrel Creek	3.9	3.9	3.9	0.0		Entire Reach	
Widefield Creek	3.1	3.5	3.3	0.2		Entire Reach	
Williams Canyon	3.7	4.2	4.0	0.2		Entire Reach	
Windmill Gulch	3.1	3.5	3.3	0.2		Entire Reach	
Windmill Gulch – Dix Circle Overflow	3.1	3.5	3.3	0.2		Entire Reach	
Windmill Gulch – Grand Boulevard Overflow	3.1	3.5	3.3	0.2		Entire Reach	
Windmill Gulch – Libby Court Overflow	3.1	3.5	3.3	0.2		Entire Reach	

[1] Detailed study performed in NAVD88.
[2] Stream not included as part of map modernization; vertical datum is NGVD29.
[3] Downstream portion of stream not included as part of map modernization; vertical datum is NGVD29.
[4] The portion of Monument Creek between Cross Section O and downstream of Cross Section AW not included as part of map modernization; vertical datum is NGVD29.
[5] Upstream portion of stream not included as part of map modernization; vertical datum is NGVD29.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 1-percent-annual-chance flood elevations and delineations of the 1-percent and 0.2-percent-annual-chance floodplain boundaries and 1-percent-annual-chance floodway to assist communities in developing floodplain management measures. This information is presented on the Flood Insurance Rate Map and in many components of the Flood Insurance Study report, including Flood Profiles, Floodway Data table and Summary of Stillwater Elevations Table. Users should reference the data presented in the Flood Insurance Study report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1-percent and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at scales of 1:240; 1:1,200; 1:2,400; 1:4,800; 1:6,000; and 1:24,000, with contour intervals of 2, 4, 5, and 20 feet.

The 1-percent and 0.2-percent-annual-chance floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE); and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1-percent and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the Flood Insurance Rate Map.

The approximate 1-percent-annual-chance boundaries for the flows along Sutherland Creek downstream of Cross Section A were delineated using topographic maps at a scale of 1:1,200, with contour intervals of 4 and 20 feet.

The 1-percent-annual-chance flood boundaries for the remaining streams studied by approximate methods were delineated using topographic maps enlarged to a scale of 1:4,800, with a contour interval of 40 feet.

Approximate 1-percent-annual-chance floodplain boundaries in some portions of the study area were taken directly from the Flood Hazard Boundary Map for the City of Colorado Springs, City of Fountain, and the unincorporated areas of El Paso County.

4.2 Floodways

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

The floodways presented in this Flood Insurance Study report and on the Flood Insurance Rate Map panels were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 8). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

Hazardous velocities would occur during flooding on the upper reaches of Monument Creek near the Town of Palmer Lake and on Monument Creek Tributary under existing-channel conditions. Encroachments, islands, and flood boundaries are subject to extreme erosion when velocities are so high. Therefore, the 1-percent-annual-chance flood boundary was designated as the floodway as shown on the Flood Insurance Rate Map (Exhibit 2).

Because of high-velocity conditions, the floodways were developed for Fountain Creek, Ruxton Creek, Sutherland Creek, and Williams Canyon by applying the allowable rise to the energy grade line instead of the water-

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Bear Creek								
A	352	59	313	13.2	5946.9	5946.9	5946.9	0.0
B	495	65	324	12.8	5952.9	5952.9	5952.9	0.0
C	525	71	333	12.4	5956.3	5956.3	5956.3	0.0
D	702	52	302	13.7	5960.8	5960.8	5960.8	0.0
E	725	60	315	13.1	5967.1	5967.1	5967.1	0.0
F	985	74	409	10.1	5972.2	5972.2	5972.2	0.0
G	1,590	43	272	14.5	5981.4	5981.4	5981.4	0.0
H	1,930	66	318	12.4	5988.5	5988.5	5988.5	0.0

[1]Feet Above Confluence with Fountain Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BEAR CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Black Forest Creek								
A	0	120	290	7.6	6660.9	6660.9	6761.4	0.5
B	1,165	92	288	7.7	6701.5	6701.5	6701.8	0.3
C	2,250	70	219	10.1	6722.8	6722.8	6723.1	0.3
D	2,705	52	190	10.9	6731.4	6731.4	6731.8	0.4
E	3,815	39	172	12.0	6762.3	6762.3	6762.5	0.2
F	4,090	85	224	9.2	6776.2	6776.2	6776.7	0.5
G	4,620	105	240	8.6	6788.0	6788.0	6788.2	0.2
H	5,260	82	219	9.4	6802.1	6802.1	6802.4	0.3
I	5,815	25	120	12.6	6822.8	6822.8	6823.3	0.5
J	6,415	75	286	5.3	6841.7	6841.7	6842.5	0.8
K	7,250	27	142	10.7	6861.1	6861.1	6861.5	0.4
L	8,050	24	116	12.5	6881.4	6881.4	6881.5	0.1
M	8,800	44	127	9.7	6916.5	6916.5	6916.9	0.4
N	9,655	21	99	12.5	6949.3	6949.3	6949.5	0.2
O	10,200	12	64	9.9	6967.5	6967.5	6968.5	1.0
P	10,480	85	82	5.6	6982.8	6982.8	6982.8	0.0
Q	11,160	20	50	9.1	7010.7	7010.7	7011.0	0.3
R	11,870	50	30	4.4	7040.4	7040.4	7040.5	0.1

[1]Feet Above Confluence with Monument Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BLACK FOREST CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Black Forest Creek-Baptist Road Tributary								
A	890	16	47	9.8	6981.7	6981.7	6982.1	0.4
B	1,305	13	44	10.5	6996.4	6996.4	6996.7	0.3
C	1,932	21	65	9.6	7027.0	7027.0	7027.0	0.0
D	2,382	28	76	8.2	7046.1	7046.1	7046.3	0.2
E	3,082	95	104	6.0	7074.9	7074.9	7075.0	0.1
F	3,302	80	95	6.2	7083.0	7083.0	7083.1	0.1
G	4,502	22	55	9.0	7132.6	7132.6	7133.0	0.4
H	5,262	20	45	8.6	7163.9	7163.9	7164.2	0.3

[1]Feet Above Confluence with Black Forest Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BLACK FOREST CREEK – BAPTIST ROAD TRIBUTARY

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Black Forest Creek - Middle Tributary								
A	0	110	40	3.5	6728.3	6728.3	6728.3	0.0
B	570	28	26	4.8	6738.8	6738.8	6738.9	0.1
C	682	8	15	7.9	6742.0	6742.0	6742.0	0.0
D	2,702	11	42	3.1	6797.9	6797.9	6797.9	0.0
E	2,827	11	18	7.3	6806.8	6806.8	6807.0	0.2
F	2,962	12	18	7.0	6811.4	6811.4	6811.7	0.3

[1]Feet Above Interstate 25.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BLACK FOREST CREEK - MIDDLE TRIBUTARY

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Black Squirrel Creek								
A	0	884	4,564	10.2	5690.4	5690.4	5690.8	0.4
B	1,000	986	4,464	10.4	5696.2	5696.2	5696.5	0.3
C	2,000	1,029	4,826	9.7	5702.6	5702.6	5702.7	0.1
D	2,876	1,397	4,976	9.4	5707.6	5707.6	5707.6	0.0
E	3,762	927	3,496	8.3	5712.2	5712.2	5712.2	0.0
F	4,700	679	2,989	9.6	5718.3	5718.3	5718.3	0.0
G	5,435	558	2,440	11.8	5722.5	5722.5	5722.5	0.0
H	6,525	1,717	4,205	8.9	5730.9	5730.9	5731.0	0.1
I	7,560	1,221	4,479	8.3	5738.4	5738.4	5738.5	0.1
J	8,267	1,096	3,887	9.6	5742.2	5742.2	5742.2	0.0
K	9,098	885	3,699	10.1	5747.1	5747.1	5747.2	0.1
L	10,341	996	4,219	8.9	5755.4	5755.4	5756.1	0.7
M	10,798	1,102	3,528	10.6	5759.8	5759.8	5760.5	0.7
N	11,794	903	3,810	9.8	5768.9	5768.9	5769.4	0.5
O	12,828	1,016	4,437	8.4	5775.4	5775.4	5775.5	0.1
P	13,646	971	3,802	9.8	5780.7	5780.7	5781.5	0.8
Q	14,323	1,392	4,930	7.6	5785.2	5785.2	5786.1	0.9
R	15,678	1,690	4,659	6.4	5792.9	5792.9	5793.4	0.5
S	16,116	1,572	4,592	6.5	5794.6	5794.6	5795.6	1.0
T	17,902	1,888	5,621	5.2	5805.0	5805.0	5805.0	0.0
U	19,000	1,772	5,165	5.6	5810.1	5810.1	5811.1	1.0
V	19,500	1,596	3,864	7.5	5813.1	5813.1	5813.7	0.6
W	20,250	1,863	4,591	6.3	5818.6	5818.6	5819.5	0.9
X	21,514	1,463	3,829	7.6	5826.6	5826.6	5827.1	0.5

[1] Feet Above Limit of Detailed Study.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BLACK SQUIRREL CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Black Squirrel Creek								
Y	22,196	1,360	4,012	7.3	5830.7	5830.7	5831.3	0.6
Z	23,156	1,240	3,226	9.0	5835.3	5835.3	5835.3	0.0
AA	24,167	908	3,212	9.1	5842.5	5842.5	5842.5	0.0
AB	24,726	850	3,159	9.2	5845.8	5845.8	5845.9	0.1
AC	25,513	853	2,845	10.2	5851.3	5851.3	5851.4	0.1
AD	26,498	740	3,397	8.6	5856.6	5856.6	5857.4	0.8
AE	27,887	623	2,228	10.6	5866.8	5866.8	5866.8	0.0
AF	28,752	674	2,898	8.2	5871.6	5871.6	5872.2	0.6
AG	29,338	786	2,730	8.7	5874.1	5874.1	5874.4	0.3
AH	30,340	1,460	3,353	5.0	5882.0	5882.0	5882.8	0.8
AI	30,866	1,569	2,732	6.2	5884.1	5884.1	5885.1	1.0
AJ	31,669	962	2,662	6.3	5890.1	5890.1	5890.2	0.1
AK	32.643	717	2,591	6.5	5897.1	5897.1	5897.3	0.2
AL	33,533	680	1,991	8.5	5905.5	5905.5	5905.5	0.0
AM	34,498	1,216	2,523	6.7	5911.2	5911.2	5911.5	0.3
AN	35,400	1,986	3,167	5.3	5917.5	5917.5	5918.3	0.8
AO	36,150	1,671	2,747	6.1	5924.4	5924.4	5924.4	0.0
AP	37,000	1,261	2,528	6.7	5930.5	5930.5	5931.3	0.8
AQ	37,500	2,443	6,319	3.7	5937.8	5937.8	5938.6	0.8
AR	38,000	2,011	3,029	6.0	5940.8	5940.8	5941.6	0.8
AS	38,735	1,733	3,664	4.9	5945.1	5945.1	5945.8	0.7
AT	39,500	1,801	3,180	5.7	5951.4	5951.4	5952.1	0.7
AU	40,602	1,950	3,336	5.4	5959.4	5959.4	5960.4	1.0
AV	41,023	1,947	3,321	5.4	5963.2	5963.2	5963.9	0.7

[1] Feet Above Limit of Detailed Study.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BLACK SQUIRREL CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Black Squirrel Creek								
AW	41,325	1,237	2,440	7.4	5965.0	5965.0	5965.5	0.5
AX	42,004	1,025	2,330	7.7	5970.7	5970.7	5971.1	0.4
AY	43,022	1,766	3,767	4.8	5981.6	5981.6	5981.8	0.2
AZ	43,535	1,579	3,770	6.2	5983.4	5983.4	5984.4	1.0

[1] Feet Above Limit of Detailed Study.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BLACK SQUIRREL CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Black Squirrel Creek – Right Split Flow Path								
A	1,531	1,369	3,623	3.3	5718.2	5718.2	5718.2	0.0
B	2,460	494	1,737	5.0	5723.0	5723.0	5723.0	0.0
C	3,146	847	1,247	7.0	5728.8	5728.8	5728.8	0.0

[1] Feet Above Confluence with Black Squirrel Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BLACK SQUIRREL CREEK – RIGHT SPLIT FLOW PATH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Book Ranch Creek								
A	-2,002	470	1,328	9.0	5722.5	5722.5	5723.5	1.0
B	-923	216	1,093	11.0	5734.2	5734.2	5735.0	0.8
C	-184	195	962	12.5	5742.9	5742.9	5742.9	0.0
D	69	253	1,246	9.6	5745.7	5745.7	5746.4	0.7
E	532	274	1,316	9.1	5751.0	5751.0	5751.3	0.3
F	1,088	212	985	12.2	5758.1	5758.1	5758.1	0.0
G	1,762	346	1,203	10.0	5765.4	5765.4	5765.8	0.4
H	2,739	470	1,283	9.4	5775.9	5775.9	5775.9	0.0
I	3,268	259	1,109	10.8	5780.6	5780.6	5780.6	0.0
J	3,826	444	1,376	8.7	5786.3	5786.3	5786.3	0.0
K	4,740	279	1,133	10.6	5792.1	5792.1	5793.1	1.0
L	5,447	204	977	12.3	5800.2	5800.2	5800.8	0.6
M	6,202	264	1,111	10.8	5807.6	5807.6	5807.6	0.0
N	7,405	269	1,130	10.6	5818.6	5818.6	5819.6	1.0
O	8,110	754	2,122	5.7	5824.8	5824.8	5825.8	1.0
P	9,068	316	1,220	9.8	5835.8	5835.8	5836.5	0.7
Q	9,989	613	2,739	5.0	5844.2	5844.2	5845.1	0.9
R	10,580	145	891	13.5	5849.6	5849.6	5850.1	0.5
S	11,705	405	1,418	8.5	5858.8	5858.8	5859.5	0.7
T	12,297	349	1,214	9.9	5864.2	5864.2	5864.2	0.0
U	12,726	255	1,053	11.4	5867.0	5867.0	5867.0	0.0
V	13,610	214	1,072	11.2	5874.5	5874.5	5874.5	0.0
W	14,498	144	840	14.3	5882.9	5882.9	5882.9	0.0
X	15,318	285	1,166	10.3	5890.0	5890.0	5890.0	0.0

[1] Feet Above South Ellicott Highway.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BOOK RANCH CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Book Ranch Creek (cont.)								
Y	16,622	678	1,662	7.2	5900.5	5900.5	5901.4	0.9
Z	17,582	467	1,426	8.4	5907.1	5907.1	5908.1	1.0
AA	18,332	882	1,889	6.4	5913.4	5913.4	5914.4	1.0
AB	19,234	1,634	2,263	5.3	5922.3	5922.3	5923.3	1.0
AC	19,782	553	1,643	7.3	5929.6	5929.6	5930.6	1.0
AD	20,239	388	1,232	9.7	5933.7	5933.7	5934.5	0.8
AE	20,840	369	1,450	8.3	5939.4	5939.4	5940.4	1.0
AF	21,793	226	1,029	11.7	5950.7	5950.7	5950.9	0.2
AG	22,576	309	1,245	9.6	5958.0	5958.0	5958.8	0.8
AH	23,351	174	922	13.0	5967.8	5967.8	5967.8	0.0
AI	24,184	295	1,104	10.9	5973.8	5973.8	5973.8	0.0
AJ	25,149	424	1,242	9.7	5983.9	5983.9	5983.9	0.0
AK	25,945	516	1,331	9.0	5991.2	5991.2	5991.2	0.0
AL	26,900	440	1,632	7.6	6000.7	6000.7	6001.3	0.6
AM	27,599	340	1,288	9.3	6006.9	6006.9	6007.2	0.3
AN	28,248	769	1,552	7.7	6013.3	6013.3	6013.3	0.0
AO	28,937	375	1,184	10.1	6019.9	6019.9	6019.9	0.0
AP	29,548	673	1,705	7.0	6025.6	6025.6	6025.6	0.0
AQ	30,124	556	1,365	8.8	6029.8	6029.8	6029.8	0.0
AR	30,827	462	1,269	9.5	6036.1	6036.1	6036.1	0.0
AS	31,786	848	1,788	6.7	6043.6	6043.6	6043.6	0.0
AT	32,705	835	1,561	7.7	6051.5	6051.5	6051.5	0.0
AU	33,719	452	1,362	8.8	6059.3	6059.3	6059.3	0.0
AV	34,151	334	1,570	10.3	6062.2	6062.2	6062.2	0.0

[1] Feet Above South Ellicott Highway.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BOOK RANCH CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Butler Canyon								
A	1,490	250	337	6.7	7330.1	7330.1	7330.1	0.0
B	1,770	90	272	8.3	7355.1	7355.1	7355.1	0.0
C	1,980	50	204	11.1	7370.4	7370.4	7370.4	0.0
D	2,140	160	305	7.4	7377.1	7377.1	7377.1	0.0
E	2,280	80	230	9.8	7397.8	7397.8	7397.8	0.0
F	2,470	50	196	11.5	7428.3	7428.3	7428.3	0.0
G	2,730	60	210	10.8	7460.0	7460.0	7460.0	0.0
H	2,970	160	292	7.7	7488.0	7488.0	7488.0	0.0

[1]Feet Above Mouth.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

BUTLER CANYON

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Camp Creek								
A	422	165	473	5.7	6117.4	6117.4	6118.4	1.0
B	847	155	342	7.8	6129.0	6129.0	6129.1	0.1
C	1,332	140	856	5.5	6135.7	6135.7	6136.7	1.0
D	2,177	240	789	6.0	6156.0	6156.0	6156.2	0.2
E	2,542	310	753	6.2	6162.1	6162.1	6162.9	0.8
F	3,412	260	790	6.0	6180.0	6180.0	6180.0	0.0
G	3,624	215	969	4.8	6185.8	6185.8	6186.1	0.3
H	4,039	165	526	8.9	6194.4	6194.4	6194.4	0.0
I	4,180	160	603	7.8	6198.0	6198.0	6198.0	0.0
J	4,272	195	614	7.7	6199.7	6199.7	6199.7	0.0
K	5,017	180	578	8.1	6213.5	6213.5	6213.5	0.0
L	5,202	180	543	8.7	6217.8	6217.8	6217.8	0.0
M	5,582	183	554	8.5	6228.4	6228.4	6228.4	0.0
N	5,769	360	1,094	4.3	6232.7	6232.7	6233.6	0.9
O	5,899	212	624	7.5	6234.5	6234.5	6234.5	0.0
P	6,581	125	448	10.5	6245.9	6245.9	6245.9	0.0
Q	7,516	190	637	7.4	6264.7	6264.7	6264.7	0.0
R	7,756	250	675	7.0	6267.9	6267.9	6268.0	0.1
S	7,856	245	692	6.8	6269.8	6269.8	6269.8	0.0
T	9,096	130	480	9.6	6292.4	6292.4	6292.4	0.0
U	10,086	300	724	6.4	6312.5	6312.5	6312.6	0.1
V	10,257	285	747	6.2	6317.6	6317.6	6317.8	0.2
W	11,437	405	886	5.2	6344.5	6344.5	6344.6	0.1
X	13,217	270	688	6.7	6381.1	6381.1	6381.2	0.1

[1]Feet Above Confluence with Upper Fountain Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

CAMP CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Camp Creek (cont.)								
Y	14,457	140	535	8.6	6410.8	6410.8	6410.8	0.0
Z	14,875	225	644	7.1	6422.4	6422.4	6422.7	0.3
AA	14,990	200	678	6.8	6424.3	6424.3	6424.7	0.4
AB	15,398	195	633	7.3	6436.4	6436.4	6436.5	0.1
AC	15,612	120	498	9.2	6442.3	6442.3	6442.7	0.4
AD	15,979	190	659	7.0	6452.0	6452.0	6452.1	0.1
AE	16,082	200	630	7.3	6455.3	6455.3	6455.9	0.6
AF	16,562	250	777	5.9	6468.8	6468.8	6469.4	0.6
AG	17,412	220	647	7.1	6500.8	6500.8	6500.8	0.0
AH	17,718	170	578	8.0	6513.9	6513.9	6514.2	0.3
AI	18,063	140	546	8.4	6528.3	6528.3	6528.7	0.4

[1]Feet Above Confluence with Upper Fountain Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

CAMP CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Carpenter Creek								
B	49,136	299	524	6.6	7190.0	7190.0	7190.0	0.0
C	49,541	230	444	7.8	7197.9	7197.9	7197.9	0.0
D	49,877	150	376	9.2	7207.3	7207.3	7207.3	0.0
E	50,315	220	447	7.7	7220.1	7220.1	7220.1	0.0
F	50,501	190	392	8.8	7223.5	7223.5	7223.5	0.0
G	50,584	310	811	4.3	7225.4	7225.4	7225.4	0.0
H	50,702	240	365	9.5	7226.9	7226.9	7226.9	0.0

[1]Feet Above Mouth.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

CARPENTER CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Cheyenne Creek								
A	520	200	1,674	5.4	5918.4	5918.4	5918.9	0.5
B	1,130	770	2,160	4.2	5920.1	5920.1	5920.7	0.6
C	1,330	730	2,058	4.4	5920.3	5920.3	5921.0	0.7
D	1,370	880	2,056	4.4	5920.3	5920.3	5921.0	0.7
E	1,410	880	3,225	4.1	5922.3	5922.3	5922.6	0.3
F	1,710	695	2,061	6.5	5925.1	5925.1	5926.1	1.0
G	1,760	700	2,078	6.4	5925.2	5925.2	5926.1	0.9
H	1,840	740	2,903	4.6	5927.7	5927.7	5928.5	0.8
I	2,200	540	2,085	6.4	5930.9	5930.9	5931.2	0.3
J	2,490	410	1,848	7.2	5937.5	5937.5	5937.7	0.2
K	2,530	410	1,870	7.1	5938.0	5938.0	5938.0	0.0
L	2,930	830	3,609	3.7	5940.2	5940.2	5941.2	1.0
M	3,160	500	1,915	6.9	5946.4	5946.4	5946.7	0.3
N	3,210	500	2,014	6.6	5946.6	5946.6	5947.4	0.8
O	3,930	350	1,750	7.6	5959.5	5959.5	5959.7	0.2
P	3,980	350	1,711	7.8	5959.8	5959.8	5959.8	0.0
Q	4,130	530	2,289	5.8	5961.2	5961.2	5961.9	0.7
R	4,170	490	1,939	6.9	5961.4	5961.4	5961.5	0.1
S	4,560	400	1,898	7.0	5970.2	5970.2	5970.4	0.2
T	4,610	400	1,918	6.9	5970.5	5970.5	5970.7	0.2
U	5,060	300	1,643	8.1	5977.7	5977.7	5977.9	0.2
V	6,090	300	1,583	8.4	5993.2	5993.2	5993.7	0.5
W	6,940	600	2,249	5.9	6009.5	6009.5	6010.4	0.9
X	6,980	600	2,136	6.2	6009.8	6009.8	6010.4	0.6

[1]Feet Above Confluence with Fountain Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

CHEYENNE CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Cheyenne Creek (cont.)								
Y	7,470	300	1,549	8.6	6019.7	6019.7	6020.3	0.6
Z	7,910	300	1,636	8.1	6029.3	6029.3	6030.2	0.9
AA	8,920	450	1,862	7.1	6048.8	6048.8	6049.7	0.9
AB	9,810	650	2,163	6.1	6066.2	6066.2	6067.2	1.0
AC	10,190	600	1,991	6.7	6076.9	6076.9	6077.7	0.8
AD	11,200	450	1,752	7.6	6098.3	6098.3	6099.0	0.7
AE	12,320	300	1,666	8.0	6124.5	6124.5	6125.3	0.8
AF	12,650	200	1,335	10.0	6134.5	6134.5	6135.4	0.9
AG	12,710	200	1,341	9.9	6134.9	6134.9	6135.6	0.7
AH	13,220	200	1,311	10.1	6147.9	6147.9	6148.1	0.2
AI	14,180	250	1,353	9.8	6173.2	6173.2	6174.0	0.8
AJ	14,220	250	1,380	9.6	6173.4	6173.4	6174.3	0.9
AK	14,820	300	1,548	8.6	6193.4	6193.4	6194.2	0.8
AL	14,860	300	1,507	8.8	6193.5	6193.5	6194.3	0.8
AM	15,940	320	1,701	7.8	6220.6	6220.6	6221.4	0.8
AN	16,660	200	1,348	9.9	6245.2	6245.2	6245.6	0.4
AO	17,300	200	1,319	10.1	6264.9	6264.9	6264.9	0.0
AP	17,770	250	1,284	10.4	6280.4	6280.4	6280.5	0.1

[1]Feet Above Confluence with Fountain Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

CHEYENNE CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Cheyenne Run								
A	404	15	102	15.0	5936.1	5936.1	5936.1	0.0
B	490	15	101	15.0	5936.6	5936.6	5936.6	0.0
C	689	21	176	8.6	5942.0	5942.0	5942.0	0.0
D	1,473	23	186	8.2	5955.7	5955.7	5955.7	0.0
E	1,870	19	130	11.7	5959.1	5959.1	5959.1	0.0
F	2,238	19	145	10.5	5964.3	5964.3	5964.3	0.0
G	2,763	49	151	10.0	5970.6	5970.6	5970.6	0.0
H	3,231	19	126	12.1	5984.8	5984.8	5984.9	0.1
I	4,058	28	152	10.0	6001.4	6001.4	6001.4	0.0
J	4,445	29	95	10.4	6008.6	6008.6	6008.6	0.0
K	4,542	35	48	6.7	6014.4	6014.4	6015.0	0.6
L	5,072	37	49	6.6	6028.4	6028.4	6028.7	0.3
M	5,625	53	391	2.5	6039.2	6039.2	6040.2	1.0
N	5,955	40	107	9.3	6039.5	6039.5	6040.2	0.7
O	6,513	34	70	8.2	6048.3	6048.3	6049.1	0.8

[1]Feet Above Confluence with Cheyenne Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

CHEYENNE RUN

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Corral Tributary								
A	800	290	979	7.5	5843.4	5843.4	5843.6	0.2
B	2,150	210	953	7.7	5855.1	5855.1	5855.1	0.0
C	3,150	130	735	9.9	5861.8	5861.8	5861.9	0.1
D	3,710	170	774	9.4	5866.5	5866.5	5866.5	0.0
E	3,738	170	869	8.4	5867.1	5867.1	5867.1	0.0
F	3,780	90	639	11.4	5869.7	5869.7	5869.7	0.0
G	3,990	90	527	13.8	5871.2	5871.2	5871.2	0.0
H	5,360	70	485	15.0	5893.3	5893.3	5893.3	0.0
I	7,060	90	770	9.5	5906.4	5906.4	5906.7	0.3
J	8,410	60	441	15.9	5915.4	5915.4	5915.5	0.1
K	10,120	100	837	8.4	5928.9	5928.9	5929.3	0.4
L	12,160	90	378	13.2	5948.8	5948.8	5948.8	0.0
M	13,220	120	529	9.4	5958.8	5958.8	5959.0	0.2
N	16,000	100	486	10.3	5979.5	5979.5	5979.6	0.1
O	18,890	130	624	7.4	5998.7	5998.7	5998.9	0.2
P	20,700	90	386	11.9	6011.2	6011.2	6011.2	0.0
Q	22,410	70	456	9.7	6027.1	6027.1	6027.3	0.2
R	24,600	80	351	11.7	6047.1	6047.1	6047.1	0.0
S	26,780	150	640	6.4	6067.2	6067.2	6067.6	0.4
T	28,820	110	368	10.6	6085.3	6085.3	6085.3	0.0
U	30,050	210	656	5.9	6096.8	6096.8	6097.3	0.5
V	31,310	140	376	9.3	6110.1	6110.1	6110.1	0.0
W	31,530	110	353	9.9	6113.4	6113.4	6113.4	0.0
X	31,580	110	347	10.1	6114.2	6114.2	6114.2	0.0

[1]Feet Above Confluence with Jimmy Camp Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

CORRAL TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Corral Tributary (cont.)								
Y	31,620	140	715	4.9	6116.3	6116.3	6116.3	0.0
Z	31,720	140	669	5.2	6116.4	6116.4	6116.4	0.0
AA	32,080	160	371	8.6	6119.0	6119.0	6119.1	0.1
AB	33,220	50	242	11.6	6135.4	6135.4	6135.5	0.1
AC	34,892	80	281	10.0	6157.6	6157.6	6157.6	0.0
AD	37,192	120	376	6.4	6178.1	6178.1	6178.9	0.8
AE	38,252	50	200	11.0	6191.3	6191.3	6191.3	0.0
AF	39,672	80	313	6.6	6206.7	6206.7	6207.4	0.7

[1]Feet Above Confluence with Jimmy Camp Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

CORRAL TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Cottonwood Creek								
A	300	142	1,092	9.2	6251.8	6251.8	6252.3	0.5
B	460	130	1,026	9.7	6252.3	6252.3	6252.7	0.4
C	590	130	1,059	9.4	6252.6	6252.6	6253.6	1.0
D	780	96	712	14.0	6260.3	6260.3	6260.8	0.5
E	1,530	86	670	14.9	6274.1	6274.1	6274.2	0.1
F	1,555	97	1,033	9.7	6278.1	6278.1	6278.1	0.0
G	1,702	42	580	17.2	6280.9	6280.9	6280.9	0.0
H	1,922	90	1,604	6.2	6289.6	6289.6	6289.6	0.0
I	2,232	116	1,024	9.8	6291.9	6291.9	6292.0	0.1
J	2,766	198	997	10.0	6302.3	6302.3	6302.4	0.1
K	3,665	81	673	14.9	6315.5	6315.5	6315.5	0.0
L	4,445	87	794	12.6	6320.3	6320.3	6320.8	0.5
M	5,041	61	613	16.3	6326.4	6326.4	6326.7	0.3
N	5,920	75	618	16.2	6354.2	6354.2	6354.7	0.5
O	6,601	81	649	15.4	6365.8	6365.8	6366.4	0.6
P	7,841	100	675	14.8	6389.0	6389.0	6389.0	0.0
Q	7,941	100	897	11.2	6393.8	6393.8	6393.8	0.0
R	8,180	101	671	14.9	6401.3	6401.3	6402.0	0.7
S	8,930	92	651	15.4	6417.1	6417.1	6417.5	0.4
T	9,890	132	744	13.4	6432.2	6432.2	6432.9	0.7
U	10,811	350	1,026	9.7	6450.9	6450.9	6450.9	0.0
V	12,450	159	747	12.3	6472.6	6472.6	6472.6	0.0
W	13,020	127	689	13.3	6482.3	6482.3	6482.3	0.0
X	13,740	105	650	14.1	6500.7	6500.7	6500.7	0.0

[1]Feet Above Confluence with Monument Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

COTTONWOOD CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Cottonwood Creek (cont.)								
Y	13,865	105	650	14.2	6503.2	6503.2	6503.2	0.0
Z	14,170	200	820	11.2	6507.1	6507.1	6507.1	0.0
AA	14,741	169	766	12.0	6514.5	6514.5	6514.5	0.0
AB	15,491	181	783	11.8	6526.1	6526.1	6526.1	0.0
AC	15,806	193	799	11.5	6530.7	6530.7	6530.7	0.0
AD	16,256	128	693	13.3	6539.7	6539.7	6539.8	0.1
AE	16,526	215	1,009	9.1	6542.8	6542.8	6543.2	0.4
AF	17,106	221	945	11.5	6552.8	6552.8	6553.3	0.5
AG	17,346	194	808	11.4	6556.7	6556.7	6557.4	0.7
AH	17,876	239	862	10.7	6564.1	6564.1	6565.1	1.0
AI	18,506	209	853	10.8	6573.0	6573.0	6573.8	0.8
AJ	18,976	190	824	11.2	6577.3	6577.3	6578.0	0.7
AK	19,756	155	770	11.9	6588.6	6588.6	6589.1	0.5
AL	20,276	135	1,244	7.4	6606.3	6606.3	6606.3	0.0
AM	21,196	225	909	10.1	6614.1	6614.1	6614.3	0.2
AN	21,836	155	758	12.1	6623.7	6623.7	6624.6	0.9
AO	22,936	81	609	15.1	6642.4	6642.4	6643.3	0.9
AP	23,541	83	537	14.5	6651.2	6651.2	6651.2	0.0
AQ	24,571	83	537	14.5	6668.5	6668.5	6668.5	0.0
AR	25,826	99	570	13.7	6688.7	6688.7	6688.7	0.0
AS	26,917	100	544	13.3	6705.5	6705.5	6705.5	0.0
AT	28,212	110	565	12.8	6725.6	6725.6	6725.6	0.0
AU	29,347	130	590	12.3	6749.1	6749.1	6749.1	0.0
AV	30,817	130	553	13.1	6769.1	6769.1	6769.1	0.0

[1]Feet Above Confluence with Monument Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

COTTONWOOD CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Cottonwood Creek (cont.)								
AW	32,227	100	504	12.7	6795.3	6795.3	6795.3	0.0
AX	33,807	110	518	12.4	6822.8	6822.8	6822.8	0.0
AY	35,287	130	546	11.8	6848.5	6848.5	6848.9	0.4
AZ	36,587	90	482	13.3	6875.2	6875.2	6875.2	0.0
BA	36,798	70	449	14.3	6878.6	6878.6	6878.6	0.0
BB	36,829	77	555	11.6	6879.0	6879.0	6880.0	1.0
BC	37,262	80	466	13.8	6889.0	6889.0	6889.0	0.0
BD	37,552	80	468	13.7	6894.1	6894.1	6894.1	0.0
BE	38,617	90	414	11.8	6907.1	6907.1	6907.1	0.0
BF	39,797	110	435	11.2	6926.0	6926.0	6926.0	0.0
BG	40,792	100	424	11.5	6942.5	6942.5	6942.5	0.0
BH	41,767	60	349	14.0	6960.8	6960.8	6960.8	0.0
BI	41,837	40	307	15.9	6961.2	6961.2	6961.2	0.0
BJ	41,884	40	407	12.0	6963.7	6963.7	6963.7	0.0
BK	42,043	57	345	14.1	6965.1	6965.1	6965.1	0.0
BL	42,492	60	362	13.5	6974.1	6974.1	6974.1	0.0
BM	45,022	90	431	11.3	7014.0	7014.0	7014.0	0.0
BN	45,062	170	497	9.8	7023.6	7023.6	7024.1	0.5
BO	45,112	300	2,802	1.7	7024.9	7024.9	7025.8	0.9
BP	45,917	140	644	6.3	7024.9	7024.9	7025.8	0.9
BQ	46,432	120	447	9.1	7033.0	7033.0	7033.0	0.0
BR	46,711	182	453	9.1	7055.7	7055.7	7055.7	0.0
BS	47,961	92	324	12.7	7062.9	7062.9	7062.9	0.0
BT	49,561	90	354	11.6	7085.3	7085.3	7085.3	0.0

[1]Feet Above Confluence with Monument Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

COTTONWOOD CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Crystal Creek								
A	215	125	204	6.9	6928.7	6928.7	6928.7	0.0
B	717	262	1,036	1.2	6941.7	6941.7	6941.9	0.2
C	1,067	155	200	6.4	6945.0	6945.0	6945.2	0.2
D	1,767	110	172	7.1	6957.7	6957.7	6957.7	0.0
E	2,414	16	67	9.7	6978.4	6978.4	6978.4	0.0
F	2,759	26	70	9.2	6989.7	6989.7	6990.6	0.9
G	3,799	98	110	5.8	7004.8	7004.8	7004.8	0.0
H	4,319	110	208	2.9	7034.1	7034.1	7034.1	0.0
I	4,599	147	1,210	0.5	7034.2	7034.2	7034.2	0.0
J	4,984	73	92	6.5	7038.2	7038.2	7038.2	0.0
K	6,344	63	86	6.1	7080.8	7080.8	7081.8	1.0
L	6,834	70	286	1.8	7082.1	7082.1	7083.1	1.0
M	7,299	80	88	6.0	7099.1	7099.1	7100.0	0.9
N	7,819	54	110	4.8	7105.9	7105.9	7106.0	0.1
O	8,569	55	166	3.2	7129.4	7129.4	7129.6	0.2
P	9,094	50	181	2.3	7141.3	7141.3	7142.3	1.0

[1]Feet Above Monument Lake.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

CRYSTAL CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Dirty Woman Creek								
A	245	102	322	10.1	6866.2	6866.2	6867.1	0.9
B	767	147	743	4.4	6879.7	6879.7	6880.2	0.5
C	1,102	248	444	7.3	6885.7	6885.7	6885.7	0.0
D	1,507	167	972	3.4	6890.9	6890.9	6891.8	0.9
E	1,852	18	179	17.9	6900.6	6900.6	6900.6	0.0
F	2,503	70	561	5.7	6906.7	6906.7	6907.1	0.4
G	3,247	100	317	10.1	6930.3	6930.3	6931.1	0.8
H	3,489	30	489	6.2	6930.4	6930.4	6930.4	0.0
I	3,969	140	1,325	2.2	6931.0	6931.0	6931.0	0.0
J	4,476	75	360	8.2	6930.5	6930.5	6930.5	0.0
K	4,955	101	301	9.8	6932.1	6932.1	6932.1	0.0
L	5,624	82	282	10.4	6941.8	6941.8	6941.9	0.1
M	6,143	73	267	10.9	6946.6	6946.6	6946.6	0.0
N	6,324	32	234	14.3	6951.3	6951.3	6951.3	0.0
O	7,242	177	356	8.1	6969.3	6969.3	6969.3	0.0
P	7,999	281	395	6.8	6983.8	6983.8	6983.8	0.0
Q	8,485	52	220	11.5	6997.6	6997.6	6997.6	0.0
R	9,341	221	350	7.2	7012.7	7012.7	7012.7	0.0
S	9,903	176	331	7.6	7025.2	7025.2	7025.3	0.1
T	10,287	147	746	3.4	7032.4	7032.4	7033.3	0.9
U	10,779	121	286	8.8	7051.1	7051.1	7052.0	0.9
V	11,349	130	583	4.0	7053.7	7053.7	7054.6	0.9
W	11,819	100	255	9.2	7060.9	7060.9	7061.7	0.8
X	12,428	86	234	9.4	7073.6	7073.6	7073.6	0.0

[1]Feet Above Confluence with Monument Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

DIRTY WOMAN CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Dirty Woman Creek (cont.)								
Y	13,115	90	237	9.3	7088.1	7088.1	7088.3	0.2
Z	13,744	90	238	9.3	7100.1	7100.1	7100.5	0.4
AA	14,287	115	255	8.5	7117.4	7117.4	7117.7	0.3
AB	14,867	85	228	9.3	7128.9	7128.9	7129.8	0.9
AC	15,467	152	309	6.7	7138.8	7138.8	7139.8	1.0
AD	15,942	100	234	8.3	7146.4	7146.4	7146.6	0.2
AE	16,345	86	136	7.1	7156.9	7156.9	7156.9	0.0
AF	16,835	68	91	6.5	7172.7	7172.7	7172.7	0.0
AG	17,294	70	91	6.5	7191.2	7191.2	7191.3	0.1
AH	17,782	53	82	7.2	7203.0	7203.0	7203.0	0.0
AI	18,269	60	87	6.8	7225.0	7225.0	7225.2	0.2
AJ	18,837	60	79	6.5	7248.7	7248.7	7249.3	0.6
AK	19,352	47	72	7.1	7259.1	7259.1	7259.2	0.1
AL	19,862	36	66	7.8	7275.7	7275.7	7275.7	0.0
AM	20,352	35	47	6.6	7294.4	7294.4	7294.6	0.2
AN	20,952	50	52	5.9	7324.0	7324.0	7324.3	0.3

[1]Feet Above Confluence with Monument Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

DIRTY WOMAN CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Dirty Woman Creek - Lake Fork								
A	130	62	78	6.2	7018.4	7018.4	7018.4	0.0
B	935	25	56	8.6	7083.1	7083.1	7083.1	0.0
C	1,203	43	67	7.2	7095.1	7095.1	7095.1	0.0
D	1,358	64	77	6.3	7105.8	7105.8	7105.8	0.0
E	4,198	71	138	8.0	7112.8	7112.8	7113.3	0.5
F	4,788	68	136	8.1	7132.0	7132.0	7132.0	0.0
G	5,216	150	879	1.2	7144.4	7144.4	7144.6	0.2
H	5,720	80	136	7.5	7154.3	7154.3	7154.4	0.1
I	7,168	130	160	6.4	7192.7	7192.7	7192.8	0.1
J	7,508	110	138	6.4	7205.2	7205.2	7205.3	0.1
K	7,691	130	154	5.7	7208.7	7208.7	7208.7	0.0
L	8,356	70	119	7.5	7224.8	7224.8	7225.0	0.2
M	8,731	75	128	6.9	7237.7	7237.7	7237.9	0.2
N	9,309	130	491	1.2	7255.9	7255.9	7256.1	0.2
O	9,669	70	91	6.5	7273.4	7273.4	7273.6	0.2

[1]Feet Above Confluence with Dirty Woman Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

DIRTY WOMAN CREEK - LAKE FORK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Dirty Woman Creek - Middle Fork								
A	865	20	42	8.2	7180.8	7180.8	7180.8	0.0
B	1,385	70	64	5.5	7204.6	7204.6	7204.9	0.3
C	1,880	35	51	6.9	7216.3	7216.3	7216.3	0.0
D	2,410	35	50	7.0	7238.8	7238.8	7238.8	0.0
E	2,958	52	58	6.1	7261.3	7261.3	7262.0	0.7
F	3,290	60	47	5.0	7283.5	7283.5	7283.5	0.0
G	4,243	43	42	5.6	7317.7	7317.7	7317.7	0.0
H	4,735	35	39	6.0	7339.3	7339.3	7339.4	0.1

[1]Feet Above Confluence with Dirty Woman Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

DIRTY WOMAN CREEK - MIDDLE FORK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Dirty Woman Creek-North Fork								
A	300	80	99	6.3	7171.0	7171.0	7171.2	0.2
B	640	75	97	6.5	7185.0	7185.0	7185.2	0.2
C	1,170	60	95	6.6	7195.8	7195.8	7195.8	0.0
D	1,635	50	85	7.4	7206.9	7206.9	7206.9	0.0
E	2,205	50	84	7.5	7221.3	7221.3	7221.3	0.0
F	3,425	20	111	4.5	7255.3	7255.3	7255.8	0.5
G	3,805	114	96	5.2	7273.0	7273.0	7273.0	0.0
H	4,315	160	108	4.7	7290.2	7290.2	7290.2	0.0
I	4,745	60	95	1.2	7293.3	7293.3	7293.3	0.0
J	4,975	150	40	2.9	7311.7	7311.7	7311.7	0.0
K	5,615	60	38	3.1	7324.3	7324.3	7324.5	0.2
L	5,995	35	24	4.8	7346.5	7346.5	7346.5	0.0
M	6,575	20	19	5.6	7363.2	7363.2	7363.2	0.0
N	6,925	85	31	3.5	7388.8	7388.8	7388.8	0.0

[1]Feet Above Confluence with Dirty Woman Creek – Middle Fork.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

DIRTY WOMAN CREEK- NORTH FORK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Dirty Woman Creek - South Fork								
A	432	54	61	6.1	7178.6	7178.6	7178.8	0.2
B	1,085	220	99	3.8	7210.0	7210.0	7210.0	0.0
C	1,522	70	67	5.6	7223.4	7223.4	7223.4	0.0
D	2,117	40	56	6.8	7247.7	7247.7	7247.7	0.0
E	2,630	90	52	4.4	7274.0	7274.0	7274.2	0.2
F	3,089	70	48	4.7	7298.2	7298.2	7298.6	0.4
G	3,692	40	21	4.2	7329.0	7329.0	7329.0	0.0
H	4,187	60	24	3.7	7360.1	7360.1	7360.1	0.0

[1]Feet Above Confluence with Dirty Woman Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

DIRTY WOMAN CREEK - SOUTH FORK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD29)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Douglas Creek North								
BEGIN PROFILE DATA IN NGVD 1929								
A	870	40	261	14.0	6139.1	6139.1	6139.2	0.1
B	1,280	380	500	6.8	6164.2	6164.2	6164.2	0.0
C	2,040	40	293	15.6	6170.4	6170.4	6170.4	0.0
D	2,760	190	1,669	2.7	6199.0	6199.0	6199.0	0.0
E	3,520	70	338	13.5	6209.7	6209.7	6209.7	0.0

[1]Feet Above Confluence with Monument Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

DOUGLAS CREEK NORTH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD29)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Douglas Creek South								
A	210	70	331	11.1	6109.2	6109.2	6109.2	0.0
B	500	30	224	16.4	6121.6	6121.6	6121.6	0.0
C	540	30	269	13.7	6123.3	6123.3	6123.3	0.0
D	730	80	500	7.4	6125.9	6125.9	6125.9	0.0
E	1,100	70	342	10.8	6132.4	6132.4	6132.4	0.0
F	1,590	20	212	17.4	6152.7	6152.7	6152.7	0.0
G	1,670	20	262	14.0	6154.9	6154.9	6154.9	0.0
H	2,190	170	985	3.7	6183.0	6183.0	6183.0	0.0
I	2,480	200	347	10.2	6196.8	6196.8	6196.8	0.0
J	3,650	90	563	6.5	6198.7	6198.7	6198.9	0.2
K	4,500	237	597	4.5	6214.0	6214.0	6215.0	1.0
L	5,282	32	193	14.0	6232.3	6232.3	6232.5	0.2
END PROFILE DATA IN NGVD 1929								

[1]Feet Above Confluence with Monument Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

DOUGLAS CREEK SOUTH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Douglas Creek South (cont.)								
BEGIN PROFILE DATA IN NAVD 1988								
M	5,930	66	538	5.0	6248.1	6248.1	6248.6	0.5
N	7,124	23	160	12.3	6268.7	6268.7	6269.0	0.3
O	8,140	37	164	12.0	6287.3	6287.3	6287.3	0.0
P	9,645	37	164	12.0	6319.2	6319.2	6319.2	0.0
Q	10,204	37	164	12.0	6342.6	6342.6	6342.6	0.0
R	11,118	37	164	12.0	6363.7	6363.7	6363.7	0.0
S	11,548	26	144	13.6	6378.3	6378.3	6378.3	0.0
T	11,991	25	143	13.7	6392.1	6392.1	6392.1	0.0
U	12,558	25	209	7.1	6408.0	6408.0	6408.1	0.1
V	13,658	20	110	13.6	6432.0	6432.0	6432.0	0.0

[1]Feet Above Confluence with Monument Creek.

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

DOUGLAS CREEK SOUTH