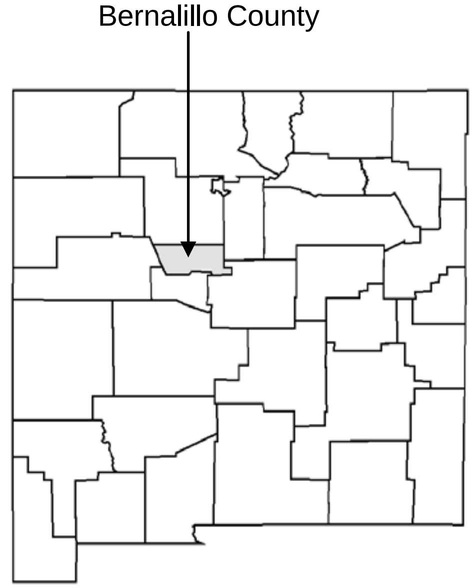
FLOOD INSURANCE STUDY

VOLUME 1 OF 2

BERNALILLO COUNTY, NEW MEXICO

AND INCORPORATED AREAS



COMMUNITY NAME	COMMUNITY NUMBER
ALBUQUERQUE, CITY OF	350002
BERNALILLO COUNTY, UNINCORPORATED AREAS	350001
EDGEWOOD, TOWN OF	350018
ISLETA, PUEBLO OF	350057
*LAGUNA, PUEBLO OF	350003
LOS RANCHOS DE ALBUQUERQUE, VILLAGE OF	350123
*NAVAJO INDIAN RESERVATION	350091
RIO RANCHO, CITY OF	350146
SANDIA, PUEBLO OF	350087
TIJERAS, VILLAGE OF	350135

* No Special Flood Hazard Areas Identified

REVISED:
NOVEMBER 4, 2016

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
35001CV001D

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) report may not contain all data available within the Community Map Repository. Please contact the Community Map Repository for any additional data.

The Federal Emergency Management Agency (FEMA) may revise and republish part or all of this FIS report at any time. In addition, FEMA may revise part of this FIS report by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS report. Therefore, users should consult with community officials and check the Community Map Repository to obtain the most current FIS report components.

This FIS report was revised on November 4, 2016. Users should refer to Section 10.0 Revision 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 supersedes information in Section 1.0 through 9.0 of this FIS report.

Initial Countywide Effective Date: September 20, 1996

Revised Countywide Effective Dates:

April 2, 2002
- To update corporate limits, to change Base Flood Hazard Areas, to add roads and road names, to reflect updated topographic information, and to incorporate previously issued Letters of Map Revision.

November 19, 2003
- To update corporate limits and to incorporate previously issued Letters of Map Revision.

September 26, 2008
- To update corporate limits, to change Special Flood Hazard Areas, to add roads and road names, to incorporate previously issued Letters of Map Revision, to reflect updated topographic information, to change Base Flood Elevations, to add Base Flood Elevations.

August 16, 2012
- To update corporate limits, to change Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to add roads and road names, to incorporate previously issued Letters of Map Change.

November 4, 2016
- To update corporate limits, to incorporate previously issued Letters of Map Change.

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EXHIBITS

FLOOD INSURANCE STUDY
BERNALILLO COUNTY, NEW MEXICO AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Bernalillo County, NM, including the Cities of Albuquerque and Rio Rancho; the Town of Edgewood; the Villages of Los Ranchos de Albuquerque and Tijeras; the Pueblos of Isleta, Sandia, and Laguna; the Navajo Indian Reservation; and the unincorporated areas of Bernalillo County (referred to collectively herein as Bernalillo County). It 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 county that will be used to establish actuarial flood insurance rates and to assist the county in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR 60.3.

Please note that the City of Rio Rancho and the Pueblo of Sandia are in both Bernalillo and Sandoval Counties (Reference 1). The Town of Edgewood is in Bernalillo and Santa Fe Counties (Reference 2). The Pueblo of Isleta is in both Bernalillo and Valencia Counties (Reference 3). The Pueblo of Laguna is in Bernalillo, Cibola, Sandoval, and Valencia Counties (References 1 – 4). The Navajo Indian Reservation is in Bernalillo, Cibola, McKinley, Rio Arriba, San Juan, Sandoval, and Socorro Counties, New Mexico; Apache, Navajo and Coconino Counties, Arizona; and Kane and San Juan Counties, Utah. See these separately published FIS reports and Flood Insurance Rate Maps (FIRMs) for the countywide map dates and flood hazard information outside of Bernalillo County.

Please note that, as of the effective date of this study, the Pueblo of Laguna and the Navajo Indian Reservation have no mapped Special Flood Hazard Areas (SFHAs) identified in Bernalillo County. This does not preclude future determinations of SFHAs that could be necessitated by changed conditions affecting the community (e.g., the annexation of new lands), or the availability of new scientific or technical data about flood hazards.

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, these criteria or regulations take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

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

Information on the authority and acknowledgments for each of the previously published FIS and FIRMs for communities within Bernalillo County was compiled and is shown below.

City of Albuquerque:	The hydrologic and hydraulic analyses for Calabacillas Arroyo, the Rio Grande, and Tijeras Arroyo (south of Kirtland Air Force Base) (Reference 5) were performed by Bohannan-Huston, Inc., for the Federal Emergency Management Agency (FEMA), under Contract No. H-6852. This work was completed in November 1981. Supplemental hydrologic and hydraulic information was taken from other sources (References 6 – 9). Hydrologic information for the Rio Grande was taken from a U.S. Army Corps of Engineers (USACE) study (Reference 10).
Bernalillo County (Unincorporated Areas):	The hydrologic and hydraulic analyses for Frost Arroyo, Rio Puerco, San Pedro Creek, and Unnamed Arroyo No. 1 (Reference 5) were performed by Bohannan-Huston, Inc., for FEMA, under Contract No. H-6852. This work was completed in December 1981.
Village of Tijeras:	The hydrologic and hydraulic analyses for Cedro Canyon Arroyo and Tijeras Arroyo (at Tijeras) (Reference 11) were performed by Bohannan-Huston, Inc., for FEMA, under Contract No. H-6852. This work was completed in June 1980.

There are no previous FISs or FIRMs for the City of Rio Rancho, the Town of Edgewood, the Pueblos of Isleta, Laguna, and Sandia, and the Navajo Indian Reservation, and no previous FISs for the Village of Los Ranchos de Albuquerque; therefore, the previous authority and acknowledgment information for these communities is not included in this FIS. These communities may not appear in the Community Map History table (Section 6.0).

September 20, 1996, FIS

For the FIS (Reference 12), dated September 20, 1996, the hydrologic and hydraulic analyses for Arroyos A-B, A-C, B-B, and B-C; the Tierra Bayita Storm Drain; and the Rio Grande (upstream of Cross-section AE) were performed by Resource Technology, Inc., for a study that was completed in September 1995. Several Letters of Map Revision (LOMRs), which are listed in Section 2.1, were incorporated into the FIS.

Previous FIS Revisions

For the FIS (Reference 13), dated April 2, 2002, the hydrologic and hydraulic analyses for Arroyo del Pino, Arroyo SB, Bear Arroyo Tributary, Middle Branch South Arroyo de Domingo Baca Tributary, North Arroyo de Domingo Baca, North Domingo Baca Spillway, South Arroyo de Domingo Baca, South Arroyo de Domingo Baca Tributary, South Branch South Arroyo de Domingo Baca Tributary, South Domingo Baca Spillway, Tijeras Arroyo (north of Kirtland Air Force Base), and Tijeras Arroyo Tributaries A through F were performed by Resource Technology, Inc., under Contract No. EMW-94-C-4647. This restudy was completed in May 1996. Several LOMRs, which are listed in Section 2.1, were incorporated into the FIS.

There were no changes to the hydrologic and hydraulic analyses for the November 19, 2003 (Reference 14), FIS; however, several LOMRs, which are listed in Section 2.1, were incorporated into this revision.

For the FIS (Reference 15), dated September 26, 2008, the hydrologic and hydraulic analyses for Airport Arroyo, Boca Negra Arroyo, Boca Negra Arroyo Split Flow, Calabacillas Arroyo, Embudo Arroyo, Embudo Hills Storm Drain, Frost Arroyo, Indian

School Road, Juniper Hill Arroyo, Menaul Detention Basin, Mesa Del Sol Playas 1, 2, and 3, Middle Tributary of the Boca Negra Arroyo, North Branch of the San Antonio Arroyo, Odelia Park Dam, San Antonio Arroyo, San Pedro Creek, and the Rio Grande de-accredited levee analyses from the Isleta boundary, north for three miles, were performed by Mapping Alliance Partnership (MAPVI), under Contract No. EMT-2002-CO-0052. This restudy was completed in December 2007. Several LOMRs, which are listed in Section 2.1, were incorporated into this revision.

August 16, 2012, FIS

For the August 16, 2012, FIS, Risk Assessment, Mapping, and Planning Partners (RAMPP) conducted 142 miles of approximate analysis in eastern and southern Bernalillo County, near the Town of Edgewood, the Pueblo of Isleta, and the Village of Tijeras. RAMPP also conducted 2 miles of detailed analysis on the Glenrio and McKnight Storm Drains in the City of Albuquerque. Several LOMRs issued since the 2008 revision have been incorporated into this revision and are shown in Table 8, Section 2.1. RAMPP completed this work in November 2010 under Contract No. HSFEHQ-09-D-0369.

Base map information shown on the FIRM was provided in digital format by the City of Albuquerque (2010), Bernalillo County (2004 and 2010), Bureau of Land Management (2003), National Geodetic Survey (2003), and U.S. Geological Survey (USGS; 1999). Additional information was photogrammetrically compiled at a scale of 1:12,000 from U.S. Department of Agriculture aerial photography (2009).

RAMPP used the New Mexico State Plane, Central Zone (Federal Information Processing Standard 3002) projection in preparing this map. The horizontal datum was North American Datum of 1983, Geodetic Reference System 1980 spheroid. Differences in datum, spheroid, projection, or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM. Flood elevations on this map are referenced to the North American Vertical Datum of 1988 (NAVD 88).

November 4, 2016, Physical Map Revision

Please refer to Section 10.1 for details on this revision.

1.3 Coordination

The purpose of an initial Consultation Coordination Officer (CCO) meeting is to discuss the scope of the FIS. A final CCO meeting is held to review the results of the study. The dates of the initial and final CCO meetings held for the previous FIS for Bernalillo County and the incorporated communities within its boundaries are shown in Tables 1 and 2 (References 5 and 11 – 16).

The initial CCO meetings were held with representatives from FEMA, the communities, and the study contractors to explain the nature and purpose of a FIS and to identify the streams to be studied by detailed methods. The final CCO meetings were held with representatives from FEMA, the communities, and the study contractors to review the results of the studies.

Table 1 – CCO Meetings Prior to September 20, 1996 FIS

Community Name	Initial CCO Date	Final CCO Date
City of Albuquerque	June 1979	November 3, 1982
Bernalillo County (Unincorporated Areas)	June 1979	November 3, 1982
Village of Tijeras	June 1979	January 20, 1982

Table 2 – CCO Meetings After September 20, 1996 FIS

Revision Date	Initial CCO Date	Final CCO Date
FIS dated September 1996	*	September 12, 1995
FIS dated April 2, 2002	August 12, 1993	September 12, 1995
FIS dated November 19, 2003	*	January 22, 2003
FIS dated September 26, 2008	July 28 and August 12, 2003	September 18, 2007

* Data Not Available

For the August 16, 2012, FIS, an initial CCO meeting was held on November 4, 2009, with representatives from FEMA, the community, and the study contractor. The final CCO meeting was held on March 7, 2011, with representatives from FEMA, the community, and the study contractor.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS report covers the geographic area of Bernalillo County, New Mexico. The areas studied by detailed methods (Table 3) were selected with priority given to all known flood hazards and areas of projected development or proposed construction through 2010.

Table 3 – Stream Reaches Studied by Detailed Methods

Stream	Limits of Detailed Study
Airport Arroyo	From approximately 50 feet downstream from University Boulevard to approximately 50 feet upstream of Edmund Street

Table 3 – Stream Reaches Studied by Detailed Methods (continued)

Stream	Limits of Detailed Study
Amole Arroyo	From Westgate Detention Dam to Snow Vista Channel
Arroyo A-B	From approximately 70 feet downstream from Amalia Road to approximately 130 feet upstream of Sage Road
Arroyo B-B	From approximately 580 feet downstream from Unser Boulevard to approximately 820 feet upstream of 94th Street
Arroyo B-C	From approximately 50 feet downstream from Arenal Road SW to approximately 345 feet upstream of West Sky Street
Arroyo Del Pino	From confluence with Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) Diversion Channel to Wyoming Boulevard
Bear Arroyo Tributary	From the South Pino Tributary Desiltation Pond to approximately 3,650 feet upstream of the South Pino Tributary Desiltation Pond
Boca Negra Arroyo	From approximately 2,350 feet upstream from Paseo Del Volcan to approximately 750 feet upstream of Compass Court
Boca Negra Arroyo Split Flow	From approximately 1,200 feet downstream from Chiquito Place to approximately 50 feet upstream of Lynn Road
Borrega Arroyo	From approximately 2,270 feet downstream from Perdiz Street to approximately 1,550 feet upstream of 118th Street
Calabacillas Arroyo	From the confluence with the Rio Grande approximately 10,000 feet upstream of Unser Boulevard
Cedro Canyon Arroyo	From the confluence with Tijeras Arroyo (at Tijeras) to approximately 920 feet upstream of State Route 337
Double Eagle II Channel	From I-40 to Atrisco Vista Blvd
Embudo Arroyo	From approximately 240 feet downstream from Tramway Boulevard to approximately 1,300 feet upstream of Monte Largo Drive
Frost Arroyo	Approximately 2.6 miles upstream of the confluence of San Pedro Creek to the downstream side of Camino Alto Road
Glenrio Storm Drain	From Outfall at Rio Grande to Estancia Drive.
Indian School Road	I-25 to University Boulevard
Juniper Hill Arroyo	Approximately 100 feet downstream from Sandia Indian Reservation boundary to the upstream Cibola National Forest boundary
Ladera Diversion Channel	From Ladera drive to Ouray Road
McKnight Storm Drain	From Confluence with Embudo Channel to Pitt Street
Menaul Detention Basin	Approximately 150 feet upstream of I-25 to approximately 700 feet downstream from Broadway Boulevard
Mesa Del Sol Playa 1	Approximately 1800 feet north of the City of Albuquerque / Isleta Reservation boundary.

Table 3 – Stream Reaches Studied by Detailed Methods (continued)

Stream	Limits of Detailed Study
Mesa Del Sol Playa 2	Approximately 2.2 miles north of the Isleta Reservation Boundary and 1.5 miles west of the City of Albuquerque and Kirtland Air Force Base boundary
Mesa Del Sol Playa 3	Approximately 1,400 feet west of the City of Albuquerque / Kirtland Air Force Base and coincident with the City of Albuquerque / Isleta Indian Reservation boundary on the south.
Middle Tributary of the Boca Negra Arroyo	Approximately 220 feet downstream from Rim Rock Drive to approximately 480 feet upstream of Boulevard de Oest Lane
Mirehaven Arroyo A	Ladera Dam Detention Pond 12 to approximately 3,000 feet above Ladera Detention Pond 12
Mirehaven Arroyo B	Ladera Dam to approximately 1,000 feet above Ladera Dam
Mirehaven Arroyo C	From Unser Diversion to I-40
North Branch of the San Antonio Arroyo	Approximately 130 feet upstream of Dellyne Avenue
North Camino Arroyo	From approximately 1,800 feet west of San Mateo Blvd to I-25
North Pino Channel	From the confluence with AMAFCA North Diversion Channel to approximately 0.5 mile upstream of Eubank Boulevard
Odelia Park Dam	Approximately 150 feet from Locust Place on the West and 100 feet from Odelia Road on the South and 200 feet from I-25 on the East
Rio Grande	From approximately 1,150 feet downstream from U.S. Interstate 25 to the upstream county boundary
Rio Grande East Overbank	From approximately 1,300 feet downstream from U.S. Interstate 25 to approximately 2,000 feet upstream of Shirk Lane SW
Rio Puerco	From approximately 1,260 feet downstream from the confluence of Unnamed Arroyo No. 1 to approximately 4,450 feet upstream of North Central Avenue
San Antonio Arroyo	From the confluence with the Rio Grande to approximately 1,000 ft upstream of Vulcan Drive.
San Pedro Creek	From the confluence with Frost Arroyo to approximately 0.2 mile upstream of Old Crest Road
Shamrock Channel/Tributary 2 Westgate Dam to Shamrock Channel	From confluence with Double Eagle II Channel to 1.9 miles upstream of Atrisco Vista Blvd

Table 3 – Stream Reaches Studied by Detailed Methods (continued)

Stream	Limits of Detailed Study
South Branch of the Piedras Marcados Arroyo	From the confluence with the Corrales Canal to just upstream of Thornwood Drive
South Domingo Baca Arroyo	From the confluence with Domingo Baca Arroyo to 0.3 mile upstream of the Forest Boundary
Southern Unnamed Tributary to Borrega Arroyo	From the confluence with Borrega Arroyo to approximately 960 feet upstream of the confluence with Borrega Arroyo
Tierra Bayita Storm Drain	From approximately 80 feet upstream of Unser Boulevard to approximately 400 feet upstream of Bridge Boulevard
Tijeras Arroyo	From the confluence with the Rio Grande to approximately 2,400 feet upstream of the confluence of Tijeras Arroyo Tributary F
Tijeras Arroyo (at Tijeras)	From approximately 270 feet downstream from the confluence of Cedro Canyon Arroyo to approximately 830 feet upstream of Cresenciano Road
Unnamed Arroyo No. 1	From the confluence with Rio Puerco to approximately 3,720 feet upstream of North Central Avenue
Unser Channel	From Unser Blvd to 98th Street
West I-40 Diversion Channel	From West Bluff Pond to Unser Blvd

Table 4 lists the LOMRs incorporated into September 20, 1996 FIS.

Table 4 – LOMRs Incorporated into the September 20, 1996 FIS

Case No.	Effective Date	Flooding Source	Community
--	March 15, 1984	Unnamed flooding source	City of Albuquerque
--	January 11, 1985	Arroyo del Pino	City of Albuquerque
--	April 8, 1985	South Domingo Baca diversion channel	City of Albuquerque
--	April 8, 1985	Shallow flooding	City of Albuquerque
--	May 10, 1985	North Pino Arroyo	City of Albuquerque
--	September 13, 1985	Pino Arroyo	City of Albuquerque
--	November 29, 1985	Embudo Diversion Tunnel	City of Albuquerque
--	May 5, 1987	Black Arroyo	City of Albuquerque
--	May 5, 1987	Bear Arroyo Tributary	City of Albuquerque
--	October 9, 1987	Shallow flooding	City of Albuquerque
--	February 5, 1988	Arroyo del Pino	City of Albuquerque
--	April 4, 1988	Domingo Baca Arroyo	City of Albuquerque
--	June 3, 1988	La Cueva Arroyo	City of Albuquerque
6-90-95	June 1, 1990	Shallow flooding	City of Albuquerque
6-90-61	June 29, 1990	Shallow flooding	City of Albuquerque
6-89-207	June 29, 1990	Shallow flooding	City of Albuquerque

Table 4 – LOMRs Incorporated into the September 20, 1996 FIS

Case No.	Effective Date	Flooding Source	Community
6-91-98	June 5, 1991	Shallow flooding	City of Albuquerque
92-06-098P	July 31, 1992	Shallow flooding	City of Albuquerque
92-06-135P	April 19, 1993	Main and South Branches San Antonio Arroyo	City of Albuquerque
93-06-234P	September 3, 1993	South Branch Piedras Marcadas Arroyo	City of Albuquerque
94-06-036P	January 28, 1994	Vineyard Arroyo	City of Albuquerque
94-06-103P	March 17, 1994	Arroyo del Pino	City of Albuquerque
94-06-145A	August 31, 1994	Ponding area	City of Albuquerque
94-06-353P	October 27, 1994	Local drainage	City of Albuquerque
94-06-376P	November 15, 1994	Arroyo del Pino	City of Albuquerque
95-06-086P	January 26, 1995	La Cueva Tributary	Unincorporated Areas
95-06-147P	May 4, 1995	Middle Branch Piedras Marcadas Arroyo	City of Albuquerque
95-06-247P	June 23, 1995	Black Arroyo	City of Albuquerque
95-06-317P	July 27, 1995	Unnamed tributary to North Arroyo de Domingo Baca	City of Albuquerque
95-06-404P	November 10, 1995	Unnamed tributary to Quickwater Channel	City of Albuquerque
96-06-013P	December 1, 1995	Unnamed arroyo	City of Albuquerque
96-06-057P	January 31, 1996	Middle Branch Piedras Marcadas Arroyo	City of Albuquerque
96-06-127P	March 25, 1996	North Branch Piedras Marcadas Arroyo	City of Albuquerque

Table 5 lists the LOMRs incorporated into April 2, 2002 FIS.

Table 5 – LOMRs Incorporated into the April 2, 2002 FIS

Case No.	Effective Date	Flooding Source	Community
96-06-423P	September 23, 1996	Ventura Tributary to North Arroyo de Domingo Baca	City of Albuquerque
96-06-507P	January 6, 1997	Middle Branch Piedras Marcadas Arroyo	City of Albuquerque, Unincorporated Areas
97-06-149P	May 2, 1997	South Pino Tributary	City of Albuquerque
97-06-776P	July 16, 1997	Shallow flooding	City of Albuquerque
97-06-347P	August 1, 1997	South La Cueva Arroyo	City of Albuquerque
96-06-517P	September 16, 1997	South Tributary to North Arroyo de Domingo Baca	Unincorporated Areas
97-06-139P	November 24, 1997	South Branch of North Arroyo de Domingo Baca	City of Albuquerque
98-06-275P	December 22, 1997	North Camino Arroyo	Unincorporated Areas
97-06-271P	February 27, 1998	La Cueva Diversion Channel and La Cueva Arroyo Tributary	Unincorporated Areas

Table 5 – LOMRs Incorporated into the April 2, 2002 FIS (Continued)

Case No.	Effective Date	Flooding Source	Community
98-06-777P	March 25, 1998	North Branch of North Arroyo de Domingo Baca	City of Albuquerque
98-06-991P	April 24, 1998	North Pino Arroyo	City of Albuquerque
98-06-990P	April 24, 1998	North Arroyo de Domingo Baca	City of Albuquerque
98-06-1281P	June 3, 1998	La Cueva Diversion Channel and La Cueva Arroyo Tributary	Unincorporated Areas
98-06-660P	September 11, 1998	North and South La Cueva Arroyos	City of Albuquerque, Unincorporated Areas
97-06-1337P	October 21, 1998	Rio Grande	City of Albuquerque, Unincorporated Areas
99-06-514P	April 26, 1999	North Arroyo de Domingo Baca	City of Albuquerque
99-06-1803P	September 29, 1999	Watercress and Goldenthread Columbine Flowpath	City of Albuquerque
99-06-513P	January 19, 2000	North Arroyo de Domingo Baca	Unincorporated Areas
00-06-614P	March 31, 2000	North Arroyo de Domingo Baca	Unincorporated Areas
00-06-420P	July 13, 2000	I-40 Drainageway	City of Albuquerque
99-06-1119P	July 13, 2000	Bear Arroyo Tributary, South Pino Tributary	City of Albuquerque
01-06-152P	July 30, 2001	Shallow flooding	City of Albuquerque, Unincorporated Areas

Table 6 lists the LOMRs incorporated into the November 19, 2003.

Table 6 – LOMRs Incorporated into the November 19, 2003 FIS

Case No.	Effective Date	Flooding Source	Community
97-06-045P	December 20, 1996	Unnamed tributary to Calabacillas Arroyo	City of Albuquerque, Unincorporated Areas
97-06-172P	April 4, 1997	Ponding area	Unincorporated Areas
97-06-304P	April 11, 1997	South Diversion Channel, Tijeras Arroyo	City of Albuquerque, Unincorporated Areas
97-06-670P	July 1, 1997	Sunningdale Watershed	City of Albuquerque
97-06-250P	August 26, 1997	Unnamed tributary to Snow Vista Channel	City of Albuquerque
97-06-1046P	September 5, 1997	Ladera Arroyo	City of Albuquerque, Unincorporated Areas
97-06-1071P	September 10, 1997	Shallow flooding	City of Albuquerque

Table 6 – LOMRs Incorporated into the November 19, 2003 FIS (cont'd)

Case No.	Effective Date	Flooding Source	Community
97-06-1075P	September 15, 1997	Street flooding	City of Albuquerque
97-06-1026P	September 25, 1997	Ponding Area 17	City of Albuquerque
97-06-1175P	October 3, 1997	Mirehaven Arroyos B and C	City of Albuquerque, Unincorporated Areas
97-06-1054P	October 24, 1997	Unnamed tributary to Ponding Area 22	City of Albuquerque
98-06-038P	October 31, 1997	Ponding area	Unincorporated Areas
98-06-058P	January 26, 1998	Arroyo de San Antonio	City of Albuquerque, Unincorporated Areas
98-06-1114P	June 18, 1998	North and South Pajarito Arroyos	City of Albuquerque, Unincorporated Areas
98-06-1150P	June 18, 1998	Los Indios Arroyo, Raymac Arroyo	Unincorporated Areas
98-06-781P	July 17, 1998	Amole del Norte Channel	City of Albuquerque
98-06-1065P	September 18, 1998	Ponds 16A & B, Rinconada Arroyo	City of Albuquerque
99-06-685P	March 16, 1999	Boca Negro Arroyo, Boca Negro Arroyo South, Mariposa Detention Facility and Diversion Channel	City of Albuquerque
99-06-844P	April 15, 1999	Ponding Area 22, Shallow flooding	City of Albuquerque
99-06-815P	September 27, 1999	Snow Vista Channel	City of Albuquerque
00-06-210A	January 13, 2000	Ponding area	City of Albuquerque
00-06-089P	January 24, 2000	Unnamed arroyo	City of Albuquerque
00-06-609P	February 29, 2000	Unnamed flooding source	City of Albuquerque
00-06-296P	March 21, 2000	Ponding area	City of Albuquerque
00-06-1700P	October 6, 2001	North Arroyo de Domingo Baca	Unincorporated Areas
00-06-1176P	November 8, 2001	Unnamed tributary to Amole Arroyo	Unincorporated Areas
01-06-303P	December 1, 2001	Pond 7	City of Albuquerque
01-06-880P	January 29, 2002	Borrega Arroyo	Unincorporated Areas
02-06-1261P	July 16, 2002	North Arroyo de Domingo Baca	City of Albuquerque, Unincorporated Areas
02-06-1262P	August 1, 2002	Shallow flooding	City of Albuquerque, Unincorporated Areas
02-06-1544P	September 10, 2002	Barr Arroyo	Unincorporated Areas
02-06-2143P	January 8, 2003	Shallow flooding	City of Albuquerque, Unincorporated Areas
03-06-413P	April 30, 2003	Vista Sandia Storm Drain	City of Albuquerque
03-06-439P	May 14, 2003	Unnamed shallow flooding area	City of Albuquerque
03-06-200P	June 13, 2003	Unnamed tributary to Mirehaven Arroyo	City of Albuquerque, Unincorporated Areas

Table 7 lists the LOMRs incorporated for the September 26, 2008 FIS.

Table 7 – LOMRs Incorporated into the September 26, 2008 FIS

Case No.	Effective Date	Flooding Sources	Community
96-06-213P	June 28, 1996	Unnamed Tributary to Ponding Area 22	City of Albuquerque
03-06-412P	August 4, 2003	Two unnamed tributaries to Arroyo De Domingo Baca, referred to as North Tributary & South Tributary	City of Albuquerque
03-06-1002P	August 15, 2003	Arroyo B-A & storm drain pipe (for an unnamed upper tributary to Amole Arroyo) & unnamed lower tributary to Amole Arroyo & North Pond & South Pond	City of Albuquerque
03-06-445P	September 8, 2003	Arroyo A-C & Gonzales Pond & Ponding Area 18	City of Albuquerque
03-06-2678P	October 3, 2003	Unnamed shallow flooding area	City of Albuquerque
03-06-1734P	October 9, 2003	Unnamed shallow flooding area	City of Albuquerque
03-06-1742P	October 21, 2003	Arroyo B-B & Two unnamed detention ponds	Unincorporated Areas
04-06-241P	November 20, 2003	Arroyo A-C	City of Albuquerque Unincorporated Areas
04-06-242P	November 20, 2003	Arroyo B-B	City of Albuquerque Unincorporated Areas
04-06-244P	November 20, 2003	Unnamed shallow flooding area	City of Albuquerque
04-06-245P	November 20, 2003	Tierra Bayita Storm Drain	City of Albuquerque
04-06-246P	November 20, 2003	Unnamed shallow flooding area	City of Albuquerque
04-06-247P	November 20, 2003	Two unnamed tributaries to South Domingo Baca Arroyo, referred to as North Tributary and South Tributary	City of Albuquerque
04-06-243P	December 4, 2003	Borrega Arroyo	Unincorporated Areas
04-06-394P	December 9, 2003	Bear Arroyo Tributary	City of Albuquerque
03-06-2531P	December 16, 2003	Unnamed Zone AO, Shallow flooding	City of Albuquerque
03-06-2543P	December 16, 2003	North Arroyo De Domingo Baca, unnamed tributary to North Arroyo De Domingo Baca	City of Albuquerque
03-06-2542P	January 27, 2004	Arroyo B-B	City of Albuquerque, Unincorporated Areas
03-06-1003P	March 3, 2004	Pond B	City of Albuquerque
04-06-659P	February 27, 2004	Ponds 2 and 5	Unincorporated Areas
04-06-671P	March 23, 2004	North Arroyo De Domingo Baca	City of Albuquerque, Unincorporated Areas

Table 7 – LOMRs Incorporated into the September 26, 2008 FIS (continued)

Case No.	Effective Date	Flooding Sources	Community
03-06-1219P	April 16, 2004	Mirehaven Arroyo, unnamed Zone AE ponding area	City of Albuquerque
04-06-039P	April 16, 2004	Two unnamed ponding areas	City of Albuquerque, Unincorporated Areas
04-06-654P	April 20, 2004	Two unnamed ponding areas	Unincorporated Areas
03-06-1727P	April 21, 2004	Unnamed shallow ponding area	City of Albuquerque
04-06-138P	April 27, 2004	South Domingo Baca Arroyo	City of Albuquerque
04-06-1193P	July 9, 2004	Arroyo B-C	City of Albuquerque Unincorporated Areas
03-06-1927P	August 25, 2004	Arroyo Del Pino	City of Albuquerque
03-06-832P	September 17, 2004	Unnamed Ponding Area	City of Albuquerque
04-06-1208P	September 27, 2004	Bear Canyon Arroyo	City of Albuquerque
04-06-1924P	November 5, 2004	Unnamed Zone AO Shallow flooding	City of Albuquerque
04-06-666P	November 9, 2004	Unnamed tributary to the La Cueva Arroyo	Unincorporated Areas
04-06-1904P	January 12, 2005	Amole Arroyo	City of Albuquerque
05-06-0322P	June 6, 2005	South La Cueva Arroyo	City of Albuquerque
05-06-0914P	June 6, 2005	Unnamed Ponding Area	City of Albuquerque
04-06-2142P	July 27, 2005	La Cueva Arroyo & Unnamed detention pond	Unincorporated Areas
05-06-0440P	September 30, 2005	Mirehaven Arroyo A	City of Albuquerque
05-06-0768P	October 12, 2005	Public Sewers (Unnamed Pond 1)	City of Albuquerque
04-06-1742P	October 13, 2005	Borrega Arroyo & Rio Bravo Boulevard Channel & Unnamed Arroyo to Borrega Arroyo & Unnamed Arroyo to Hubbell Lake detention area	Unincorporated Areas
06-06-A653P	January 30, 2006	South Camino Arroyo	City of Albuquerque

Table 8 lists the Letters of Map Change (LOMC) incorporated for the August 16, 2012 PMR and FIS Update. This includes two Letters of Map Revision based on Fill (LOMR-F) that are large enough to be mapped.

Table 8 – LOMCs Incorporated in the August 16, 2012 FIS

Case No.	Effective Date	Flooding Sources	Community
02-06-2335A	August 30, 2002	Sheetflow	City of Albuquerque
06-06-BJ84A	October 10, 2006	Shallow Ponding	City of Albuquerque

Table 8 – LOMCs Incorporated in the August 16, 2012 FIS (continued)

Case No.	Effective Date	Flooding Sources	Community
08-06-3115P	September 29, 2008	El Camino Arroyo, Unnamed Ponding Area	City of Albuquerque, Unincorporated Areas
08-06-3116P	September 29, 2008	Local Runoff	City of Albuquerque
08-06-3117P	September 29, 2008	Unnamed Ponding	City of Albuquerque
08-06-3118P	September 29, 2008	Shallow Street Flooding	City of Albuquerque
08-06-3119P	September 29, 2008	South La Cueva Arroyo	City of Albuquerque
08-06-1020P	September 30, 2008	Ponding Area 21, Arroyo B-C	City of Albuquerque, Unincorporated Areas
09-06-0033P	October 20, 2008	Amole Arroyo	City of Albuquerque
09-06-0034P	October 20, 2008	Unnamed Channel, Unnamed Natural Arroyo	City of Albuquerque
09-06-0035P	October 20, 2008	Amole Arroyo, Snow Vista Channel	City of Albuquerque
09-06-0036P	October 20, 2008	Ponding Area 6, Detention Basin 10	City of Albuquerque
09-06-0864P	February 19, 2009	South La Cueva Arroyo	City of Albuquerque
09-06-0828P	February 20, 2009	Hartline Detention Pond La Familia Pond Unnamed Pond	City of Albuquerque, Unincorporated Areas
08-06-2956P	February 27, 2009	Unnamed Stream	City of Albuquerque, City of Rio Rancho
09-06-0084P	February 27, 2009	Unnamed Flood Source	City of Albuquerque
09-06-1237P	March 31, 2009	Unnamed Zone AH Ponding Area	Unincorporated Areas
09-06-1370P	May 8, 2009	Campus Wash	City of Albuquerque
09-06-2228P	June 29, 2009	El Camino Arroyo	City of Albuquerque, Unincorporated Areas
09-06-1313P	June 30, 2009	Unnamed Tributary to I-40 Channel	City of Albuquerque
09-06-1726P	July 2, 2009	Hubbell Lake Detention Area	Unincorporated Areas
09-06-1433P	October 26, 2009	Four Hills Channel (Arroyo)	City of Albuquerque
09-06-2930P	October 30, 2009	La Cueva Diversion Channel	Unincorporated Areas

Table 8 – LOMCs Incorporated in the August 16, 2012 FIS (continued)

Case No.	Effective Date	Flooding Sources	Community
08-06-2955P	December 17, 2009	Sacate Blanco Arroyo, Rio Bravo Boulevard Channel Tributary 1 to Sacate Blanco Arroyo Tributary 2 to Sacate Blanco Arroyo	City of Albuquerque, Unincorporated Areas
09-06-1628P	May 24, 2010	Boca Negra Arroyo Tributary 2 Boca Negra Arroyo Tributary 2 Calabacillas Arroyo	City of Albuquerque, City of Rio Rancho, Unincorporated Areas
10-06-1963P	May 27, 2010	Unnamed AO Zone, Pond K	City of Albuquerque
10-06-2151P	August 26, 2010	La Cueva Diversion Channel	Unincorporated Areas
10-06-3037P	September 15, 2010	South La Cueva Arroyo	Unincorporated Areas
10-06-1078P	September 30, 2010	Rio Grande	City of Albuquerque, Unincorporated Areas
10-06-1984P	November 1, 2010	Hahn Arroyo	City of Albuquerque
10-06-3270P	March 1, 2011	North La Cueva Arroyo	City of Albuquerque
10-06-1669P	March 23, 2011	Rio Grande	Unincorporated Areas
11-06-0273P	April 11, 2011	South Domingo Baca Arroyo	Unincorporated Areas
11-06-0465P	September 27, 2011	Calabacillas Arroyo	City of Albuquerque

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 Bernalillo County.

Table 10, Stream Name Changes, lists those streams whose name has changed or differs from that published in the previous FIS for Bernalillo County or any of the communities within.

Table 9 – Stream Name Changes

Old Name	New Name
Arroyo B-A	Tierra Bayita Storm Drain
Arroyo de Domingo Baca	South Domingo Baca Arroyo
Arroyo De Domingo Baca Channel North	North Domingo Baca Arroyo
Arroyo De Domingo Baca Channel South	South Domingo Baca Arroyo

Table 9 – Stream Name Changes (continued)

Arroyo De Las Calabacillas	Calabacillas Arroyo
Borrega Stream	Borrega Arroyo
Broadbent Tributary	Menaul Detention Basin
Calabacillas Arroyo	West Branch Calabacillas Arroyo
Camino Arroyo	El Camino Arroyo
Eagle Nest Drive Tributary	Juniper Hill Arroyo
Embudo Channel	Embudo Arroyo
Four Hills Channel	Four Hills Arroyo
Hubball Lake Detention Area	Hubbell Lake Detention Area
North Arroyo Del Pino	North Pino Channel
Ponding Area 19	Odelia Park Dam
Raymac Dam Stream	Raymac Arroyo
Retabalo Road Tributary	Middle Tributary of the Boca Negra Arroyo
San Antonio Diversion Channel	San Antonio Arroyo and South San Antonio Arroyo
South Branch of the Piedras Marcados Arroyo Channel	South Branch of the Piedras Marcados Arroyo
Stream in area 1	Mesa Del Sol Playa 1
Stream in area 26	Mesa Del Sol Playa 2
Stream in area 3/35	Mesa Del Sol Playa 3
Sunport Arroyo	Airport Arroyo
Unnamed	Paradise Boulevard Storm Drain
Unnamed	Paradise Hills Golf Course Arroyo

2.2 Community Description

Bernalillo County is located in central New Mexico and is traversed by Interstate Highway 40 for east-west traffic and by Interstate Highway 25 for north-south traffic. The land area of the County is approximately 1,170 square miles, and the estimated population in 2013 was 674,221 (Reference 17). Large areas of Bernalillo County include: Indian Reservations located in the northern, western and southern portions of the county, Kirtland Air Force Base just southeast of Albuquerque, and Cibola National Forest, which is located in the eastern part of Bernalillo County.

The Rio Grande flows southward through the center of Bernalillo County, with the land rising on both sides of the river and forming mesas at elevations above 5,000 feet. To the east, the Sandia and Manzano Mountains rise to a maximum elevation of 10,678 feet and parallel the Rio Grande. The valley and mesa areas are arid, with an average annual precipitation near 8 inches. In the mountains, average precipitation ranges from 15 to 30 inches, generally increasing with elevation (Reference 18).

The climate is classified as arid continental, characterized by fairly hot summers, mild winters, and short, temperate spring and fall seasons. Approximately half of the precipitation falls as summer rains during brief, but often intense, thunderstorms. Winter precipitation falls as either rain or snow and is caused by frontal activity associated with storms moving across the country from the Pacific Ocean.

The City of Albuquerque is located in the central portion of both New Mexico and Bernalillo County. Albuquerque is situated approximately 60 miles south of Santa Fe, New Mexico, and 270 miles north of El Paso, Texas. The Rio Grande flows south through the City and is the principal river in New Mexico, with a drainage area of 14,500 square miles at Albuquerque. The 2013 population for the City of Albuquerque was estimated at 556,495 (Reference 17).

Albuquerque can be divided into three general areas: the valley areas immediately next to the Rio Grande and the East and West Mesas, which flank the valley. The valley is comprised of low-density residential and commercial development and the central business district. The East Mesa extends approximately 10 miles from the Rio Grande Valley to the base of the Sandia Mountains and is experiencing rapid medium-to high-density residential and commercial development. The West Mesa extends approximately four miles from the Rio Grande to the volcanic escarpment and is rapidly undergoing high-density residential development.

The Village of Los Ranchos de Albuquerque is located in north-central Bernalillo County, along the Rio Grande, and is surrounded almost entirely by the City of Albuquerque. The estimated population in 2013 was 6,076 (Reference 17).

The Village of Tijeras is located in the eastern portion of Bernalillo County, approximately 6 miles east of Albuquerque, at the intersection of Interstate Highway 40 and New Mexico State Highway 14. Elevations in Tijeras and contributing drainage areas range from 6,000 to 7,000 feet. The 2008 population was estimated at 520 (Reference 17).

The Village of Tijeras is sparsely developed, with most of the older development west of State Highway 14, while most of the newer development occurs east of State Highway 14 and south of Interstate Highway 40. Vegetation consists mainly of Piñon pine, juniper trees, and native grasses. Higher elevation areas around Tijeras are forested mainly with Ponderosa pine, Douglas fir, white fir, Engelmann spruce, and aspen (Reference 19).

The City of Rio Rancho is located 5 miles northwest of Albuquerque on the West Mesa. It is located in both Bernalillo and Sandoval Counties. The city is experiencing medium-to-high density residential and commercial development. The estimated population of Rio Rancho in 2013 was 91,956 (Reference 17).

The Town of Edgewood is a rural community about 30 miles east of Albuquerque, along I-40. The Town covers approximately 44.4 square miles of land in Bernalillo, Santa Fe and Torrance Counties on the eastern side of the Sandia and Manzano Mountains. The estimated population of Edgewood in 2010 was 3,735 (Reference 17).

2.3 Principal Flood Problems

Flooding within the unincorporated areas of Bernalillo County is most likely to occur during late summer as a result of intense short-duration thunderstorms. The resulting peak flows can be large but usually produce relatively small volumes of water.

Historically, flooding in the Albuquerque area can be divided into two categories: flooding from the Rio Grande and runoff generated from local thunderstorms.

Flooding from the Rio Grande can be from rapid snowmelt induced by warm rains or from widespread thunderstorms. Floodwaters from the Rio Grande can also block irrigation and drainage ditches with sediment, increasing the flood potential. Before the 1930s, flooding from the river had been widespread within the North and South Valley areas of the City. The present flood potential in the City of Albuquerque from the Rio Grande is much less than historical data may suggest because of a levee system built in the 1930s (Reference 10). Also, several flood control structures have been built upstream of the City (see Section 2.4).

Other flooding within the City of Albuquerque can result from brief, intense thunderstorms causing substantial localized flash flooding and serious sedimentation and erosion problems. The Sandia Mountains, east of Albuquerque, have steep bedrock outcrops, which have high runoff potential. Flow runoff paths are unpredictable at the base of the mountains as the runoff spreads onto several alluvial fans. Continued development on the East Mesa at the base of the mountains and on the alluvial areas complicates the flow patterns and increases the potential for flood damage.

Flooding on the West Mesa can also result from intense thunderstorms, and the area has serious sedimentation and erosion problems. The area contains mostly fine sands and silts with minimal ground cover, which is highly prone to erosion. Flood flows can pond behind ditch levees and in low spots, depositing large quantities of sediment, or the floodwaters can flow into irrigation ditches, filling the ditches with sediment and causing the banks to be overtopped.

The low-lying valley areas along the Rio Grande are also subject to flooding from runoff from the east and west uplands. Residential and commercial development, channel levees, and irrigation embankments have obstructed the natural outfalls to the river and increased the flood hazards in many areas. Floodwaters flow rapidly into the valley areas and then spread into ponding areas because of the flat slopes and limited outlets to the river.

Recurrence intervals for historic floods on the Rio Grande are not relevant because the floods occurred before the flood control structures were built (References 6 and 20). The recurrence interval for the 1967 flood along the Tijeras Arroyo is 20 years.

Historical flood information for the City of Albuquerque is shown in Table 10.

Table 10 – Historical Floods in Albuquerque Area

Source of Flooding	Date	Estimated Maximum Rainfall (inches) or Flow Rate cubic feet per second (cfs)	Damages ($1,000s)
Rio Grande spring snowmelt	1874	100,000 cfs	*
	1884	40,000 cfs	*
	1912	29,000 cfs	*
	1920	36,000 cfs	*
	1941	22,500 cfs	*
Thunderstorms within the Albuquerque area	August 11, 1961	4.0 inches	200
	August 10, 1963	3.3 inches in 1 hour	1,875

Table 10 – Historical Floods in Albuquerque Area (continued)

Source of Flooding	Date	Estimated Maximum Rainfall (inches) or Flow Rate cubic feet per second (cfs)	Damages ($1,000s)
	June 17, 1967	1.4 inches	442
	September 7, 1969	1.4 inches	328
	July 15, 1970	1.3 inches	200
	July 31, 1974	1.2 inches	123
	August 14, 1980	5.07 inches	800
Tijeras Arroyo	June 24, 1967	6,500 cfs	*

* Data not available

The history of flooding within the Tijeras area indicates that flooding is most likely to occur during late summer as a result of intense short-duration thunderstorms. The resulting peak flows can be large but are usually of short duration.

Most of the stream channels within Tijeras are well incised and can carry large discharges. Generally, flood damages are limited to culverts and bridges that are damaged or washed away during high flows. Residences located near arroyos or located at elevations similar to the flow elevations of the arroyos can be damaged by high-velocity flood flows.

Quantitative flood information is limited to the discharge records of Tijeras Arroyo at the USGS stream gage 08330500, located approximately 3 miles downstream from the study area in Tijeras. The maximum peak discharge for 26 years of record (1944 to 1978) was 6,500 cfs on June 24, 1967, and has an estimated return period of 20 years.

2.4 Flood Protection Measures

There are structural flood protection facilities within the detailed study limits of the unincorporated areas of Bernalillo County. There are no known structural flood protection facilities within the Villages of Los Ranchos de Albuquerque or Tijeras.

Information from a USACE report indicates that floods up to the 1-percent- annual chance flood along the Rio Grande that are generated upstream of the Cochiti Dam are controlled by the dams within the Rio Grande system. The flood control storage of these dams and reservoirs are as follows: Cochiti Dam (486,000 acre-feet), Abiquiu Dam (502,000 acre-feet), Galistero Dam (79,000 acre-feet) and Jemez Canyon Dam (73,000 acre-feet). Platoro Dam has 6,000 acre-feet of storage allocated for flood control and an additional 50,000 acre-feet combined storage. El Vado Dam has 196,500 acre-feet of storage for irrigation (References 21).

The drainage area of the Rio Grande at Albuquerque, which is not controlled by the upstream dams, is 1,100 square miles (Reference 2). Construction of the levees was completed in the Albuquerque area from Bernalillo to Belen in 1958. The levees in the immediate Albuquerque area provide protection for discharges up to 42,000 cfs (0.4-percent-annual-chance recurrence interval). However, the levees north and south of Albuquerque only provide protection for 5.2- to 2.9-percent-annual-chance floods.

The City of Albuquerque and the AMAFCA are continuing to develop a comprehensive flood control system to control floodwaters from the East and West Mesas.

The West Mesa flood control facilities consist mainly of diversion and detention structures rather than quickly conveying runoff to the Rio Grande in concrete-lined channels. Several large facilities are the Hubbell Lake System, Ladera Diversion and Detention System, and the Mariposa System. Several smaller detention systems are also in operation.

The East Mesa flood control facilities consist mainly of several miles of concrete-lined channel, storm sewers, and several storm detention dams at the base of the Sandia Mountains. Several concrete channels and storm sewer systems (such as Embudo Arroyo, Embudito Arroyo, Interstate 40 Channel, and North and South Glenwood Hills Arroyos) carry the water to the North and South Diversion Channels. The North and South Diversion Channels are two large concrete channels that drain most of the East Mesa.

The AMAFCA North Diversion Channel begins just east of the intersection of Lomas Boulevard and Yale Boulevard and flows north across Interstate 25, discharging into the Rio Grande near the intersection of New Mexico State Highways 85 and 422. The AMAFCA South Diversion Channel begins north of Gibson Boulevard, flows south across Broadway Boulevard, then west, joining the Tijeras Arroyo and discharging into the Rio Grande approximately one mile south of Rio Bravo Boulevard.

Most levees along the Rio Grande are shown as accredited and as providing protection on the FIRMs. A stretch of levee on the west bank of the Rio Grande from the Pueblo of Isleta boundary, upstream to the north for three miles, has recently been rebuilt and accredited to provide protection against the 1-percent chance annual flood.

Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent annual chance level) and Emergency Action Plan on the levee systems shown as providing protection in Bernalillo County. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and flood-proofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at http://www.fema.gov/businee/nfip/index.shtm.

Non-structural measures of flood protection are being utilized to aid in the prevention of future flood damage. These are in the form of land use regulations adopted from the Code of Federal Regulations (CFR), which control building within areas that have a high risk of flooding (Reference 22).

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 (100-year) 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.

Peak discharge-drainage area relationships are shown in Tables 12 and 13. Certain ponding areas and dedicated stormwater detention basins are shown in Table 14, with their corresponding water surface elevations (WSELs). Those elevations that are not shown to the tenth decimal place are rounded to the nearest whole-foot elevation. See the FIRM for the 1-percent-annual-chance elevations for those that are not listed.

Analyses before September 20, 1996 FIS

Prior to the September 20, 1996, FIS the following hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods in Bernalillo County.

<u>City of Albuquerque</u>

For the FIS, dated April 14, 1983, for the City of Albuquerque (Reference 16), a flood frequency study of the unregulated drainage area of the Rio Grande between Cochiti Dam and the Bernalillo gage was made by the USACE (Reference 10). The study indicated that dams within the Rio Grande system control flows up to the 1-percent-annual-chance flood originating upstream of the Cochiti Dam. The Cochiti Dam has been in operation since 1975.

To determine flows originating from areas downstream of the Cochiti Dam, flow records at the Bernalillo gage (1941 to 1969) were modified by the USACE to separate out portions of flows that are now regulated. The remaining synthetic peak flow record was then analyzed by the log Pearson III procedure and adjusted for expected probability (Reference 23). The log Pearson III procedure was used, but based on FEMA guidelines and specifications (Reference 24); peak flows were not adjusted for expected probability. Both agencies attenuated peak flows by the modified Puls routing method. The discharge-frequency relation for the Rio Grande, which was developed by the USGS, was used for this study.

Additional hydrologic analyses considered the impact of the North and South Diversion Channels. Results indicate, for any recurrence interval flood, the discharge of the North Diversion Channel or the South Diversion Channel is slightly less than the discharge from the unregulated drainage area upstream of Bernalillo County.

For the Tijeras Arroyo south of Kirtland Air Force Base, a regional rainfall-runoff model, Hydrologic Modeling (HYMO), was used (Reference 25). HYMO uses a Natural Resources Conservation Service (NRCS, formally the Soil Conservation Service (SCS)) curve number approach to determine rainfall characteristics and the variable storage coefficient flood routing method. A one-hour intense thunderstorm type rainfall distribution was used (References 26 and 27). Discharges from contributing drainage basins were computed, routed downstream, and combined with other contributing drainage areas to the Tijeras Arroyo system. The discharge from the Tijeras Arroyo, at a stream gage located approximately 1 mile upstream from the City of Albuquerque corporate limits, matched within 10 percent of the standard Water Resources Council log Pearson III analysis of the gage record (References 23 and 28).

Table 11– Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Airport Arroyo					
At Confluence with South Diversion Channel	1 [1]	*	*	399 [1]	*
Amole Arroyo					
Approximately 50 feet upstream of confluence with Snow Vista Channel	7.07	*	*	1,230	*
At Valley View Drive Bridge	7.01	*	*	1,124	*
At Delgado Drive	6.79	*	*	784	*
Arroyo A-B					
At Sage Road	0.1	81	149	179	1,767
Arroyo A-C	[2]	[2]	[2]	[2]	[2]
At the Arenal Main Canal					
Arroyo B-B					
At Unser Boulevard	[3]	[3]	[3]	[3]	[3]
Arroyo B-C					
At Unser Boulevard	0.24	47	103	115	147
At Abeyta Road	0.24	17	72	83	106

1 These flows do not include routing through storm drains systems. For study areas containing storm drain systems, the drainage area is not reported due to storm flow routing.

2 1-percent annual chance (100-year) flood discharge for Arroyo A-C completely contained within storm sewer system and Gonzales Pond.

3 Discharge for all Recurrence Intervals routed to the Tower Sage Detention Pond.
* Data not Available

Table 11 - Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Boca Negra Arroyo					
Cross-section A	14.1	482	1,335	1,831	3,246
Cross-section B	13.0	419	1,151	1,586	2,832
Cross-section E	12.2	404	1,111	1,534	2,745
Split Flow South Branch Cross-section A	11.8	0	40	83	300
Split Flow North Branch Section I	11.8	404	1,071	1,451	2,445
Cross-section M	11.7	404	1,111	1,534	2,745
Cross-section P	11.5	392	1,080	1,493	2,675
Calabacillas Arroyo					
At the confluence with the Rio Grande	93.2	1,968	5,998	9,013	16,350
2,900 feet upstream of Eagle Ranch Rd	92.5	1,747	5,161	7,378	13,686
At Unser Blvd	78.6	1,859	5,480	7,813	14,675
3,300 feet upstream of Unser Blvd.	71.5	1,695	4,966	7,071	13,295
Cedro Canyon Arroyo					
At confluence with Tijeras Arroyo (at Tijeras)	18.9	1,830	3,730	5,420	10,840

Table 11 - Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Double Eagle II Channel					
At I-10		*	*	945	*
At Confluence of Shamrock Channel		*	*	575	*
Embudo Arroyo					
230 feet downstream from Tramway Blvd.	4.6	328	733	1,055	1,617
550 feet upstream of Monte Largo Drive	3.5	297	526	800	1,174
Embudo Hills Storm Drain	1 [1]	*	*	384 [1]	*
Frost Arroyo					
Cross-section A	30.3	5,017	9,701	12,961	24,647
Cross-section C	29.4	4,663	8,953	11,990	23,018
Cross-section O	25.0	3,956	7,410	9,954	19,547
Cross-section P	24.0	3,520	6,480	8,740	17,500
Upstream of unnamed tributary	10.5	1,710	2,910	3,790	7,580
Indian School Road					
At I-25	0.12	83	156	193	286
Juniper Hill Arroyo					
At Cibola National Forest Boundary	0.04	36	64	79	114

[1] These flows do not include routing through storm drains systems. For study areas containing storm drain systems, the drainage area is not reported due to storm flow routing

* Data not Available

Table 11 - Summary of Discharges (Continued)

Flooding Source and Location	Flooding Source and Location	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Ladera Dam 9 Diversion					
At approximately 330 feet upstream of Detention Basin 5S	0.12	*	*	169	*
Menaul Detention Basin					
At detention basin	0.9	700	1,201	1,429	1,998
Upstream of detention basin	0.9	700	1,201	1,432	2,005
Mesa Del Sol Playa 1	39.3	*	*	8,748	14,592
Mesa Del Sol Playa 2	8.0	*	*	686	1,323
Mesa Del Sol Playa 3	6.5	*	*	470	926
Mirehaven Arroyo A					
At confluence with Mirehaven Arroyos B & C	2.9	*	*	1,452	*
At Ladera Dam Detention Ponds	3.9	*	*	1,097	*
Mirehaven Arroyo B					
Just downstream of High Mesa Drive	*	*	*	550	*
Mirehaven Arroyo C					
At Unser Diversion	*	*	*	159	*
1400 feet upstream of Unser Diversion	*	*	*	138	*
Middle Tributary of the Boca Negra					
Arroyo 220 feet downstream from Rim Rock Dr.	5.0	245	547	712	1,169
Rim Rock Dr.	1.0	222	473	604	945

*Data not Available

Table 11 - Summary of Discharges (Continued)

		Peak Discharges (cfs)			
Flooding Source and Location	**Drainage Area (square miles)**	**10-Percent-Annual-Chance**	**2-Percent-Annual-Chance**	**1-Percent-Annual-Chanc**	**0.2-Percent-Annual-Chance**
North Branch of the San Antonio Arroyo					
Confluence with South Branch San Antonio	3.0	*	*	1,147	*
130 feet upstream of Dellyne Ave.	2.9	*	*	1,109	*
960 feet upstream of Dellyne Ave.	2.1	*	*	974	*
North Pino Arroyo					
At DeVargas Loop.	0.6	*	*	542	*
Odelia Park Dam					
At detention basin	0.5	*	*	604	845
Paradise Boulevard Storm Drain					
Confluence with Paradise Boulevard	[1]	*	*	420 [1]	*
Paradise Hills Golf Course Arroyo	[1]	*	*	173 [1]	*
Rio Grande					
At downstream study limit	14,650	3,300	10,200	15,200	34,200
Upstream of La Orilla Road	*	7,100	14,500	20,000	38,000
Upstream of AMAFCA North Diversion Channel	14,610	8,180	10,790	13,170	21,330

[1] These flows do not include routing through storm drains systems. For study areas containing storm drain systems, the drainage area is not reported due to storm flow routing.
*Data not Available

Table 11 - Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Rio Puerco					
At Interstate Highway 40	2,490	15,400	26,900	32,600	47,900
San Antonio Arroyo					
150 feet downstream from Coors Blvd.	27.9	*	*	2,350	*
San Pedro Creek					
At the Confluence with Frost Arroyo	7.24	1,040	2,140	2,990	5,980
420 feet upstream Gaudian Loop.	6.6	373	1,025	1,495	3,142
350 feet downstream from Old Crest Rd.	6.5	371	1,019	1,486	3,125
Shamrock Channel/Tributary 2 Westgate Dam to Shamrock Channel					
Above confluence with Double Eagle II Channel	*	*	*	675	*
At Atrisco Vista Blvd	*	*	*	503	*
South Branch San Antonio Arroyo					
Confluence with San Antonio Arroyo	5.2	*	*	1,771	*
Confluence with North Branch San Antonio Arroyo	1.3	*	*	743	*
1090 feet upstream of Bogart St.	1.2	*	*	730	*

*Data not Available

Table 11 - Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
South Branch of the Piedras Marcadas Arroyo					
At Mariposa Detention Basin	[1]	*	*	441	*
At Primrose Dr.	0.3	*	*	205	*
Upstream of Taylor Ranch Rd.	0.16	*	*	90	*
South Domingo Baca Arroyo					
At Ventura Street	5.8	*	*	973	*
Tierra Bayita Storm Drain					
At Unser Boulevard	0.1	29	67	90	126
Tijeras Arroyo					
Upstream of confluence with South Diversion Channel	114.0	4,340	9,150	14,700	29,400
At Four Hills Road	78.0	6,285	14,300	18,065	30,500
Tijeras Arroyo (at Tijeras)					
At downstream study limit	67.1	5,080	9,970	14,060	28,100
Upstream of the confluence of Cedro Canyon Arroyo	37.5	4,120	7,890	11,100	22,200
Upstream of the confluence of Arroyo San Antonio	20.6	2,670	5,210	7,320	14,640
Upstream of the confluence of Arroyo San Antonio	20.6	2,670	5,210	7,320	14,640

[1] These flows do not include routing through storm drains systems. For study areas containing storm drain systems, the drainage area is not reported due to storm flow routing.

*Data not Available

Table 11 - Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Unnamed Arroyo No. 1					
At Interstate Highway 40	8.78	8.78	3,200	4,450	8,550
Unser Channel					
Above Unser Blvd	*	*	*	1,029	*
At Painted Sky Place	*	*	*	512	*
At Molten Place	*	*	*	247	*
At Sonterro Avenue	*	*	*	189	*
West I-40 Diversion Channel					
Above West Bluff Pond	*	*	*	843	*
At Moneda Drive	*	*	*	795	*
At Tierra del Oso Drive	*	*	*	765	*
At Stoneway Drive	*	*	*	640	*
At 76th Street	*	*	*	620	*
At Blossom Wood Place	*	*	*	600	*
At Unser Blvd	*	*	*	534	*

* Data not Available

Table 12 – Summary of Discharges for Shallow Flooding Areas

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs)			
		10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Hubbell Lake Diversion Channel[1]					
Above dam	4.90	*	*	1,456	*
At dam outfall	4.90	*	*	80	*
At confluence of Sacate Blanco Arroyo	1.54	*	*	609[2]	*
Just east of Diversion Dike	0.96	*	*	477	*
Arroyo de Domingo Baca[3]					
At North Diversion Channel	12.73	*	*	3,620	*
At Interstate Highway 25	7.11	*	*	2,146	*
At Ventura Street	5.84	*	*	1,142	*
Dam outflow	4.43	*	*	761	*
Dam inflow	4.43	*	*	3,845	*
At the confluence with Baca Tributary	3.26	*	*	2,550	*
Arroyo del Pino					
Just downstream from San Pedro Drive Northeast	8.90	*	*	2,639	*
Just downstream from Wyoming Boulevard	8.70	*	*	2,432	*
At North Diversion Channel	8.59	*	*	2,386	*
At Interstate Highway 25[3]	7.06	*	*	1,604	*
At Ventura Street (Extended)[3]	6.44	*	*	1,250	*
Dam outflow[3]	4.65	*	*	206	*
Dam inflow	4.65	*	*	4,424	*

[1] Reference 9

[2] By regression analysis

[3] Reference 8

* Data not available

Table 12 - Summary of Discharges for Shallow Flooding Areas (Continued)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Arroyo de San Antonio-Middle[1]					
At Coors Boulevard	[2]	*	*	2,640	*
At Atrisco Drive Crossing	4.03	*	*	1,970	*
At Atrisco Drive	2.61	*	*	1,324	*
Bear Arroyo[3]					
At inflow to Arroyo del Oso Dam	15.00	*	*	2,159	*
At Wyoming Boulevard	12.09	*	*	1,957	*
At confluence with Bear Canyon Arroyo	0.40	*	*	149	*
At Juan Tabo Boulevard	0.26	*	*	159	*
Bear Arroyo Tributary					
At Wyoming Boulevard[3]	2.41	*	*	1,520	*
At Juan Tabo Boulevard[3]	1.87	*	*	1,400	*
Upstream of Bear Arroyo Tributary diversion structure	0.73	*	*	1,330	*
Bear Canyon Arroyo[3]					
At Eubank and confluence with Bear Arroyo	10.48	*	*	1,948	*
At outflow of Juan Tabo Dam	9.70	*	*	1,930	*

[1]Reference 9
[2]Contributing drainage area may be different because of interbasin transfer via roads and storm sewers
[3]Reference 8
*Data not available

Table 12 - Summary of Discharges for Shallow Flooding Areas (Continued)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Black Arroyo					
Black Arroyo Detention Dam outflow	9.86	*	*	2,468	*
Black Arroyo Detention Dam inflow	9.86	*	*	5,357	*
Boca Negra Arroyo[1]					
Just downstream from confluence with South Branch	7.20	*	*	2,911	*
At confluence with South Branch	4.38	*	*	1,653	*
Just West of Atrisco Drive	2.12	*	*	894	*
Boca Negra Arroyo – South[1]	2.82	*	*	1,282	*
Borrega Arroyo[1]					
At outfall	1.26	*	*	614 [2]	*
At confluence of Borrega Arroyo "A"	0.32	*	*	171	*
Approximately 3,000 feet Upstream of Borrega Dam	1.00	*	*	815	*
At Borrega Dam	1.35	*	*	1,000	*
Borrega Arroyo "A"[1]					
At confluence with Borrega Arroyo	0.60	*	*	293	*

[1]Reference 9

[2]By regression analysis

*Data not available

Table 12 - Summary of Discharges for Shallow Flooding Areas (Continued)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Embudito Channel[1]					
At confluence with Embudo Channel	[2]	*	*	1,680	*
At Menaul Boulevard	[2]	*	*	1,557	*
Downstream from confluence of north Glenwood Hills Channel	[2]	*	*	454	*
At Juan Tabo Boulevard	[2]	*	*	241	*
At Montgomery Boulevard	[2]	*	*	110	*
Embudo Arroyo					
At confluence with Interstate Highway 40 Channel	[2]	*	*	4,980	*
At Wyoming Boulevard	[2]	*	*	5,009	*
At Indian School Road	[2]	*	*	4,539	*
At Eubank Boulevard	[2]	*	*	4,533	*
At confluence of Embudito Canal	[2]	*	*	3,258	*
At confluence of Piedra Lisa Channel	[2]	*	*	579	*
At Juan Tabo Boulevard	[2]	*	*	647	*
At Tramway Boulevard	[2]	*	*	772	*
Hahn Channel[1]	[2]				
At North Diversion Channel	[2]	*	*	1,570	*
At Carlisle Boulevard	[2]	*	*	1,363	*
At San Mateo Boulevard	[2]	*	*	1,263	*
At confluence of North Hahn Arroyo	[2]	*	*	830	*
At Louisiana Boulevard	[2]	*	*	724	*

[1]Reference 6
[2]Drainage areas not applicable because of interbasin transfer via roads and storm sewers
*Data not available

Table 12 - Summary of Discharges for Shallow Flooding Areas (Continued)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
La Rinconada Arroyo					
At outfall to gravel pit	1.98	*	*	814	*
Los Indos Arroyo "A"[1]					
Downstream from Raymac Dam	2.48	*	*	25	*
Upstream of Raymac Dam	2.48	*	*	1,194	*
At Gun Club Lateral	1.29	*	*	173	*
McKnight Storm Drain					
At Eubank Avenue	0.18	*	*	254 †	*
At Embudo Arroyo	0.21	*	*	354 †	*
Middle Branch of the Piedras Marcadas Arroyo					
Piedras Marcadas Dam outflow	5.62	*	*	80	*
Piedras Marcadas Dam inflow	5.62	*	*	2,375	*
Approximately 1,300 feet upstream of Piedras Marcadas Dam	4.86	*	*	1,786	*
North Arroyo de Domingo Baca					
At Wyoming Boulevard	3.79	*	*	658	*
Approximately 950 feet upstream of Barstow Street	3.42	*	*	538	*
At Holbrook Street	2.79	*	*	220	*
At inflow to Upper Dam	2.68	*	*	2,794	*
At Tramway Boulevard	0.89	*	*	1,080	*

*Data not available

† Discharge value for both Storm Drain and Street Flooding

Table 12 - Summary of Discharges for Shallow Flooding Areas (Continued))

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
North Pino Arroyo[1]					
At North Diversion Channel	2.07	*	*	1,175	*
At Interstate Highway 25	1.84	*	*	1,117	*
At Ventura Street	0.88	*	*	642	*
At Tramway Boulevard (diverted to Arroyo del Pino)	0.25	*	*	400	*
North Camino Arroyo[1]					
At outfall to Gravel Pit	[2]	*	*	1,590	*
At Interstate Highway 25	[2]	*	*	1,760	*
At Ventura Street	[2]	*	*	640	*
North La Cueva Arroyo					
At North Diversion Channel	8.52	*	*	4,869	*
At Interstate Highway 25	4.36	*	*	2,746	*
At Ventura Street[1]	3.54	*	*	3,494	*
At Tramway Boulevard[1]	2.81	*	*	3,759	*
North Glenwood Hills Channel[3]					
At confluence with Embudito Channel	[2]	*	*	1,450	*
At Tramway Boulevard	0.78	*	*	1,337	*
North Hahn Channel[3]					
At confluence with Hahn Arroyo	[2]	*	*	596	*
At Louisiana Boulevard	0.97	*	*	348	*

[1]Reference 8
[2]Drainage areas not applicable because of interbasin transfer via roads and storm sewers
[3]Reference 6
*Data not available

Table 12 - Summary of Discharges for Shallow Flooding Areas (Continued)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Pajarito Arroyo - North					
Downstream from Don Felipe Dam	3.26	*	*	25	*
Upstream of Don Felipe Dam	3.26	*	*	1,706	*
Piedra Lisa Channel[1]					
At confluence with Embudo Channel	[2]	*	*	2,774	*
At Juan Tabo Boulevard	[2]	*	*	2,145	*
At the confluence of South Glenwood Hills Channel	[2]	*	*	1,065	*
At Tramway Boulevard	[2]	*	*	1,011	*
Sacate Blanco Arroyo[1]					
At confluence with Hubbell Lake Diversion Channel	0.43	*	*	238[3]	*
South Domingo Baca Arroyo					
At Holbrook Street	5.52	*	*	811	*
At Browning Street	4.77	*	*	200	*
Inflow into dam	4.69	*	*	3,534	*
At Tramway Boulevard	3.29	*	*	2,352	*
South El Camino Arroyo					
At Interstate Highway 25	3.17	*	*	2,053	*
At Ventura Street[4]	2.59	*	*	3,301	*
At Tramway Boulevard[4]	1.85	*	*	2,853	*

[1]Reference 6
[2]Drainage areas not applicable because of interbasin transfer via roads and storm sewers
[3]By regression analysis
[4]Reference 8
*Data not available

Table 12 - Summary of Discharges for Shallow Flooding Areas (Continued)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
South Glenwood Hills Channel[1]					
At confluence with Piedra Lisa	[2]	*	*	844	*
At Tramway Boulevard	0.426	*	*	727	*
Tijeras Arroyo Tributary A					
At confluence with Tijeras Arroyo	0.23	*	*	379	*
Tijeras Arroyo Tributary B					
At confluence with Tijeras Arroyo	0.27	*	*	411	*
Tijeras Arroyo Tributary C					
At confluence with Tijeras Arroyo	0.63	*	*	970	*
Tijeras Arroyo Tributary D					
At confluence with Tijeras Arroyo	2.22	*	*	1,999	*
Tijeras Arroyo Tributary E					
At confluence with Tijeras Arroyo	0.92	*	*	955	*
Tijeras Arroyo Tributary F					
At confluence with Tijeras Arroyo	0.68	*	*	989	*

[1]Reference 6
[2]Drainage areas not applicable because of interbasin transfer via roads and storm sewers
*Data not available

Table 13 – Summary of Stillwater Elevations

Area	Pond Invert Elevation (feet NAVD[1])	Water Surface Elevations (feet NAVD[1]) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Amole Detention Area	*	*	*	5,000.0	*
Arroyo del Oso	*	*	*	5,345.0	*
Arroyo del Pino	*	*	*	6,019.0	*
Basketball Pond	*	*	*	5,421.0	*
Black Arroyo Detention Facility	*	*	*	5,165.0	*
Detention Basin 1	*	*	*	5,430.0	*
Detention Basin 2	*	*	*	5,415.0	*
Detention Basin 3	*	*	*	5,386.0	*
Detention Basin 4	*	*	*	5,359.0	*
Detention Basin 5	*	*	*	5,336.7	*
Detention Basin 5S	*	*	*	5,446.6	*
Detention Basin 6	*	*	*	5,326.0	*
Detention Basin 7	*	*	*	5,305.0	*
Detention Basin 8	*	*	*	5,293.0	*
Detention Basin 9	*	*	*	5,274.0	*
Detention Basin 10	*	*	*	5,252.0	*
Detention Basin 11	*	*	*	5,258.2	*
Detention Basin 12	*	*	*	5,243.1	*
Detention Basin 13	*	*	*	5,243.1	*
Detention Basin 14	*	*	*	5,236.5	*
Detention Basin 15	*	*	*	5,236.5	*
Detention Basin 16	*	*	*	5,231.9	*

[1] North American Vertical Datum of 1988

* Data not available

Table 13 - Summary of Stillwater Elevations (Continued)

Area	Pond Invert Elevation (feet NAVD[1])	Water Surface Elevations (feet NAVD[1]) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Detention Basin 17	*	*	*	5,140.0	*
Don Felipe Dam	*	*	*	4,969.0	*
East Amole Surge Pond	*	*	*	5525.0	*
Gonzales Pond	4990.3	*	*	5007.8	*
Interim Pond 1	*	*	*	5489.0	*
Interim Pond 2	*	*	*	5415.0	*
Interim Pond 3	*	*	*	5374.0	*
Interim Pond 4	*	*	*	5333.0	*
Hubbell Lake Detention Area	*	*	*	4,928.0	*
Juan Tabo Dam	*	*	*	5,771.0	*
Kirtland Detention Pond	*	*	*	5,359.0	*
Lower North Baca Dam	*	*	*	5,320.0	*
Mariposa Detention Facility	*	*	*	5,118.0	*
North Domingo Baca Dam	5,721.4	5,740.3	5,748	5,750.8	5,753.3
North Pond	5,204.2	*	*	5,217.8	*
Odelia Park Dam	*	*	*	5,025.0	*
Pajarito Sedimentation Basin	*	*	*	5,001.0	*
Piedras Marcadas	*	*	*	5,032.0	*

[1] North American Vertical Datum of 1988

* Data not available

Table 13 - Summary of Stillwater Elevations (Continued)

Area	Pond Invert Elevation (feet NAVD[1])	Water Surface Elevations (feet NAVD[1]) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Pond 1	5,389.0	5,394.2	5,396.5	5,397.4	5,398.1
Pond 2					
Area bounded by 98th Street to the east, 102nd Street to the west, Avalon Road to the south, and Bluewater Road to the north	5,252.6	*	*	5,260.4	*
Pond 3	5,526.8	5,529.1	5,531.7	5,532.8	5,533.2
Pond 4	5,570.8	5,574.9	5,575.6	5,575.9	5,576.4
Pond 5					
Area bounded by 98th Street to the east, 102nd Street to the west, Avalon Road to the south, and Bluewater Road to the north	5,253.6	*	*	5,264.3	*
Pond D	*	*	*	5,202.0	*
Ponding Area 6	*	*	*	5,234.0	*
Ponding Area 7	*	*	*	5,197.0	*
Ponding Area 9	*	*	*	5,972.0	*
Ponding Area 10	*	*	*	5,990.0	*
Ponding Area 12	*	*	*	5,928.0	*
Ponding Area 13	*	*	*	5,523.0	*
Ponding Area 18	5,009.8	*	*	5,013.3	*
Ponding Area 20	*	*	*	5,414.0	*
Ponding Area 23	*	*	*	5,474.0	*
Ponding Area 25	*	*	*	5,031.0	*
Ponding Area 27	*	*	*	5,033.0	*
Ponding Area 28	*	*	*	5,030.0	*
Pond No. 6	*	*	*	5,130.0	*
Pond No. 16A	*	*	*	5,108.0	*
Pond No. 16B	*	*	*	5,105.0	*

[1] North American Vertical Datum of 1988

* Data not available

Table 13 - Summary of Stillwater Elevations (Continued)

Area	Pond Invert Elevation (feet NAVD[1])	Water Surface Elevations (feet NAVD[1]) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Raymac Dam	*	*	*	4,964.0	*
Retention Pond	*	*	*	5,233.0	*
South Domingo Baca Dam	5,878.8	5,900.8	5,911.3	5,915.4	5,921.4
South Pond	5,201.0	*	*	5,211.2	*
Unnamed Pond Area bounded by Sunset Gardens Road to the north, 106th Street to the east and Eucariz Avenue to the south	*	*	*	5,248.7	*
Unnamed Pond Area bounded by Duke Avenue to the north and Eucariz Avenue to the south	*	*	*	5,230.9	*
Unnamed Ponding Area Generally located along El Camino Arroyo at Beverly Hills Avenue	*	*	*	5,324.0	*
Unnamed Ponding Area Generally located south of Acoma Road, north of Southern Avenue SE, and west of Britt Street	*	*	*	5,483.7	*

[1] North American Vertical Datum of 1988

* Data not available

The 4- and 1-percent-annual-chance discharges from the Calabacillas Arroyo were obtained from a drainage management plan for the western Albuquerque metropolitan area (Reference 5). A frequency analysis was done to determine the 10-, 2-, and 0.2-percent-annual-chance peak discharges.

Bernalillo County (Unincorporated Areas)

For the FIS, dated March 15, 1983, for the unincorporated areas of Bernalillo County (Reference 5), discharges for Frost Arroyo, San Pedro Creek, and Unnamed Arroyo No. 1 were based on statistical data because stream gage data were not available in those areas. For the Rio Puerco, flows were based on a hydrology study by the USACE (Reference 29); however, "expected probability" was taken out of the statistical analyses.

For Unnamed Tributary No. 1, the regression equations for the 10- and 1-percent-annual-chance discharges developed by the USGS for small drainage basins (Reference 30) were used. The study contractor developed regression equations for the 2- and 0.2-percent-annual-chance discharges from the same data used by the USGS.

Within the Tijeras area, there were 29 streams originally scheduled to be studied by detailed methods. Drainage areas of these streams ranged from 0.5 to 70 square miles. Flow data were available only at Tijeras Arroyo, with a drainage area of approximately 75 square miles at the gage site. Because discharge-frequency relations were initially required for several small drainage basins, and very little flow data were available, HYMO was used (Reference 25). A one-hour intense thunderstorm type rainfall distribution was used (References 26 and 27). Discharges from contributing drainage basins were computed, routed downstream, and combined with other contributing drainage areas from the entire study area. The 1-percent-annual chance discharge for Tijeras Arroyo, computed at the downstream study limit, agreed within 7 percent of the standard statistical analysis of the Tijeras Arroyo gage data (References 23 and 28).

Village of Tijeras

For the FIS dated July 6, 1982, for the Village of Tijeras (Reference 11), there were 12 streams originally scheduled to be studied by detailed methods. Drainage areas of these streams ranged from 0.5 to 70 square miles. Flow data were available only at Tijeras Arroyo (at Tijeras), near the downstream study limit, encompassing a drainage area of approximately 75 square miles at the gage site. Because discharge-frequency relations were initially required for several small drainage basins and very little flow data were available, HYMO was used in order to compute discharges for Cedro Canyon Arroyo and Tijeras Arroyo (at Tijeras) (Reference 25). A one-hour intense thunderstorm type rainfall distribution was used (References 26 and 27). Discharges from contributing drainage basins were computed, routed downstream, and combined with other contributing drainage areas from the entire study area. The 1-percent-annual-chance discharge for Tijeras Arroyo (at Tijeras), computed at the downstream study limit, agreed within 10 percent of the standard statistical analysis of the data from the stream gage located approximately 3 miles downstream from the study limit (References 23 and 28).

September 20, 1996, FIS

For the FIS (Reference 12) dated September 20, 1996, hydrologic analyses for Arroyos A-A, A-B, A-C, B-B, B-C, E, the Tierra Bayita Storm Drain, and Ladera Arroyo were carried out using the Arid Lands Hydrologic Model (AHYMO) 392 computer model (Reference 31) to establish peak discharge frequency relationships for the 10-, 2-, 1-, and 0.2-percent-annual-chance floods. The flood hydrographs within the AHYMO models were bulked to account for sediment by increasing each ordinate by an input factor.

These factors were computed based on actual sediment removal data by the AMAFCA, and are summarized as follows.

Development Conditions	Sediment Bulking Factors (%)
Undeveloped watershed	17
50% developed watershed	11
Fully developed watershed	7

The study of Ladera Arroyo indicates that a series of flood control dams eliminate flooding from the arroyo up to the 0.2-percent-annual-chance flood. The flooding shown in the study area is a result of local drainage.

The hydrologic analysis was not revised for the Rio Grande.

FIS dated April 2, 2002

For this revision (Reference 13), hydrologic analyses for Arroyo del Pino, Arroyo SB, Middle Branch South Arroyo de Domingo Baca Tributary, North Arroyo de Domingo Baca, North Domingo Baca Spillway, South Arroyo de Domingo Baca, South Arroyo de Domingo Baca Tributary, South Branch South Arroyo de Domingo Baca Tributary, South Domingo Baca Spillway, Tijeras Arroyo, and Tijeras Arroyo Tributaries A through F were carried out using the AHYMO194 computer model (Reference 33) to establish peak discharge-frequency relationships for the 10-, 2-, 1-, and 0.2-percent-annual-chance floods.

The flood hydrographs within the AHYMO models were bulked to account for sediment by increasing each ordinate by an input factor. These factors, applied to account for sediment volume within the flow, are summarized as follows:

Clear Water Discharge (cfs)	Bulk Factor (%)
0-500	4
501-1,000	5
1,001-1,600	6
1,601-2,100	7
2,101-2,600	8
2,601-3,200	9
3,201-3,700	10
3,701-4,200	11

These bulk factors (BFs) are based on the following regression equation:

$$BF = 3.622 + 0.001875\ Q$$

as derived and approved by the AMAFCA in the Master Drainage Plan for Camino and La Cueva Arroyos conducted by Resource Technology Inc. (Reference 33).

The study areas for North and South Arroyos de Domingo Baca, Arroyo del Pino, and their respective tributaries include an alluvial pediment with generally incised channels and confined flow. To account for the impact of erosion/sedimentation, flow bulking, generalized sediment effects at culvert entrances, and flow avulsion were considered. Avulsions occur where a channel bed aggrades or a bank is eroded and a flow split results. The flow split may continue in the same watershed or enter a different watershed.

The selection of potential avulsion locations both outside and within the study area was based on aerial photograph review, topographic map review, field observation, and discussions with the AMAFCA.

A detailed sediment transport (aggradation/degradation) analysis was included in this project for one location along North Arroyo de Domingo Baca east of Barstow Avenue. Therefore, the selection criteria above were used to determine locations of possible avulsions in the study watersheds.

Possible avulsion locations that were investigated include South Arroyo de Domingo Baca east of Holbrook Avenue. This possible avulsion would occur as a secondary overflow approximately 250 feet away (north) of the edge of the existing channel. Because of the potential for flow spreading farther east, this overflow area has been designated as an area of shallow flooding potential. The avulsion channel has also been included as an area of shallow flooding.

The discharge-frequency data for Tijeras Arroyo was computed using the Tijeras Arroyo Drainage Management Plan, Phase II (Reference 34). This report revised the hydrology for Tijeras Arroyo north of Kirtland Air Force Base and has been adopted by Bernalillo County and the AMAFCA. Therefore, this area was remodeled using the new hydrology for that reach of Tijeras Arroyo.

Elevations of ponding areas and dedicated stormwater detention basins were computed using a reservoir routing analysis with the AHYMO computer program (Reference 32).

FIS dated November 19, 2003

For this revision, there were no changes to the hydrologic analyses.

FIS dated September 26, 2008

Detailed and Enhanced Approximate Type 1 Study Streams methods were used in the community. The discharges for the new Detailed and Enhanced Approximate Studied streams were calculated using the region of influence regression model or a rainfall-runoff model. The hydrologic analysis performed as part of the Enhanced Approximate Study Type I is similar to the Detailed Study in every way, except that only flow rates for the 1-percent chance storm event are calculated as opposed to the 10-percent, 2-percent, 1-percent, and 0.2-percent chance storm events for the Detailed Study. Regional Regression Equations are only applicable for two study reaches due to engineered storage facilities, concrete lined channels, or development in the study reach watersheds. All other study reaches require a rainfall-runoff model.

The following are the two basic methods of analysis that were used for the hydrologic analyses of limited (also known as enhanced approximate type 1) and detailed studies in Bernalillo County:

AHYMO Analysis –The methodology selected for computation within AHYMO was the SCS TR-55 method. This method is based on dividing the watershed flow path into sheet flow segments, shallow concentrated flow segments, and channel flow segments. AHYMO calculates the hydrographs of drainage basins and adds the hydrographs at confluences. This more accurately produces peak discharges than simple addition of peak discharges. AHYMO is more specific than the regression equations as it takes into account drainage basin specific characteristics such as land use, soil type, and time of concentration.

Using AHYMO within Bernalillo County is valid; however the results must be reality-checked to determine reasonableness of the results. AMAFCA, the City of Albuquerque and the County of Bernalillo require the use of AHYMO for hydrology. However, the basin characteristics for Bernalillo County vary dramatically from urban conditions to rural mountainous conditions with steep terrain. AHYMO is not appropriate for all locations, specifically in the east mountain region where rainfall values are higher and terrain is very steep. In addition the east mountain region is outside the Albuquerque city limits. For example, MAPVI did not use AHYMO for San Pedro Creek and Frost Arroyo because it is an inappropriate methodology for theses study reaches based on terrain and climate.

There are limitations with respect to time-step increment and a maximum of 600 points in the unit hydrograph. Points beyond 600 are lost.

USGS Regression Equations – The USGS developed a series of equations to predict the peak runoff rates for a given watershed based on statistically significant basin and climatic characteristics. Bernalillo County falls within the Central Mountain Valley Region 6 series of USGS Regression Equations for New Mexico.

The USGS updated the National Flood Frequency Regional Regression equations for New Mexico in 1993. Only basins consisting entirely of rural conditions that were larger than 10 square miles were chosen. For basins less than 10 square miles the USGS regression equation for small rural watersheds was applicable (Reference 35). The difference in the flow rates based on NOAA Atlas 2 versus NOAA Atlas 14 is minimal and well within the percent error range given for the regression equations. NOAA has stated that Atlas 14 supersedes Atlas 2 and that precipitation values from Atlas 2 are not be used any more. MAPVI investigated the applicability of the Atlas 14 data with the USGS regression equations. An email from Scott Waltemeyer of USGS, who is working on the new flood frequency report, regarding the applicability of NOAA 2 versus NOAA 14 indicated that only slight differences exist using the new NOAA 14 data.

Precipitation Data – On August 6, 2003, the National Oceanic and Atmospheric Administration (NOAA) released updated Precipitation Frequency Data for the State of New Mexico. NOAA Atlas 14 superseded the NOAA Atlas 2 data.

A random selection of points scattered across Bernalillo County were used to compare the values of NOAA Atlas 2 and NOAA Atlas 14. For a majority of the county, the precipitation values decreased slightly. There was a slight increase in precipitation values observed for the east mountain areas with higher elevations (Reference 36).

The centroid of each watershed for the limited and detailed study reaches was approximated based on the watershed delineation. The coordinates of the centroid were input into the NOAA Atlas 14 website. The NOAA Atlas website uses the coordinates of a fixed location to interpolate the average precipitation values for that location. The precipitation values obtained for each location were used in the analysis of each watershed.

Rainfall Distribution – For AHYMO computations, a rainfall distribution must be selected. The hydrologic analysis performed for these studies were for the 24-hour storm duration. A 24-hour SCS Type II-A distribution for New Mexico was selected. This distribution has the peak intensity occurring at 6 hours. This was a rainfall type 5 within the AHYMO software.

Street Flooding – During the scoping meeting for this map revision, two locations were identified by the City of Albuquerque as needing refinement. Both the Southeast Heights and the Downtown area had existing floodplains that were not centered on the street as shown on the FIRM dated November 19, 2003(Reference 14). Additionally, these areas were shown as Zone AO (depth 1 foot) flooding and are not consistently confined to the street prism.

A restudy of the City of Albuquerque Master Drainage Study was performed by Bohannan-Huston in December 1987. This restudy focused on the Southeast Heights and analyzed storm drainage systems that had been constructed along with street flooding in the area. The results of this study provided technical data that all street flooding within this area is contained within in the street prism. From this analysis, the extent of the Zone AO (depth 1 foot) flooding was refined to include only the street and the zone designation was changed to Zone A with a note indicating that it is confined to the street.

FIS Dated August 16, 2012

RAMPP used detailed and approximate methods in the community. The discharges for shallow flooding areas were calculated using a rainfall-runoff model. Discharges for approximate study streams were calculated using the region of influence regression equations.

Shallow Flooding Areas – During the scoping meeting for this map revision, two locations were identified by the City of Albuquerque as needing refinement. These included an AH ponding zone on Glenrio Road NW and an AO zone on McKnight Avenue NE. RAMPP determined the peak 1-percent-annual-chance discharge for these study areas using the AHYMO rainfall-runoff model.

The SCS TR-55 method was selected for the time of concentration computation in AHYMO. This method is based on dividing the watershed flow path into sheet flow segments, shallow concentrated flow segments, and channel flow segments. RAMPP determined land use for each watershed from orthophotos.

AHYMO was used to determine the peak discharge at storm sewer inlets along McKnight Avenue NE. The reservoir routing capabilities of AHYMO were used to determine flood elevations for the shallow ponding areas on Glenrio Road NW.

Precipitation – RAMPP approximated the centroid of the contributory watershed for the shallow flooding areas based on the watershed delineation. The coordinates of the centroid were input into the NOAA Atlas 14 Web site (Reference 36), which uses the coordinates of a fixed location to interpolate the average precipitation values for that location. RAMPP used the precipitation values obtained for each location in the analysis of each watershed.

Rainfall Distribution - For AHYMO computations, a rainfall distribution must be selected. The hydrologic analysis performed for these studies was for the 24-hour storm duration. RAMPP selected a 24-hour SCS Type II-75 distribution for New Mexico. This distribution has the peak intensity occurring at 6 hours. This was a rainfall Type 5, within the AHYMO software.

Approximate Study Streams – RAMPP determined the peak 1-percent-annual-chance discharge for streams studied by approximate methods with USGS regression equations. Bernalillo County falls within the Central Mountain Valley Region 6 series of USGS regression equations for New Mexico. The USGS updated the National Flood-Frequency regional regression equations for New Mexico in 2008 (Reference 37).

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 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 this 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.

All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry.

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 FIRM (Exhibit 2).

Channel and overbank roughness factors (Manning's "n" values) used in the hydraulic computations for all streams studied were chosen by engineering judgment and were based on field observations of the stream and floodplain areas. Table 15 provides roughness coefficients used for streams studied by detailed methods. Those streams with concrete channels are not listed and have a roughness factor of 0.015.

Table 14 – Manning's "n" Values

Flooding Source	Channel "n" Values	Overbank "n" Values
Arroyo A-B	*	*
Arroyo A-C	*	*
Tierra Bayita Strom Drain	*	*
Arroyo B-B	*	*
Arroyo B-C	*	*
Arroyo del Pino[1]	0.030-0.125	0.035-0.124
Bear Arroyo Tributary	*	*
Boca Negra	0.035	0.035-0.200
Borrega Arroyo	*	*
Calabacillas Arroyo	0.022-0.030	0.018-0.200
Cedro Canyon Arroyo	0.030-0.045	0.040-0.060
Double Eagle II Channel	0.013-0.04	0.013-0.035
Embudo Arroyo	0.016-0.040	0.016-0.200

[1] Shallow flooding area

* Data not available

Table 14 – Manning's "n" Values (continued)

Flooding Source	Channel "n" Values	Overbank "n" Values
Frost Arroyo	0.035-0.060	0.035-0.200
Juniper Hill Arroyo	0.050-0.100	0.050-0.200
Ladera Dam 9 Diversion	0.035-0.04	0.03-0.045
Menaul Detention Basin	0.013-0.100	0.013-0.200
Middle Branch South Arroyo de Domingo Baca Tributary[1]	0.030-0.125	0.035-0.124
Middle Tributary of the Boca Negra Arroyo	0.035-0.050	0.035-0.050
Mirehaven Arroyo B	0.03-0.045	0.03-0.045
Mirehaven Arroyo C	0.035	0.04
North Arroyo de Domingo Baca[1]	0.030-0.125	0.035-0.124
North Branch of the San Antonio Arroyo	0.035-0.040	0.035-0.100
North Domingo Baca Spillway[1]	0.030-0.125	0.035-0.124
North Pino Arroyo	0.130	0.030-0.120
Paradise Hills Golf Course Arroyo	0.017-0.040	0.040-0.100
Rio Grande	0.025-0.040	0.040-0.090
Rio Grande East Overbank	0.025-0.040	0.040-0.090
Rio Puerco	0.025-0.045	0.035-0.045
San Antonio Arroyo	0.016-0.040	0.030-0.100
San Pedro Creek	0.070	0.016-0.200
Shamrock Channel	0.035	0.04
South Arroyo de Domingo Baca[1]	0.030-0.125	0.035-0.124
South Arroyo de Domingo Baca Tributary[1]	0.030-0.125	0.035-0.124
South Branch South Arroyo de Domingo Baca Tributary[1]	0.030-0.125	0.035-0.124
South Domingo Baca Spillway[1]	0.030-0.125	0.035-0.124
Southern Unnamed Tributary to Borrega Arroyo	*	*
Tijeras Arroyo	0.025-0.040	0.040-0.090
Tijeras Arroyo (at Tijeras)	0.030-0.045	0.040-0.060
Unnamed Arroyo No. 1	0.025-0.045	0.035-0.045
Unser Channel	0.035	0.04
West I-40 Diversion Channel	0.013-0.045	0.013-0.045

[1] Shallow flooding area

* Data not available

Analyses before September 20, 1996 FIS

Prior to the September 20, 1996, FIS, hydraulic analyses were performed as follows:

City of Albuquerque

For the FIS, dated April 14, 1983, for the City of Albuquerque (Reference 16), most of the flooding was either shallow flooding along the many small braided streams and along roads that flow near critical depth or shallow ponding in the valley areas. Because the flows were at shallow depths, the AO designation (shallow flooding) was used to delineate flood areas with average depths of 1, 2, or 3 feet (Reference 24). Only the 1-percent-annual-chance flood was analyzed for these areas and no profiles were computed. Estimated depths were based on normal or critical depth calculations, which agree closely with each other.

Step-backwater analyses of braided streams and ponding areas did not necessarily improve floodplain delineation. The step-backwater computer analysis of shallow flow near critical depths tends to produce an oscillation between adjacent cross-sections of low stage and high velocity and then high stage and low velocity. Within the valley areas, various types of embankments, rather than hydraulic characteristics, are very often the controlling features.

There are several concrete-lined channels within the study area designed to carry the 1-percent-annual-chance discharge with freeboard. Evaluations of 0.2-percent-annual-chance flooding along these channels were not economically justified and profiles for the constructed channels were not computed. These channels are shown and noted as constructed channels on the FIRM.

The Calabacillas Arroyo, Rio Grande, and Tijeras Arroyo (downstream from Kirtland Air Force Base) were studied by detailed methods, and the 10-, 2-, 1-, and 0.2-percent-annual-chance flood profiles were developed. Cross-sections for the backwater analyses were obtained from the following aerial photographs:

Flooding Source	Date of Photography	Scale of Negative
Calabacillas Arroyo	March 21, 1980	1:10,800
Rio Grande	December 19, 1979	1:24,000
Tijeras Arroyo	October 26, 1979	1:12,000

Except for the Rio Grande, streams were dry when the aerial photographs were taken. The water sections of the Rio Grande were estimated based on field surveys.

WSELs for floods of the selected recurrence intervals were computed through use of the HEC-2 step-backwater computer program (Reference 38).

For the Rio Grande, WSELs at each selected cross-section were field surveyed on June 9 and 10, 1980, during the snowmelt runoff period. Discharge in the river was approximately 6,400 cfs. The surveyed WSELs were used to calibrate the HEC-2 step-backwater model. After calibration, WSELs were determined for the selected floods. The 10-, 2-, and 1-percent-annual-chance flood profiles were computed with the flows confined within the constructed levees except along two reaches where levee failure is assumed to occur during the 1-percent-annual-chance flood.

The USACE and FEMA criteria for levee failure were used (References 10 and 39). Levee failure is assumed to occur when the WSEL is within 3 feet of the top of the levee. Levee elevations at each cross-section were field surveyed to accurately evaluate levee integrity.

Levee failure is assumed for the 1-percent-annual-chance flood along a short reach of the west levee downstream from the Corrales Main Canal siphon. Discharge outside the leveed channel was estimated by combining discharge ratings for the channel and the overbank areas. The overbank discharge was routed separately downstream to the confluence with the Calabacillas Arroyo where it would reenter the leveed channel. Levee failure was also assumed to occur along the east levee downstream from the confluence with the South Diversion Channel. The overflow discharge was estimated by combining discharge ratings. The overflow was routed separately down the east floodplain and would not return to the leveed channel until downstream from the study limits.

Based on FEMA's criteria, the constructed levees were not considered to be in place when the water surface profile was computed for the 0.2-percent-annual-chance flood. Cross-sections for the entire historical floodplain were used in the analysis. Along several reaches, the overbank areas are lower than the bottom of the Rio Grande channel and have large carrying capacities. The channel meanders somewhat within the historic floodplain and cross-sections perpendicular to the flow across the entire floodplain were difficult to define. Small changes in ground elevation across the large floodplains yield very large changes in conveyance and corresponding changes in WSELs. As a result, the water surface profile computed by step-backwater analysis, as shown on the flood profiles, is not always higher compared to the 10-, 2-, and 1-percent-annual-chance flood profiles. Also, hydraulic characteristics of the area outside the levees are very difficult to define due to numerous irrigation levees and road and railroad embankments. The intense effort to accurately delineate the 0.2-percent-annual-chance flooding was beyond the scope of this study. Therefore, WSELs and limits of flooding for the 0.2-percent-annual-chance flood should be considered only approximate.

Starting WSELs for the Rio Grande were calculated using the slope-area method. Critical depth was assumed for starting WSELs for the Calabacillas Arroyo and Tijeras Arroyo.

Bernalillo County (Unincorporated Areas)

For the FIS, dated March 15, 1983, for the unincorporated areas of Bernalillo County (Reference 5), cross-sections for the backwater analyses were obtained from aerial photographs from October 26 and November 14, 1979, at a negative scale of 1 inch = 1,000 feet (Reference 40). All streams were dry when the aerial photographs were taken.

WSELs of floods of the selected recurrence intervals for Frost Arroyo, Rio Puerco, San Pedro Creek, and Unnamed Arroyo No. 1 were computed using the USACE HEC-2 step-backwater computer program (Reference 38).

Starting WSELs for Frost Arroyo, San Pedro Creek, and Unnamed Arroyo No. 1 were calculated using critical depth. Normal depth was used for the starting WSELs for the Rio Puerco. Unnamed Arroyo No. 1 was analyzed in two separate reaches, one upstream and one downstream from the Interstate Highway 40 crossing, because the highway crossing does not have the capacity to pass the 2-, 1-, and 0.2-percent-annual-chance flows. The floodwaters pond upstream of the highway embankment and then flow over the west bank to the Rio Puerco. The culvert under Interstate Highway 40 has a capacity of approximately 1,400 cfs.

Village of Tijeras

For the FIS, dated July 6, 1982, for the Village of Tijeras (Reference 11), cross-sections for the backwater analyses were obtained from aerial photographs, dated October 26, 1979, at a negative scale of 1 inch = 1,000 feet (References 40 and 41). All streams were dry when the aerial photographs were taken.

WSELs of floods of the selected recurrence intervals for Cedro Canyon Arroyo and Tijeras Arroyo (at Tijeras) were computed using the USACE HEC-2 step-backwater computer program (Reference 42). Starting WSELs for Cedro Canyon Arroyo and Tijeras Arroyo (at Tijeras) were calculated using the slope-area method.

September 20, 1996, FIS

For the FIS, dated September 20, 1996, cross-sections were obtained from aerial photography, dated April 3, 1991, at scales of 1:8,000 and 1:10,000, for Arroyos A-B, A-C, B-B, B-C, Tierra Bayita Storm Drain, and the Rio Grande (upstream of Cross Section AE). For the Rio Grande between the levees, ground elevations at each selected cross-section were obtained from the USACE, which used a digital terrain model from aerial photography, dated February 3, 1984 (Reference 43). These cross-sections were extended into the east overbank using a digital terrain model based on 1991 aerial photography.

The USACE HEC-2 step-backwater computer program (Reference 38) was used to compute WSELs for Arroyos A-B, A-C, B-B, B-C, Tierra Bayita Storm Drain, and the Rio Grande (upstream of Cross-section AE). Due to poorly defined banks in some locations, engineering judgment was applied for evaluation of model results. For Arroyos A-B, A-C, B-B, B-C, and the Tierra Bayita Storm Drain, critical depth was assumed for starting WSELs. For the Rio Grande, the starting WSELs were based on the slope-area method. Levee failure was assumed for the 1- and 0.2-percent-annual-chance recurrence intervals along the east levee downstream from the South Diversion Channel through the study reach because only approximately 1.5 feet of freeboard are available during the 1-percent-annual-chance flood.

April 2, 2002 FIS

For this revision (Reference 13), cross-sections were compiled using aerial photogrammetry, available topographic mapping, USGS quadrangle maps, and as-built information. The USACE HEC-2 computer program (Reference 38) was used to perform the hydraulic analyses for Arroyo del Pino, Arroyo SB, Middle Branch South Arroyo de Domingo Baca Tributary, North Arroyo de Domingo Baca, North Domingo Baca Spillway, South Arroyo de Domingo Baca, South Arroyo de Domingo Baca Tributary, South Branch South Arroyo de Domingo Baca Tributary, South Domingo Baca Spillway, Tijeras Arroyo (upstream of Kirtland Air Force Base), and Tijeras Arroyo Tributaries A through F. Critical depth was assumed for starting WSELs for all streams studied in the April 2, 2002, revision.

All of the restudy areas except for the main branch of Tijeras Arroyo were mapped as shallow flooding areas. Shallow flooding areas with average depths between 1 and 3 feet were designated Zone AO (Reference 13). Mapping depths were based on critical depth calculations in supercritical flow reaches and on the computed water surface depths in subcritical flow reaches. The shallow flooding designation was due to shallow flooding with high velocity flow and a potential sediment load. A portion of the main branch of

Tijeras Arroyo upstream of Kirtland Air Force Base was restudied using detailed methods, and the 10-, 2-, 1-, and 0.2-percent-annual-chance flood profiles were developed accordingly. The Zone AE designation was used for flood areas for Tijeras Arroyo (Reference 13).

The concrete channels along portions of North and South Arroyos de Domingo Baca (near Tramway Boulevard) were also analyzed using the HEC-2 computer program (Reference 38) and the computed discharges. The analyses indicated that the channels have adequate capacity for the 1- and 0.2-percent-annual-chance floods.

The hydraulic analyses for this study were based on unobstructed flow except at culverts in which the potential for obstruction due to sedimentation and debris was considered. The following assumptions and simplified analysis were applied to account for sediment accumulation within culverts and the resulting effect on the WSEL in the vicinity of the culverts.

In areas of North and South Arroyos de Domingo Baca and their respective tributaries, the culverts are typically less than 36 inches in diameter; therefore, these culverts were not included in the HEC-2 model. The flood elevations and floodplains around each culvert were subsequently computed assuming culvert hydraulics with inlet control. In most cases, the discharge exceeded the maximum headwater elevation (top of road) and weir flow in excess of the culvert capacity would occur. Because most existing culverts were partially or completely plugged with sediment and debris, it was assumed that all of the less than 60-inch-diameter culverts would be completely plugged. Because of the large weir flow capacity over the roadways, this assumption is not too conservative.

Because the culverts of the tributaries to Tijeras Arroyo upstream of Kirtland Air Force Base are large box culverts and the channel slopes are very steep, no culvert restriction was found. Therefore, all of these culverts were modeled at full capacity. However, on Tijeras Arroyo, upstream of Kirtland Air Force Base, there is one multiple-culvert crossing (four 72-inch- and one 78-inch-diameter pipe culverts), which was obstructed by debris when inspected in the field. These culverts were modeled as 40-percent ineffective. All other crossings of Tijeras Arroyo in the study reach upstream of Kirtland Air Force Base were bridges where no blockage was assumed.

November 19, 2003 FIS

There were no changes to the hydraulic analyses in this revision.

September 26, 2008 FIS

For streams studied under new detailed analysis, water surface elevations for the 10-, 2-, 1-, and 0.2-percent-annual-chance floods were computed using the U.S. Army Corps of Engineers' HEC-RAS version 3.1.3 step-backwater computer program (Reference 44). For streams studied under enhanced approximate type 1 analysis, only the 1-percent-annual-chance floods were computed. These streams were identified in Section 2.1. Hydrologic Modeling System (HEC-HMS) software was used to compute the maximum water surface elevation based on hydrograph routing. The 2007 de-accredited Rio Grande levee analyses were performed using the HEC-RAS version 3.1.3 step-backwater computer program (Reference 44).

For detailed study hydraulic analyses, profiles of the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events were generated. For enhanced approximate type 1 study streams, only the 1-percent-annual-chance flood was computed.

The following are the four basic methods of analysis that were used for the Riverine Analyses of limited and detailed studies in Bernalillo County:

Normal Depth Calculations – Normal depth calculations were performed for areas where the channel configuration was consistent throughout the study reach, or the study reach could be divided into defined sections of a consistent configuration. Situations where normal depth calculations were used consist of street flow, some concrete lined channels, and some man-made channels. Calculations were performed in FlowMaster Version 7 (Reference 45).

Ponding – For areas where ponding occurs, the depth was determined utilizing the software program AHYMO v1997.2. Situations were ponding occurs consists of man-made retention and detention ponds and natural playas (Reference 46).

Storm Drains – Study reaches consisting of storm drain systems were analyzed utilizing StormCAD v5.5 (Reference 47). Where it was determined that the storm drain system does not have the capacity to contain the 1-percent-annual-chance event, the excess flow was computed and then routed as surface flow down the streets. Normal depth calculations, as described above, were performed on the street flow.

Riverine – For riverine areas, the study reaches were modeled using the step-backwater computer model HEC-RAS v3.1.1 (Reference 48) based in the Watershed Information System (WISE) platform (Reference 49). Cross-sections to be utilized by the modeling program are placed at reasonable spacing based on topographic conditions.

Additional cross-sections are placed at culvert and bridge crossings and at locations where there is a significant change in the channel configuration. The cross-sections are based on the Light Detection and Ranging (LiDAR) data (Reference 50) contained in the WISE Terrain module (Reference 49). Cross-sections were refined based on actual field survey data of cross-sections (detailed study only) and crossing structures, and knowledge of the area obtained during the field reconnaissance task of the project.

Supercritical Analyses and Floodway Encroachments – Section C.3.4.4 of the Guidelines and Specifications stipulates that "for concrete-lined channels, the Mapping Partner shall perform a supercritical run for the project area." Many of the channels that were used for the Riverine Analyses of limited and detailed studies in Bernalillo County are concrete lined and contain little to no vegetation; even those channels that are not concrete-lined are sparsely vegetated at best. Therefore, the majority of the channels are clean and smooth which, combined with the steeply sloped topography of New Mexico, leads to larger conveyance due to supercritical flow conditions and enables them to flow fast and full. Due to the supercritical flow, a floodway analysis was not possible. Increasing encroachments results in a drop of water surface elevation and a resulting increase in velocity. Therefore, the encroachments were set to zero and floodway boundaries and floodway widths were set to those of the 1-percent-annual-chance floodplain.

August 16, 2012 FIS

RAMPP computed streams studied by approximate methods using the riverine methods described below. Water surface elevations for the 1-percent-annual-chance floods were computed. RAMPP analyzed shallow flooding for the areas drained by the Glenrio and McKnight Storm Drains using the additional methods described below.

Riverine – For riverine areas, RAMPP modeled the study reaches using the step-backwater computer model HEC-RAS Version 4.1.0 (Reference 51), based in the WISE platform (Reference 49). This model places cross-sections to be used at reasonable spacing, based on topographic conditions.

Cross-sections were placed at culvert and bridge crossings, and at locations where there is a significant change in the channel configuration. The cross-sections were based on LiDAR data contained in the WISE Terrain module (Reference 49) and on knowledge of the area obtained during field reconnaissance.

Normal Depth Calculations – RAMPP performed normal depth calculations for areas where the channel configuration was consistent throughout the study reach or where the study reach could be divided into defined sections of a consistent configuration. These consisted of street flow, overflow sections, and areas of sheet flow. Calculations were performed in FlowMaster Version 8, Service Pack 3 (Reference 52).

Ponding – For areas drained by the Glenrio Storm Drain where ponding occurs, RAMPP determined the depth using the reservoir routing methods of the software program AHYMO Version S4.01a. Situations where ponding occurs consist of retention on the streets, boulevards, and lots caused by the fact that the area was likely a natural playa that was not mass graded during development (Reference 53).

Storm Drains – RAMPP analyzed the Glenrio and McKnight Storm Drain systems using StormCAD Version 8i (Reference 54). Where it was determined that the storm drain system does not have the capacity to contain the 1-percent-annual-chance event, the excess flow was computed and then routed as surface flow down the streets. RAMPP analyzed depth calculations for street flooding associated with the Glenrio Storm Drain using normal depth calculations or ponding area calculations, as described above. Depth calculations for the street flooding associated the McKnight Storm Drain were analyzed using riverine methods.

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 on 1929 (NGVD 29). With the completion of NAVD 88, many FIS reports and FIRMs are being prepared using NAVD 88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD 88. Effective information was converted from NGVD 29 to NAVD 88. The average conversion factor of + **2.80** feet was applied to convert all effective Base Flood Elevations (BFEs). Structure and ground elevations in the community must, therefore, be referenced to NAVD 88. It is important to note that adjacent communities not presented in this FIS may be referenced to NGVD 29. This may result in differences in BFEs across the corporate limits between communities.

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD 88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the NGVD 29 and NAVD 88, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

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.

3.4 Refinement

September 26, 2008 FIS

All Zone A Special Flood Hazard Areas that were not re-studied underwent refinement. The refinement was based on the orthophotography that was provided by Bernalillo County (Reference 56) and was the base map for the FIRMs. Refinement does not take into account changes to the ground surfaces since orthophotos were taken. Potential surface changes may include development and fluvial changes to the river systems.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS report provides 1-percent-annual-chance (100-year) flood elevations and delineations of the 1- and 0.2-percent-annual-chance (500-year) floodplain boundaries and 1-percent-annual-chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data Table, and Summary of Stillwater Elevations Table. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross-section. Between cross-sections, the boundaries were originally interpolated using topographic maps at a scale of 1:24,000, with a contour interval of 2 feet (Reference 57).

For the FIS, dated April 14, 1983, for the City of Albuquerque (Reference 16), the boundaries were interpolated between cross-sections using topographic maps at a scale of 1:6,000, with a contour interval of 2 feet.

For the FIS, dated March 15, 1983, for the unincorporated areas of Bernalillo County (Reference 5), the boundaries were interpolated between cross-sections using topographic maps at a scale of 1:6,000, with a contour interval of 2 feet.

For the FIS, dated July 6, 1982, for the Village of Tijeras (Reference 11), the boundaries were interpolated between cross-sections using topographic maps at a scale of 1:2,400, with a contour interval of 2 feet.

For the FIS, dated September 20, 1996 (Reference 12), the boundaries were interpolated between cross-sections using topographic maps based on aerial photography, dated April 3, 1991, at scales of 1:8,000 and 1:10,000.

For the FIS, dated April 2, 2002 (Reference 13), the boundaries were interpolated between cross-sections using aerial photogrammetry, available topographic mapping, USGS quadrangle maps, and as-built information. In addition, floodplain revisions based on the storm drainage system along Tramway Boulevard near San Rafael Avenue and Pino Avenue, prepared by Resource Technology, Inc., were incorporated (Reference 33).

For the FIS dated November 19, 2003 (Reference 14), there were no changes to the floodplain boundaries.

For the FIS dated September 26, 2008 (Reference 15), the boundaries were interpolated between cross sections using available topographic mapping, survey information, and orthophotography. WSELs for previously studied reaches were obtained from existing profiles and mapped using information listed above.

August 16, 2012, FIS

RAMPP interpolated floodplain boundaries for approximate areas using Bernalillo County LiDAR (References 50, 58, and 59), USGS 10-meter digital elevation models (DEMs) (Reference 60), and orthophotography (Reference 61). Floodplain boundaries for the Glenrio and McKnight Storm Drains were interpolated using as-built information provided by the City of Albuquerque, field surveys, Bernalillo County LiDAR (References 50, 58, and 59), and orthophotography (Reference 61).

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

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

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to

1 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 FIS report and on the FIRM 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 have been tabulated for selected cross-sections (Table 16). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the WSEL of the 1-percent-annual-chance flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1. No floodways were computed for Arroyos A-B, A-C, B-B, and B-C, Tierra Bayita Storm Drain, Bear Arroyo Tributary, Borrega Arroyo, Rio Grande East Overbank, and Southern Unnamed Tributary to Borrega Arroyo.

In previous revisions, floodways were calculated for the Boca Negra Arroyo, Boca Negra Arroyo Split Flow, Calabacillas Arroyo, Embudo Arroyo, Juniper Hill Arroyo, Menaul Detention Basin, and Middle Tributary of the Boca Negra Arroyo. Floodways in these cases were confined to the channel and match the 1-percent-annual-chance floodplain.

In previous revisions floodways were also calculated for Cedro Canyon Arroyo, Frost Arroyo, Rio Grande, Rio Puerco, San Pedro Creek, Tijeras Arroyo, Tijeras Arroyo (At Tijeras), and Unnamed Arroyo No. 1. Floodways in these cases did not necessarily match the 1-percent-annual-chance floodplain.

For the August 16, 2012, PMR and FIS update, no new floodway analyses were conducted.

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY[2]	WITHOUT FLOODWAY[2]	WITH FLOODWAY[2]	INCREASE[2]
BOCA NEGRA ARROYO								
A	16,457	96.9	214	8.5	5,204.8	5,204.8	5,204.8	0.0
B	17,000	37.7	161	11.4	5,276.4	5,276.4	5,276.4	0.0
C	17,130	124.5	231	6.9	5,316.3	5,316.3	5,316.3	0.0
D	18,016	97.9	192	8.2	5,329.4	5,329.4	5,329.4	0.0
E	18,766	154.1	242	6.6	5,342.7	5,342.7	5,342.7	0.0
F	19,771	178.4	249	6.2	5,353.4	5,353.4	5,353.4	0.0
G	20,391	160.2	235	6.5	5,361.1	5,361.1	5,361.1	0.0
H	20,574	232.8	323	4.8	5,363.2	5,363.2	5,363.2	0.0
I	21,002	78.7	21	8.3	5,368.7	5,368.7	5,368.7	0.0
J	21,336	125.9	200	7.3	5,375.7	5,375.7	5,375.7	0.0
K	21,846	104.1	200	7.3	5,392.9	5,392.9	5,392.9	0.0
L	22,028	130.3	212	6.8	5,397.9	5,397.9	5,397.9	0.0
M	22,241	140.7	222	6.9	5,400.8	5,400.8	5,400.8	0.0
N	23,000	170.4	240	6.4	5,409.9	5,409.9	5,409.9	0.0
O	24,106	115.0	209	7.4	5,423.3	5,423.3	5,423.3	0.0
P	24,989	124.3	239	6.4	5,432.2	5,432.2	5,432.2	0.0
Q	25,375	94.1	186	8.0	5,436.0	5,436.0	5,436.0	0.0

[1]Feet above confluence with San Antonio Arroyo
[2]Floodway coincident with floodplain

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

BOCA NEGRA ARROYO

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY[2]	WITHOUT FLOODWAY[2]	WITH FLOODWAY[2]	INCREASE[2]
BOCA NEGRA ARROYO SPLIT FLOW								
A	20,775	48.6	22	3.8	5,370.3	5,370.3	5,370.3	0.0
B	21,002	55.0	23	3.6	5,372.5	5,372.5	5,372.5	0.0
C	21,336	78.8	32	2.6	5,384.1	5,384.1	5,384.1	0.0
D	21,846	27.4	18	4.6	5,397.5	5,397.5	5,397.5	0.0
E	22,028	32.6	19	4.4	5,400.4	5,400.4	5,400.4	0.0

[1]Feet above confluence with San Antonio Arroyo

[2]Floodway coincident with floodplain

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

BOCA NEGRA ARROYO SPLIT FLOW

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY[2]	WITHOUT FLOODWAY[2]	WITH FLOODWAY[2]	INCREASE[2]
CALABACILLAS ARROYO								
A	1,309	107.7	648	13.9	5,008.2	5,008.2	5,008.2	0.0
B	2,000	116.9	664	13.6	5,014.7	5,014.7	5,014.7	0.0
C	2,624	108.1	646	14.0	5,021.1	5,021.1	5,021.1	0.0
D	3,439	150.9	1082	8.3	5,035.9	5,035.9	5,035.9	0.0
E	4,000	147.5	717	12.6	5,041.7	5,041.7	5,041.7	0.0
F	5,000	103.5	637	14.2	5,056.1	5,056.1	5,056.1	0.0
G	5,560	131.6	692	13.0	5,062.7	5,062.7	5,062.7	0.0
H	6,239	339.2	1,006	9.0	5,068.4	5,068.4	5,068.4	0.0
I	6,876	109.0	648	13.9	5,073.6	5,073.6	5,073.6	0.0
J	7,247	148.0	716	12.6	5,084.3	5,084.3	5,084.3	0.0
K	8,000	114.6	577	12.8	5,094.3	5,094.3	5,094.3	0.0
L	9,033	160.0	647	11.4	5,107.4	5,107.4	5,107.4	0.0
M	10,000	203.8	697	10.6	5,124.1	5,124.1	5,124.1	0.0
N	11,000	154.7	637	11.6	5,138.5	5,138.5	5,138.5	0.0
O	12,000	137.8	613	12.1	5,155.8	5,155.8	5,155.8	0.0
P	12,663	102.9	557	13.3	5,163.7	5,163.7	5,163.7	0.0
Q	13,519	115.0	579	12.7	5,175.8	5,175.8	5,175.8	0.0
R	14,000	198.2	693	10.6	5,183.5	5,183.5	5,183.5	0.0
S	15,041	333.3	821	9.0	5,198.7	5,198.7	5,198.7	0.0

[1]Feet above confluence with the Rio Grande
[2]Floodway coincident with floodplain

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

CALABACILLAS ARROYO

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY[2]	WITHOUT FLOODWAY[2]	WITH FLOODWAY[2]	INCREASE[2]
CALABACILLAS ARROYO (continued)								
T	16,000	148.0	628	11.8	5,213.0	5,213.0	5,213.0	0.0
U	16,797	181.8	671	11.0	5,222.8	5,222.8	5,222.8	0.0
V	17,565	301.3	852	8.7	5,233.3	5,233.3	5,233.3	0.0
W	18,269	345.6	901	8.2	5,242.1	5,242.1	5,242.1	0.0
X	19,000	223.7	720	10.3	5,249.6	5,249.6	5,249.6	0.0
Y	20,145	283.9	8,121	2.2	5,281.1	5,281.1	5,281.1	0.0
Z	21,090	847.5	10,069	0.8	5,281.2	5,281.2	5,281.2	0.0
AA	22,092	362.3	878	8.9	5,280.9	5,280.9	5,280.9	0.0
AB	23,131	158.9	668	11.7	5,298.2	5,298.2	5,298.2	0.0
AC	24,000	147.8	609	11.6	5,318.0	5,318.0	5,318.0	0.0
AD	25,000	267.0	745	9.5	5,334.4	5,334.4	5,334.4	0.0
AE	29,517	268.2	742	9.5	5,347.5	5,347.5	5,347.5	0.0
AF	27,057	166.1	719	9.8	5,365.1	5,365.1	5,365.1	0.0
AG	28,047	198.9	674	10.5	5,378.0	5,378.0	5,378.0	0.0
AH	29,025	257.0	733	9.6	5,390.7	5,390.7	5,390.7	0.0
AI	29,713	367.7	825	8.6	5,401.2	5,401.2	5,401.2	0.0

[1]Feet above confluence with the Rio Grande

[2]Floodway coincident with floodplain

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

CALABACILLAS ARROYO

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY[2]	INCREASE
CEDRO CANYON ARROYO								
A	255	100	428	12.7	6,264.1	6,264.1	6,264.3	0.2
B	560	100	459	11.8	6,269.3	6,269.3	6,269.4	0.1
C	1,030	104	480	11.3	6,275.4	6,275.4	6,276.3	0.9
D	1,340	89	442	12.3	6,281.8	6,281.8	6,281.8	0.0
E	1,430	102	332	16.4	6,292.6	6,292.6	6,292.6	0.0
F	1,550	95	770	7.0	6,292.6	6,292.6	6,292.6	0.0
G	2,350	197	430	12.6	6,300.2	6,300.2	6,300.2	0.0

[1]Feet above confluence with Tijeras Arroyo (at Tijeras)

[2]Energy grade line used for floodway determination

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

CEDRO CANYON ARROYO

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY[2]	WITHOUT FLOODWAY[2]	WITH FLOODWAY[2]	INCREASE[2]
EMBUDO ARROYO								
A	8,004	26.5	97	10.9	5,837.7	5,837.7	5,837.7	0.0
B	8,360	26.5	97	10.9	5,855.3	5,855.3	5,855.3	0.0
C	8,509	26.3	97	10.9	5,867.0	5,867.0	5,867.0	0.0
D	9,063	26.3	97	10.9	5,894.7	5,894.7	5,894.7	0.0
E	9,366	26.3	96	11.0	5,911.3	5,911.3	5,911.3	0.0
F	9,821	39.3	110	9.6	5,933.1	5,933.1	5,933.1	0.0
G	9,906	108.6	154	6.8	5,935.2	5,935.2	5,935.2	0.0
H	10,257	181.2	182	5.8	5,957.0	5,957.0	5,957.0	0.0
I	10,542	28.6	83	9.7	5,974.4	5,974.4	5,974.4	0.0
J	11,026	46.9	97	8.2	6,004.1	6,004.1	6,004.1	0.0

[1]Feet above confluence with unnamed stream

[2]Floodway coincident with floodplain

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM

AND INCORPORATED AREAS

FLOODWAY DATA

EMBUDO ARROYO

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY[2]	WITHOUT FLOODWAY[2]	WITH FLOODWAY[2]	INCREASE[2]
FROST ARROYO								
A	20,000	128.9	1,054	12.3	6,420.5	6,420.5	6,420.5	0.0
B	21,050	131.8	1,045	12.4	6,431.6	6,431.6	6,431.6	0.0
C	22,094	273.8	1,121	11.6	6,450.3	6,450.3	6,450.3	0.0
D	23,119	79.8	708	16.9	6,464.2	6,464.2	6,464.2	0.0
E	23,790	97.5	755	15.9	6,477.5	6,477.5	6,477.5	0.0
F	24,210	167.6	908	13.2	6,484.6	6,484.6	6,484.6	0.0
G	25,329	133.9	974	12.3	6,496.5	6,496.5	6,496.5	0.0
H	26,508	101.5	766	15.7	6,509.1	6,509.1	6,509.1	0.0
I	27,670	140.0	1,195	10.0	6,519.6	6,519.6	6,519.6	0.0
J	28,699	90.1	735	16.3	6,528.7	6,528.7	6,528.7	0.0
K	29,714	104.6	912	13.2	6,537.7	6,537.7	6,537.7	0.0
L	30,705	95.8	750	16.0	6,548.0	6,548.0	6,548.0	0.0
M	31,760	95.3	770	15.6	6,558.0	6,558.0	6,558.0	0.0
N	32,188	129.8	847	14.2	6,564.4	6,564.4	6,564.4	0.0
O	32,558	150.6	1,144	10.5	6,568.2	6,568.2	6,568.2	0.0
P	33,166	82.3	631	15.8	6,575.9	6,575.9	6,575.9	0.0
Q	33,880	112.6	932	9.4	6,582.4	6,582.4	6,582.4	0.0
R	34,251	69.3	545	16.0	6,584.0	6,584.0	6,584.0	0.0

[1]Feet above mouth

[2]Floodway coincident with floodplain

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

FROST ARROYO

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
FROST ARROYO (continued)								
S	35,376	53	336	14.4	6,594.3	6,594.3	6,594.3	0.0
T	36,501	61	356	13.6	6,610.3	6,610.3	6,610.4	0.1
U	37,426	120	495	9.8	6,621.6	6,621.6	6,621.6	0.0
V	37,666	96	376	10.1	6,623.7	6,623.7	6,623.7	0.0
W	37,856	120	375	10.1	6,628.4	6,628.4	6,629.0	0.6
X	38,001	120	462	8.2	6,630.4	6,630.4	6,631.3	0.9
Y	38,401	120	427	8.9	6,634.7	6,634.7	6,635.0	0.3
Z	39,266	120	516	7.3	6,642.1	6,642.1	6,642.7	0.6
AA	39,351	150	396	9.6	6,647.3	6,647.3	6,647.3	0.0
AB	39,426	133	924	4.1	6,648.4	6,648.4	6,648.4	0.0
AC	40,356	92	390	9.7	6,649.2	6,649.2	6,649.8	0.6
AD	41,556	113	380	9.4	6,663.1	6,663.1	6,663.1	0.0
AE	41,621	32	232	15.4	6,664.1	6,664.1	6,664.1	0.0
AF	41,671	109	655	5.9	6,667.5	6,667.5	6,667.5	0.0
AG	42,591	57	283	12.7	6,673.8	6,673.8	6,673.8	0.0
AH	44,136	36	239	14.3	6,691.5	6,691.5	6,691.5	0.0
AI	44,196	44	247	13.8	6,693.1	6,693.1	6,693.3	0.2
AJ	44,256	120	936	3.7	6,696.2	6,696.2	6,696.2	0.0

[1]Feet above mouth

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

FROST ARROYO

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
FROST ARROYO (Continued)								
AK	44,496	119	584	5.9	6,696.2	6,696.2	6,696.3	0.1
AL	44,731	107	502	6.8	6,696.7	6,696.7	6,696.8	0.1
AM	44,791	36	233	14.7	6,699.0	6,699.0	6,699.0	0.0
AN	44,821	120	1,297	2.6	6,702.3	6,702.3	6,702.3	0.0
AO	45,696	120	373	8.9	6,709.6	6,709.6	6,709.8	0.2
AP	46,071	120	488	6.2	6,712.1	6,712.1	6,712.9	0.8
AQ	46,121	150	358	8.5	6,713.6	6,713.6	6,713.9	0.3
AR	46,221	100	483	6.3	6,714.4	6,714.4	6,714.6	0.2
AS	46,801	120	320	9.5	6,717.6	6,717.6	6,717.6	0.0
AT	47,291	120	323	9.4	6,725.9	6,725.9	6,726.4	0.5

[1]Feet above mouth

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

FROST ARROYO

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY[2]	WITHOUT FLOODWAY[2]	WITH FLOODWAY[2]	INCREASE[2]
JUNIPER HILL ARROYO								
A	34,147	36.1	19	4.2	6,260.3	6,260.3	6,260.3	0.0
B	34,294	22.7	16	4.9	6,272.8	6,272.8	6,272.8	0.0
C	34,585	15.9	15	5.5	6,293.8	6,293.8	6,293.8	0.0
D	34,911	22.6	16	4.9	6,329.1	6,329.1	6,329.1	0.0
E	35,183	16.1	15	5.5	6,363.1	6,363.1	6,363.1	0.0
F	35,380	28.5	49	1.6	6,378.3	6,378.3	6,378.3	0.0
G	35,482	15.7	15	5.5	6,394.6	6,394.6	6,394.6	0.0
H	35,743	21.3	16	5.0	6,424.3	6,424.3	6,424.3	0.0

[1]Feet above confluence with AMAFCA North Diversion Channel

[2]Floodway coincident with floodplain

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

JUNIPER HILL ARROYO

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY[2]	WITHOUT FLOODWAY[2]	WITH FLOODWAY[2]	INCREASE[2]
MENAUL DETENTION BASIN								
A	942	53.9	237	6.0	4,993.0	4,993.0	4,993.0	0.0
B	1,505	62.9	416	3.4	5,020.2	5,020.2	5,020.2	0.0
C	2,254	51.0	255	5.6	5,025.6	5,025.6	5,025.6	0.0

[1]Feet above confluence with unnamed stream
[2]Floodway coincident with floodplain

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

MENAUL DETENTION BASIN

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY[2]	WITHOUT FLOODWAY[2]	WITH FLOODWAY[2]	INCREASE[2]
MIDDLE TRIBUTARY OF THE BOCA NEGRA ARROYO								
A	1,680	23.5	71	10.0	5,295.3	5,295.3	5,295.3	0.0
B	1,903	111.5	107	5.6	5,312.0	5,312.0	5,312.0	0.0
C	2,496	129.2	144	4.2	5,319.0	5,319.0	5,319.0	0.0
D	3,001	268.0	154	3.9	5,325.1	5,325.1	5,325.1	0.0
E	3,481	340.1	169	3.6	5,333.7	5,333.7	5,333.7	0.0
F	3,974	270.7	157	3.9	5,341.7	5,341.7	5,341.7	0.0
G	4,452	346.2	157	3.9	5,351.4	5,351.4	5,351.4	0.0
H	4,993	465.1	184	3.3	5,363.2	5,363.2	5,363.2	0.0
I	5,591	503.8	212	2.9	5,372.1	5,372.1	5,372.1	0.0
J	5,928	182.8	125	4.8	5,378.4	5,378.4	5,378.4	0.0
K	6,374	325.0	177	3.4	5,385.3	5,385.3	5,385.3	0.0
L	6,748	96.3	102	5.9	5,392.1	5,392.1	5,392.1	0.0
M	7,165	53.9	84	7.2	5,399.0	5,399.0	5,399.0	0.0
N	7,681	113.6	106	5.7	5,414.5	5,414.5	5,414.5	0.0
O	8,206	47.1	80	7.5	5,427.5	5,427.5	5,427.5	0.0
P	8,461	94.8	109	5.5	5,439.5	5,439.5	5,439.5	0.0
Q	8,944	57.0	86	7.0	5,455.4	5,455.4	5,455.4	0.0

[1]Feet above confluence with Boca Negra Arroyo

[2]Floodway coincident with floodplain

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

MIDDLE TRIBUTARY OF THE BOCA NEGRA ARROYO

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY[2]	WITHOUT FLOODWAY[2]	WITH FLOODWAY[2]	INCREASE[2]
MIDDLE TRIBUTARY OF THE BOCA NEGRA ARROYO (Continued)								
R	9,213	45.4	78	7.7	5,462.2	5,462.2	5,462.2	0.0
S	9,437	67.8	91	6.6	5,470.1	5,470.1	5,470.1	0.0
T	9,750	84.6	98	6.2	5,482.7	5,482.7	5,482.7	0.0
U	10,173	88.6	100	6.0	5,491.6	5,491.6	5,491.6	0.0
V	10,687	62.8	89	6.8	5,503.5	5,503.5	5,503.5	0.0
W	11,226	60.9	87	7.0	5,513.3	5,513.3	5,513.3	0.0
X	11,750	49.9	93	6.5	5,518.4	5,518.4	5,518.4	0.0
Y	12,260	61.6	88	6.8	5,526.9	5,526.9	5,526.9	0.0
Z	12,762	73.5	94	6.5	5,536.0	5,536.0	5,536.0	0.0
AA	13,316	54.3	87	7.0	5,544.6	5,544.6	5,544.6	0.0
AB	13,577	35.3	74	8.2	5,573.2	5,573.2	5,573.2	0.0
AC	13,809	135.2	119	5.1	5,578.2	5,578.2	5,578.2	0.0
AD	14,065	50.5	82	7.4	5,587.5	5,587.5	5,587.5	0.0
AE	14,176	76.1	95	6.4	5,608.7	5,608.7	5,608.7	0.0
AF	14,306	94.1	102	5.9	5,616.6	5,616.6	5,616.6	0.0

[1] Feet above confluence with Boca Negra Arroyo
[2] Floodway coincident with floodplain

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

MIDDLE TRIBUTARY OF THE BOCA NEGRA ARROYO

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY[2]	WITHOUT FLOODWAY[2]	WITH FLOODWAY[2]	INCREASE[2]
RIO GRANDE								
A	58,654	2,030	4,895	2.4	4,906.1	4,906.1	4,906.1	0.0
B	60,700	1,800	4,797	2.5	4,908.1	4,908.1	4,908.1	0.0
C	64,460	1,753	4,275	2.9	4,912.0	4,912.0	4,912.0	0.0
D	67,910	1,656	4,137	3.0	4,914.6	4,914.6	4,914.6	0.0
E	72,900	1,491	3,808	3.4	4,918.7	4,918.7	4,918.7	0.0
F	77,100	1,593	3,389	3.9	4,922.4	4,922.4	4,922.4	0.0
G	80,012	1,419	3,704	3.8	4,925.6	4,925.6	4,925.6	0.0
H	82,115	2,290	3,578	4.4	4,926.8	4,926.8	4,927.2	0.4
I	84,230	1,360	4,272	3.7	4,929.5	4,929.5	4,929.5	0.0
J	87,930	1,356	3,573	4.4	4,933.2	4,933.2	4,933.2	0.0
K	88,110	1,344	4,454	3.5	4,933.4	4,933.4	4,933.4	0.0
L	88,750	1,386	3,569	4.4	4,934.3	4,934.3	4,934.3	0.0
M	93,050	1,356	5,772	2.7	4,937.7	4,937.7	4,937.7	0.0
N	95,990	1,402	5,369	2.9	4,939.7	4,939.7	4,939.7	0.0
O	98,300	1,395	2,510	6.3	4,941.9	4,941.9	4,941.9	0.0
P	103,050	1,421	5,140	3.1	4,945.8	4,945.8	4,945.8	0.0
Q	104,630	1,421	3,881	4.1	4,948.0	4,948.0	4,948.0	0.0
R	105,610	1,342	4,112	3.9	4,949.0	4,949.0	4,949.0	0.0
S	107,630	1,560	3,040	5.3	4,950.4	4,950.4	4,950.4	0.0
T	111,630	1,111	4,311	3.7	4,954.6	4,954.6	4,954.6	0.0

[1]Feet above State Highway 49 Bridge at Los Lunas
[2]Floodway confined to channel

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

RIO GRANDE

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY[2]	WITHOUT FLOODWAY[2]	WITH FLOODWAY[2]	INCREASE[2]
RIO GRANDE (Continued)								
U	114,080	1,330	4,511	3.6	4,957.2	4,957.2	4,957.2	0.0
V	114,820	1,455	3,676	4.4	4,958.1	4,958.1	4,958.1	0.0
W	117,580	1,280	2,178	7.6	4,960.5	4,960.5	4,960.5	0.0
X	122,030	937	4,162	4.0	4,965.8	4,965.8	4,965.8	0.0
Y	122,605	926	4,100	4.0	4,966.4	4,966.4	4,966.4	0.0
Z	125,060	988	3,968	4.2	4,967.6	4,967.6	4,967.6	0.0
AA	128,320	1,380	2,932	5.6	4,970.7	4,970.7	4,970.7	0.0
AB	132,890	2,362	5,956	2.8	4,974.9	4,974.9	4,974.9	0.0
AC	136,820	2,441	3,704	4.5	4,978.0	4,978.0	4,978.0	0.0
AD	141,150	2,598	4,483	3.7	4,983.1	4,983.1	4,983.1	0.0
AE	144,050	1,390	4,460	3.7	4,986.1	4,986.1	4,986.1	0.0
AF	147,346	1,413	5,565	4.7	4,989.4	4,989.4	4,989.4	0.0
AG	151,955	1,747	3,908	6.9	4,992.8	4,992.8	4,992.8	0.0
AH	156,056	1,434	5,419	4.9	4,998.9	4,998.9	4,998.9	0.0
AI	158,886	1,094	2,598	7.7	5,000.6	5,000.6	5,000.6	0.0
AJ	159,719	1,403	5,009	4.6	5,002.3	5,002.3	5,002.3	0.0
AK	162,081	1,847	4,693	5.8	5,005.8	5,005.8	5,005.8	0.0
AL	165,078	1,935	5,520	6.5	5,008.6	5,008.6	5,008.6	0.0
AM	168,762	1,657	5,870	3.7	5,011.5	5,011.5	5,011.5	0.0

[1]Feet above State Highway 49 Bridge at Los Lunas
[2]Floodway confined to channel

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

RIO GRANDE

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY[2]	WITHOUT FLOODWAY[2]	WITH FLOODWAY[2]	INCREASE[2]
RIO GRANDE (Continued)								
AN	170,281	2,464	7,839	4.6	5,012.3	5,012.3	5,012.3	0.0
AO	172,357	2,546	5,062	7.3	5,013.8	5,013.8	5,013.8	0.0

[1]Feet above State Highway 49 Bridge at Los Lunas
[2]Floodway confined to channel

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY
AND INCORPORATED AREAS

FLOODWAY DATA

RIO GRANDE

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
RIO PUERCO								
A	0	290/130[2]	3,693	8.8	5,259.9	5,259.9	5,260.2	0.3
B	1,120	294/45[2]	4,404	7.4	5,260.9	5,260.9	5,261.3	0.4
C	2,000	305/200[2]	5,096	6.4	5,261.6	5,261.6	5,262.1	0.5
D	2,560	501/40[2]	5,888	5.5	5,261.8	5,261.8	5,262.2	0.4
E	2,810	403/40[2]	4,945	6.6	5,261.8	5,261.8	5,262.2	0.4
F	3,445	277	2,781	11.7	5,261.9	5,261.9	5,262.3	0.4
G	4,150	172	1,826	17.9	5,261.9	5,261.9	5,261.9	0.0
H	4,310	200	2,920	11.2	5,265.0	5,265.0	5,265.0	0.0
I	4,390	200	3,428	9.5	5,265.9	5,265.9	5,265.9	0.0
J	4,525	218	2,915	11.2	5,265.9	5,265.9	5,265.9	0.0
K	5,035	278	3,933	8.3	5,267.0	5,267.0	5,267.0	0.0
L	5,405	337	4,221	7.7	5,267.2	5,267.2	5,267.2	0.0
M	6,085	300	3,852	8.5	5,267.2	5,267.2	5,267.5	0.3
N	7,430	300	4,723	6.9	5,268.4	5,268.4	5,268.6	0.2
O	8,145	300	3,105	10.5	5,268.5	5,268.5	5,268.6	0.1

[1]Feet above limit of detailed study

[2]Total width\width beyond the Reservation

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

RIO PUERCO

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
SAN PEDRO CREEK								
A	1,180	60	285	14.0	6,595.8	6,595.8	6,595.8	0.0
B	1,380	76	270	11.1	6,599.9	6,599.9	6,599.9	0.0
C	2,395	105	208	14.4	6,611.6	6,611.6	6,612.6	1.0
D	2,905	82	281	10.6	6,627.5	6,627.5	6,627.9	0.4
E	3,030	57	268	11.3	6,628.6	6,628.6	6,628.6	0.0
F	3,145	57	248	12.0	6,632.2	6,632.2	6,632.3	0.1
G	3,395	154	366	8.2	6,635.3	6,635.3	6,636	0.7
H	3,515	165	366	8.2	6,636.0	6,636.0	6,636.9	0.9
I	4,760	83	249	12.0	6,658.8	6,658.8	6,659.7	0.9
J	5,650	155	344	8.7	6,678.2	6,678.2	6,678.9	0.7
K	5,730	153	322	9.3	6,679.7	6,679.7	6,680.6	0.9
L	6,330	120	290	10.3	6,680.6	6,680.6	6,680.9	0.3
M	7,685	120	266	11.3	6,707.6	6,707.6	6,708.4	0.8
N	9,035	68	243	12.3	6,737.6	6,737.6	6,737.8	0.2
O	9,295	51	206	14.7	6,743.6	6,743.6	6,743.6	0.0
P	10,185	60	252	11.9	6,766.0	6,766.0	6,767.0	1.0
Q	11,130	83	204	14.7	6,790.0	6,790.0	6,790.1	0.1
R	11,235	90	248	12.0	6,794.1	6,794.1	6,794.8	0.7
S	11,365	90	210	14.2	6,796.6	6,796.6	6,797.6	1.0
T	11,430	138	383	7.8	6,800.7	6,800.7	6,801.4	0.7

[1]Feet above confluence with Frost Arroyo

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

SAN PEDRO CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
SAN PEDRO CREEK (Continued)								
U	11,490	63.0	267	11.4	6,800.7	6,800.7	6,801.0	0.3
V	12,230	59.0	176	17.0	6,819.4	6,819.4	6,819.4	0.0
W	13,600	60.5	210	7.1	6,857.8[2]	6,857.8[2]	6,857.8[2]	0.0[2]
X	13,917	61.7	167	8.9	6,865.8[2]	6,865.8[2]	6,865.8[2]	0.0[2]
Y	14,247	71.5	225	6.7	6,874.8[2]	6,874.8[2]	6,874.8[2]	0.0[2]
Z	14,959	44.8	144	10.4	6,893.2[2]	6,893.2[2]	6,893.2[2]	0.0[2]
AA	15,459	71.9	229	6.5	6,908.3[2]	6,908.3[2]	6,908.3[2]	0.0[2]
AB	16,014	142.0	344	4.3	6,927.8[2]	6,927.8[2]	6,927.8[2]	0.0[2]
AC	16,184	203.8	240	6.2	6,933.8[2]	6,933.8[2]	6,933.8[2]	0.0[2]
AD	16,564	63.8	217	6.9	6,945.4[2]	6,945.4[2]	6,945.4[2]	0.0[2]
AE	16,959	45.3	141	10.5	6,957.9[2]	6,957.9[2]	6,957.9[2]	0.0[2]

[1]Feet above confluence with Frost Arroyo

[2]Floodway coincident with floodplain

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

SAN PEDRO CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY[2]	INCREASE
TIJERAS ARROYO								
A	0	86	548	26.9	4,936.0	4,936.0	4,936.0	0.0
B	490	88	804	18.3	4,942.4	4,942.4	4,942.4	0.0
C	2,010	88	801	18.4	4,945.7	4,945.7	4,945.7	0.0
D	3,860	61	488	30.1	4,946.3	4,946.3	4,946.3	0.0
E	5,780	57	427	34.9	4,966.7	4,966.7	4,966.7	0.0
F	7,100	66	444	33.5	4,982.2	4,982.2	4,982.2	0.0
G	7,740	81	757	19.7	4,999.9	4,999.9	4,999.9	0.0
H	9,450	129	943	15.8	5,009.8	5,009.8	5,009.8	0.0
I	9,730	124	686	21.7	5,009.9	5,009.9	5,009.9	0.0
J	10,820	180	1,306	11.4	5,026.2	5,026.2	5,026.2	0.0
K	11,785	145	969	15.4	5,030.3	5,030.3	5,030.3	0.0
L	13,605	114	916	16.3	5,038.7	5,038.7	5,038.7	0.0
M	15,705	620	1,869	8.0	5,056.7	5,056.7	5,056.8	0.1
N	16,940	825	2,254	6.6	5,065.1	6,065.1	5,066.3	0.2
O	18,460	554	1,380	10.8	5,076.7	5,076.7	5,076.7	0.0
P	19,495	470	1,760	8.5	5,084.4	5,084.4	5,085.8	0.4
Q	20,575	113	897	16.6	5,092.2	5,092.2	5,092.2	0.0
R	21,245	106	835	17.8	5,094.2	5,094.2	5,094.2	0.0
S	21,955	326	1,531	9.7	5,103.3	5,103.3	5,103.4	0.1
T	22,885	179	833	16.0	5,107.0	5,107.0	5,107.0	0.0

[1]Feet above confluence with Rio Grande

[2]Energy grade line used for floodway determination

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

TIJERAS ARROYO

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
TIJERAS ARROYO (Continued)								
U	23,785	200	965	17.0	5,115.9	5,115.9	5,115.9	0.0
V	24,345	400	1,718	9.5	5,122.2	5,122.2	5,123.2	1.0
W	24,930	400	1,793	9.1	5,127.2	5,127.2	5,127.3	0.1
X	26,060	400	1,515	10.8	5,132.0	5,132.0	5,132.3	0.3
Y	26,725	120	997	16.4	5,135.8	5,135.8	5,135.8	0.0
Z	27,070	131	1,015	16.1	5,137.9	5,137.9	5,137.9	0.0
AA	28,430	118	973	16.8	5,147.3	5,147.3	5,147.3	0.0
AB	29,130	135	975	16.8	5,152.2	5,152.2	5,152.2	0.0
AC	30,820	244	1,190	13.8	5,168.5	5,168.5	5,168.5	0.0
AD-AL[2]								
AM	57,785	259	1,370	13.2	5,395.8	5,395.8	5,395.8	0.0
AN	58,765	160	1,166	15.5	5,407.0	5,407.0	5,407.0	0.0
AO	59,775	246/100[3]	1,423	12.7	5,419.5	5,419.5	5,419.8	0.3
AP	60,575	340	1,637	11.0	5,432.8	5,432.8	5,433.5	0.7
AQ	61,260	258	1,524	11.9	5,441.6	5,441.6	5,442.2	0.6
AR	61,965	350	2,278	7.9	5,447.2	5,447.2	5,448.2	1.0
AS	63,020	330	1,509	12.0	5,459.1	5,459.1	5,459.2	0.1
AT	64,465	350	1,518	11.9	5,475.7	5,475.7	5,476.1	0.4
AU	65,650	500	1,747	10.3	5,490.3	5,490.3	5,491.0	0.7

[1]Feet above confluence with Rio Grande
[2]Floodway not computed (Kirtland Air Force Base)
[3]Split floodway

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

TIJERAS ARROYO

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
TIJERAS ARROYO (Continued)								
AV	67,020	350	1,573	11.5	5,508.6	5,508.6	5,509.1	0.5
AW	68,465	350	1,519	11.9	5,527.5	5,527.5	5,527.6	0.1
AX	69,705	270	1,488	12.1	5,547.5	5,547.5	5,547.5	0.0
AY	69,930	194	1,248	14.5	5,550.8	5,550.8	5,550.8	0.0
AZ	70,120	270	1,401	12.9	5,566.7	5,566.7	5,566.7	0.0
BA	70,570	220	2,860	6.3	5,569.1	5,569.1	5,569.9	0.8
BB	71,255	185	1,227	14.7	5,575.0	5,575.0	5,575.0	0.0
BC	72,470	208	1,281	14.1	5,594.7	5,594.7	5,594.7	0.0
BD	72,954	186	1,674	10.8	5,605.4	5,605.4	5,605.4	0.0
BE	73,606	371	1,539	11.7	5,608.6	5,608.6	5,608.6	0.0
BF	73,930	159	1,470	12.3	5,622.2	5,622.2	5,622.2	0.0
BG	74,383	224	2,069	8.7	5,629.6	5,629.6	5,629.6	0.0
BH	74,579	273	2,039	8.9	5,630.5	5,630.5	5,630.5	0.0
BI	74,767	219	1,419	12.7	5,631.3	5,631.3	5,631.3	0.0
BJ	74,969	242	1,646	11.0	5,635.6	5,635.6	5,635.6	0.0
BK	75,213	248	1,580	11.4	5,638.9	5,638.9	5,638.9	0.0
BL	75,834	118	1,320	13.7	5,652.3	5,652.3	5,652.3	0.0
BM	76,204	154	1,593	11.3	5,660.9	5,660.9	5,660.9	0.0
BN - DP[2]								

[1]Feet above confluence with Rio Grande
[2]Floodway not computed (BN – DP)

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

TIJERAS ARROYO

TABLE 15

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
TIJERAS ARROYO (AT TIJERAS)								
A	111,120	170	1,087	12.9	6,258.6	6,258.6	6,259.1	0.5
B	111,225	170	1,116	12.6	6,261.1	6,261.1	6,261.5	0.4
C	111,805	150	834	13.3	6,270.3	6,270.3	6,270.3	0.0
D	112,300	152	834	13.3	6,276.5	6,276.5	6,276.5	0.0
E	112,385	92	705	15.7	6,278.0	6,278.0	6,278.0	0.0
F	112,435	160	1,266	8.8	6,281.5	6,281.5	6,281.5	0.0
G	113,125	118	786	14.1	6,287.1	6,287.1	6,287.1	0.0
H	114,145	150	825	13.5	6,304.5	6,304.5	6,304.5	0.0
I	114,615	274	1,517	7.3	6,309.7	6,309.7	6,309.7	0.0
J	115,165	142	869	12.8	6,321.0	6,321.0	6,321.0	0.0
K	115,455	102	717	125.5	6,324.1	6,324.1	6,324.1	0.0
L	115,660	136	943	11.8	6,327.3	6,327.3	6,327.3	0.0
M	116,165	150	818	13.6	6332.2	6,332.2	6,332.8	0.6
N	116,450	136	845	14.1	6,339.4	6,339.4	6,339.4	0.0
O	116,520	150	954	11.6	6,344.1	6,344.1	6,344.6	0.5
P	116,595	170	954	11.6	6,344.1	6,344.1	6,344.1	0.0
Q	117,145	143	772	13.6	6,353.8	6,353.8	6,353.8	0.0
R	117,680	107	804	13.1	6,359.8	6,359.8	6,360.8	1.0
S	118,125	121	740	14.2	6,369.9	6,369.9	6,369.9	0.0

[1]Feet above confluence with Rio Grande

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

TIJERAS ARROYO (AT TIJERAS)

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
TIJERAS ARROYO (AT TIJERAS) (Continued)								
T	118,175	177	842	12.5	6,374.3	6,374.3	6,374.3	0.0
U	118,235	227	1,714	6.1	6,376.6	6,376.6	6,376.6	0.0
V	118,890	98	684	15.4	6,383.3	6,383.3	6,383.3	0.0
W[2]								
X	120,190	101	700	15.1	6,402.9	6,402.9	6,402.9	0.0
Y	120,375	100	561	13.0	6,407.3	6,407.3	6,407.3	0.0
Z	120,745	136	608	12.0	6,415.5	6,415.5	6,415.5	0.0
AA	121,030	152	633	11.6	6,419.3	6,419.3	6,419.3	0.0
AB	121,125	170	836	8.8	6,423.2	6,423.2	6,423.9	0.7

[1]Feet above confluence with Rio Grande

[2]Flooding contained in channel

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

TIJERAS ARROYO (AT TIJERAS)

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
UNNAMED ARROYO NO. 1								
A	1,300	45	140	10.0	5,261.2	5,258.2[2]	5,258.2[2]	0.0
B	2,030	80	266	5.3	5,262.3	5,262.3	5,262.3	0.0
C	3,100	78	167	8.4	5,268.8	5,268.8	5,268.8	0.0
D	3,550	177	1,935	2.3	5,285.3	5,285.3	5,285.3	0.0
E	3,974	180	1,660	2.7	5,285.3	5,285.3	5,285.3	0.0
F	4,855	140	892	5.0	5,285.4	5,285.4	5,285.4	0.0
G	5,105	150	593	7.5	5,285.4	5,285.4	5,285.4	0.0
H	5,625	93	643	6.9	5,287.0	5,287.0	5,287.0	0.0
I	5,924	173	1,059	4.2	5,287.4	5,287.4	5,287.9	0.5
J	7,155	193	936	4.8	5,288.6	5,288.6	5,288.9	0.3

[1]Feet above confluence with Rio Puerco

[2]Elevations computed without consideration of backwater effects from Rio Puerco

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

UNNAMED ARROYO NO. 1

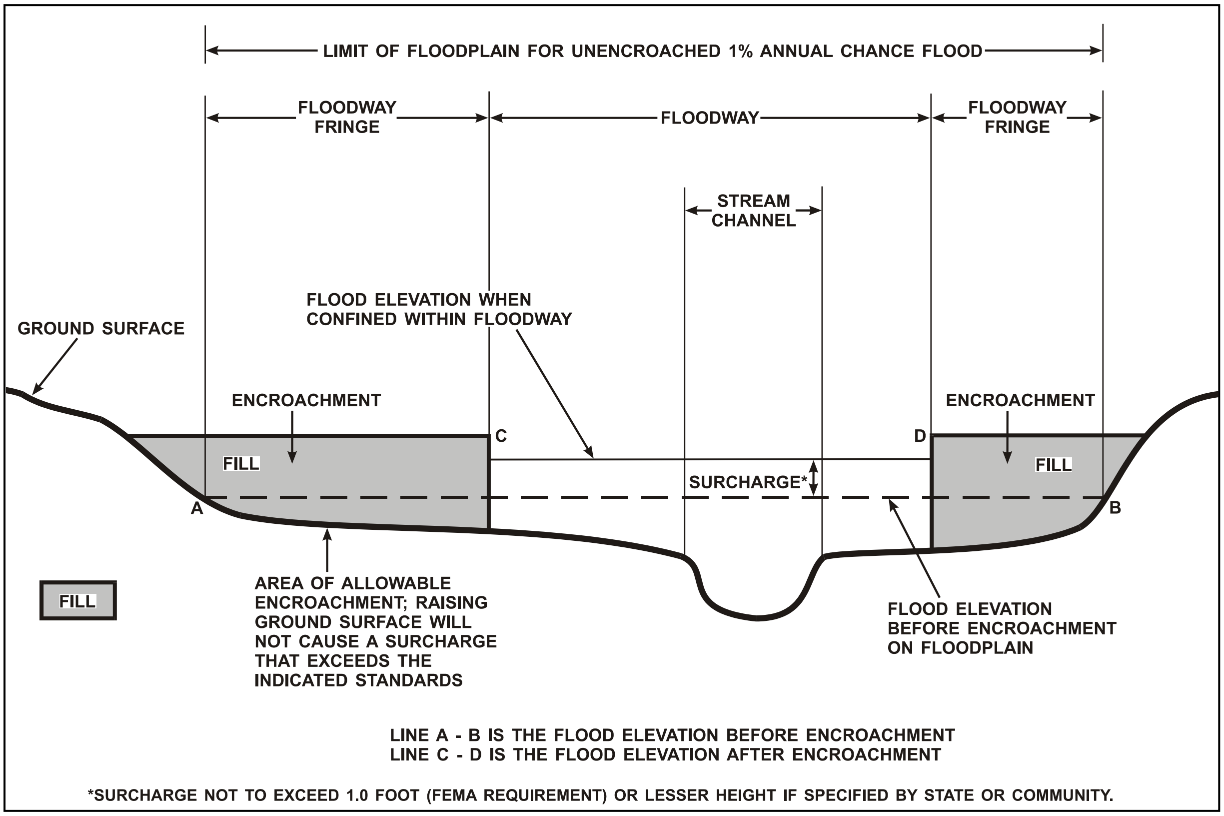

Figure 1: Floodway Schematic

5.0 INSURANCE APPLICATIONS

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

Zone A

Zone A is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs or base flood depths are shown within this zone.

Zone AE

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

Zone AH

Zone AH is the flood insurance risk zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

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

Zone X

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

Zone D

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

6.0 FLOOD INSURANCE RATE MAP

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

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

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

The current FIRM presents flooding information for the entire geographic area of Bernalillo County. Previously, separate Flood Hazard Boundary Maps and/or FIRMs were prepared for each incorporated community with identified flood hazard areas and the unincorporated areas of the county. Historical map dates relating to pre-countywide maps prepared for each community are presented in Table 17, “Community Map History”.

7.0 OTHER STUDIES

FIS have been prepared for Cibola, Sandoval, Santa Fe and Valencia Counties (References 1-4). Flood Hazard Boundary Maps have also been prepared for Torrance County, New Mexico, Unincorporated Areas, and (Reference 62). Flood hazard information presented in this report is compatible and agrees with those studies listed for adjacent counties.

This FIS report either supersedes or is compatible with all previous studies (References 5 and 11-16) published on streams studied in this report and should be considered authoritative for purposes of the NFIP.

COMMUNITY NAME	INITIAL NFIP MAP DATE	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	INITIAL FIRM DATE	FLOOD INSURANCE RATE MAP REVISION DATE(S)
Albuquerque, City of	August 20, 1976	February 14, 1978	October 14, 1983	
Bernalillo County (Unincorporated Areas)	December 20, 1974	September 6, 1977 July 10, 1979 January 13, 1981	September 15, 1983	
Edgewood, Town of	December 20, 1977[2]	None	November 4, 1988[2]	
Isleta, Pueblo of	February 9, 2000[4]	None	February 9, 2000[4]	
Laguna, Pueblo of[3]	November 29, 1977	None	July 16, 1996[5]	
Los Ranchos de Albuquerque, Village of	November 5, 1976	None	January 3, 1983	
Navajo Indian Reservation[3]	August 2, 1977[6]	None	January 3, 1986[7]	
Rio Rancho, City of	April 15, 1992	None	April 15, 1992	
Sandia, Pueblo of	September 6, 1977[1]	July 10, 1979[1]	September 15, 1983[1]	
Tijeras, Village of	July 2, 1976	February 27, 1979	January 6, 1983	

[1] Dates for this community were taken from Bernalillo County (Unincorporated Areas) [2] Dates for this community were taken from Santa Fe County (Unincorporated Areas)
[3] No special flood hazard areas identified [4] Dates for this community were taken from Valencia County (Unincorporated Areas)
[5] Dates for this community were taken from Sandoval County (Unincorporated Areas) [6] Dates for this community were taken from San Juan County (Unincorporated Areas)
[7] Dates for this community were taken from Rio Arriba County (Unincorporated Areas)

TABLE 16

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

This is a multi-volume FIS. Each volume may be revised separately, in which case it supersedes the previously printed volume. Users should refer to the Table of Contents in Volume 1 for the current effective date of each volume; volumes bearing these dates contain the most up-to-date flood hazard data.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting:

FEMA Region 6
Federal Insurance and Mitigation Division
800 North Loop 288
Denton, Texas 76209

9.0 BIBLIOGRAPHY AND REFERENCES

1. Federal Emergency Management Agency, Flood Insurance Study and Flood Insurance Rate Map, Sandoval County, New Mexico and Incorporated Areas, March 18, 2008.
2. Federal Emergency Management Agency, Flood Insurance Study and Flood Insurance Rate Map, Santa Fe County, New Mexico and Incorporated Areas, June 17, 2008.
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10.0 REVISIONS DESCRIPTIONS

This section has been added to provide information regarding significant revisions made since the original FIS report and FIRM were printed. Future revisions may be made that do not result in the republishing of the FIS report. All users are advised to contact the Community Map Repository to obtain the most up-to-date flood hazard data.

10.1 First Revision (Revised November 4, 2016)

a. Acknowledgements

The hydrologic and hydraulic analyses for this restudy were prepared for the Federal Emergency Management Agency (FEMA) by the Risk Assessment, Mapping, and Planning Partners (RAMPP) under Contract No. HSFEHQ- 13-J-0001. This work was completed in September 2014.

Base map information shown on this FIRM was provided in digital format by Bernalillo County Government. This information was derived from digital orthophotography dated 2014 (MRCOG, 2014). Additional information pertaining to road names and political boundaries were provided by the City of Albuquerque, 2014 (CABQ, 2014).

The projection used in the preparation of the map was State Plane New Mexico Central (FIPS Zone 3002). The horizontal datum was NAD83, GRS1980 spheroid. Vertical Datum is NAVD88.

b. Coordination

An initial coordination meeting is held with representatives from FEMA, the community, and the study contractor to explain the nature and purpose of a FIS, and to identify the streams to be studied or restudied. A final Consultation Coordination Officer's (CCO) is held with FEMA, the community, and the study contractor to review the results of the study.

The initial coordination meeting was held on August 14, 2014, and attended by representatives from the City of Albuquerque, Bernalillo County, FEMA Region VI, and RAMPP. A final Consultation Coordination Officer's (CCO) meeting was held on April 13, 2015, to review the results of this revision. Representatives from the City of Albuquerque, Bernalillo County, FEMA Region VI, and RAMPP attended this meeting.

c. Scope

This revision incorporates revised analyses and mapping for Double Eagle II Channel, Mirehaven Arroyo A, Mirehaven Arroyo B, Mirehaven Arroyo C, Shamrock Channel/Tributary 2 Westgate Dam to Shamrock Channel, Ladera Diversion Channel, West I-40 Diversion Channel and Unser Channel. The revised flooding sources were studied by enhanced analysis methods and are shown as Zone AE, without floodway, on the FIRM (Exhibit 2).

Table 17 lists the Letters of Map Change (LOMC) incorporated for this PMR and FIS Update. This includes two Letters of Map Revision based on Fill (LOMR-F) that are large enough to be mapped.

Table 17 – LOMCs Incorporated in the PMR dated November 4, 2016

Case No.	Effective Date	Flooding Sources	Community
14-06-0305P[1]	January 2, 2015	Mirehaven Arroyo B	City of Albuquerque
13-06-3016P	April 4, 2014	Multiple	City of Albuquerque, Bernalillo County Unincorporated Areas
13-06-2237P	October 3, 2013	Mirehaven Arroyo A	City of Albuquerque

1 Although a portion of LOMR 14-06-0305P falls within the scope of this map revision, panel 35001C0307H was not revised. Therefore, users must continue to refer to the annotated FIRM attachment for this LOMR for FIRM panel 35001C0307H.

As part of this revision, updated analyses were included for the following flooding sources as shown in Table 18.

Table 18 – Revised Stream Reaches Studied by Detailed Methods

Stream	Limits of Revised Study
Double Eagle II Channel	From I-40 to Atrisco Vista Blvd
Ladera Diversion Channel	From Ladera drive to Ouray Road
Mirehaven Arroyo A	Ladera Dam Detention Pond 12 to approximately 3,000 feet above Ladera Dam Detention Pond 12
Mirehaven Arroyo B	Ladera Dam to approximately 1,000 feet above Ladera Dam
Mirehaven Arroyo C	From Unser Diversion to I-40
Shamrock Channel/Tributary 2 Westgate Dam to Shamrock Channel	From confluence with Double Eagle II Channel to 1.9 miles upstream of Atrisco Vista Blvd
Unser Channel	From Unser Blvd to 98th Street
West I-40 Diversion Channel	From West Bluff Pond to Unser Blvd

Information for flooding sources outside of those listed in Table 18 was taken directly from the previous FIS and FIRM for Bernalillo County (FEMA, 2012).

d. Hydrologic and Hydraulic Analyses

The downstream boundary conditions for all studied reaches were determined using the normal depth method. The flow is assumed to be uniform so the energy slope was estimated by measuring the channel bed slope at the downstream end.

Roughness factors (Manning's "n") used in the hydraulic computations were based on aerial photography, field survey photos, and engineering judgment. Channel and overbank "n" values for the streams studied by enhanced methods are shown in Table 15, Revised Summary of Roughness Coefficients.

RAMPP Incorporated LOMRs that revised flooding sources in the City of Albuquerque and Bernalillo County. LOMR 13-06-3016P affected several effective flooding sources and added new flooding sources. Hydrologic computations were made for the Double Eagle II Channel, Shamrock Channel, Mirehaven Arroyo C, Unser Channel, and West I-40 Diversion Channel using the AHYMO computer program (AMAFCA, 1994) to establish peak discharge-frequency relationships for the 1-percent-annual-chance floods.

LOMR 14-06-0305P added new studies for Mirehaven Arroyo B and Ladera Dam 9 Diversion above Detention Basin 5, resulting from the construction of Detention Basin 5S and new diversion channels. Hydrologic computations were made using AHYMO to establish peak discharge-frequency relationships for the 1-percent-annual-chance floods.

RAMPP Incorporated LOMRs that revised flooding sources in the City of Albuquerque and Bernalillo County. LOMR 13-06-3016P affected several effective flooding sources and added new flooding sources. Hydraulic calculations were completed for the Double Eagle II Channel, Shamrock Channel, Mirehaven Arroyo C, Unser Channel, and West I-40 Diversion Channel using the HEC-RAS Version 4.1.0 (USACE, 2010).

LOMR 14-06-0305P added new studies for Mirehaven Arroyo B and Ladera Dam 9 Diversion above Detention Basin 5, resulting from the construction of Detention Basin 5S and new diversion channels. The storm drain system was analyzed using the EPA Storm Water Management Model (SWMM) – Version 5.0 (Build 5.0.013) (EPA, 2008). The inputs for the analysis included pipe size, roughness, entrance and exit losses, manhole inverts, hydrographs from the hydrologic analysis, stage-storage curves for Pond 5S and a time series curve developed from the hydrologic analysis that describes the water surface elevation at Ladera Dam 5 at various times in the model.

Tables 11 -14 where revised as part of the PMR. Table 11, contains the Summary of Discharges for the PMR. Table 12, contains the Summary of Discharges for Shallow Flooding Areas for the PMR. Table 13, contains the Summary of Stillwater Elevations for the PMR. Table 14, contains the Manning's "n" Values for the PMR.

For this PMR and FIS update, no new floodway analyses were conducted.

e. Other Studies

At the time of this revision, there were no other studies in progress.

f. Bibliography and References

Albuquerque Metropolitan Arroyo Flood Control Authority, AHYMO Computer Program, Albuquerque, New Mexico, January 1994.

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g. Considerations

This revision to the Bernalillo countywide FIS incorporates new analysis and mapping information for FIRM panels 35001C305H, 35001C308H, 35001C309H, 35001C326J, 35001C327J, and 35001C328J. This section presents important considerations for using the information contained in this FIS Report and in the FIRM panels updated by this revision. These considerations include changes in format and content. Figures 2 and 3 present information that applies to using the updated FIRM panels with the FIS Report.

Figure 2: FIRM Notes to Users

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Flood Map Service Center website or by calling the FEMA Map Information eXchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to Table 16 in this FIS Report.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

The map is for use in administering the NFIP. It may not identify all areas subject to flooding, particularly from local drainage sources of small size. Consult the community map repository to find updated or additional flood hazard information.

BASE FLOOD ELEVATIONS: For more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables within this FIS Report. Use the flood elevation data within the FIS Report in conjunction with the FIRM for construction and/or floodplain management.

FLOODWAY INFORMATION: Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the FIS Report for this jurisdiction.

FLOOD CONTROL STRUCTURE INFORMATION: Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 "Flood Protection Measures" of this FIS Report for information on flood control structures for this jurisdiction.

PROJECTION INFORMATION: The projection used in the preparation of the map was State Plane New Mexico Central (FIPS Zone 3002). The horizontal datum was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Figure 2: FIRM Notes to Users (continued)

ELEVATION DATUM: Flood elevations on the FIRM are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

Local vertical monuments may have been used to create the map. To obtain current monument information, please contact the appropriate local community listed in Table 31 of this FIS Report.

BASE MAP INFORMATION: Base map information shown on the FIRM was provided by was provided in digital format by Bernalillo County Government. This information was derived from digital orthophotography dated 2014. Additional information pertaining to road names and political boundaries were provided by the City of Albuquerque, 2014.

The map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables may reflect stream channel distances that differ from what is shown on the map.

Corporate limits shown on the map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after the map was published, map users should contact appropriate community officials to verify current corporate limit locations.

NOTES FOR FIRM INDEX

REVISIONS TO INDEX: Future revisions to this FIRM Index will only be issued to communities that are located on FIRM panels being revised. This FIRM Index therefore remains valid for FIRM panels dated November 4, 2016 or earlier. Please refer to the "MOST RECENT FIRM PANEL DATE" column in the Listing of Communities table to determine the most recent FIRM index date for each community.

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

This Notes to Users section was created specifically for FIRM panel 35001C0327J, of the Bernalillo County, New Mexico, and Incorporated Areas, effective November 4, 2016.

ACCREDITED LEVEE: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit www.fema.gov/national-flood-insurance-program.

Figure 3: Map Legend for FIRM

SPECIAL FLOOD HAZARD AREAS: *The 1% annual chance flood, also known as the base flood or 100-year flood, has a 1% chance of happening or being exceeded each year. Special Flood Hazard Areas are subject to flooding by the 1% annual chance flood. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights. See note for specific types. If the floodway is too narrow to be shown, a note is shown.*

	Special Flood Hazard Areas subject to inundation by the 1% annual chance flood (Zones A, AE, AH, AO, AR, A99, V and VE)
Zone A	The flood insurance rate zone that corresponds to the 1% annual chance floodplains. No base (1% annual chance) flood elevations (BFEs) or depths are shown within this zone.
Zone AE	The flood insurance rate zone that corresponds to the 1% annual chance floodplains. Base flood elevations derived from the hydraulic analyses are shown within this zone.
Zone AH	The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the hydraulic analyses are shown at selected intervals within this zone.
Zone AO	The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the hydraulic analyses are shown within this zone.
Zone AR	The flood insurance rate zone that corresponds to areas that were formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
Zone A99	The flood insurance rate zone that corresponds to areas of the 1% annual chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or flood depths are shown within this zone.
Zone V	The flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations are not shown within this zone.
Zone VE	Zone VE is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations derived from the coastal analyses are shown within this zone as static whole-foot elevations that apply throughout the zone.
	Regulatory Floodway determined in Zone AE.

Figure 3: Map Legend for FIRM (continued)

OTHER AREAS OF FLOOD HAZARD	
	Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.
	Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined based on future-conditions hydrology. No base flood elevations or flood depths are shown within this zone.
	Area with Reduced Flood Risk due to Levee: Areas where an accredited levee, dike, or other flood control structure has reduced the flood risk from the 1% annual chance flood. See Notes to Users for important information.
OTHER AREAS	
	Zone D (Areas of Undetermined Flood Hazard): The flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.
NO SCREEN	Unshaded Zone X: Areas of minimal flood hazard.
FLOOD HAZARD AND OTHER BOUNDARY LINES	
(ortho) **(vector)**	Flood Zone Boundary (white line on ortho-photography-based mapping; gray line on vector-based mapping)
	Limit of Study
	Jurisdiction Boundary
	Limit of Moderate Wave Action (LiMWA): Indicates the inland limit of the area affected by waves greater than 1.5 feet
GENERAL STRUCTURES	
Aqueduct *Channel* *Culvert* *Storm Sewer*	Channel, Culvert, Aqueduct, or Storm Sewer

Figure 3: Map Legend for FIRM (continued)

Dam Jetty Weir	Dam, Jetty, Weir
	Levee, Dike, or Floodwall
Bridge	Bridge
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AND OTHERWISE PROTECTED AREAS (OPA): *CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.*	
CBRS AREA 09/30/2009	Coastal Barrier Resources System Area: Labels are shown to clarify where this area shares a boundary with an incorporated area or overlaps with the floodway.
OTHERWISE PROTECTED AREA 09/30/2009	Otherwise Protected Area
REFERENCE MARKERS	
22.0	River mile Markers
CROSS SECTION & TRANSECT INFORMATION	
B 20.2	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
5280 21.1	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
17.5	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
8	Coastal Transect
	Profile Baseline: Indicates the modeled flow path of a stream and is shown on FIRM panels for all valid studies with profiles or otherwise established base flood elevation.
	Coastal Transect Baseline: Used in the coastal flood hazard model to represent the 0.0-foot elevation contour and the starting point for the transect and the measuring point for the coastal mapping.
513	Base Flood Elevation Line

Figure 3: Map Legend for FIRM (continued)

ZONE AE (EL 16)	Static Base Flood Elevation value (shown under zone label)
ZONE AO (DEPTH 2)	Zone designation with Depth
ZONE AO (DEPTH 2) (VEL 15 FPS)	Zone designation with Depth and Velocity
BASE MAP FEATURES	
Missouri Creek	River, Stream or Other Hydrographic Feature
234	Interstate Highway
234	U.S. Highway
234	State Highway
234	County Highway
MAPLE LANE	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
RAILROAD	Railroad
	Horizontal Reference Grid Line
	Horizontal Reference Grid Ticks
+	Secondary Grid Crosshairs
Land Grant	Name of Land Grant
7	Section Number
R. 43 W. T. 22 N.	Range, Township Number
$^{42}76^{000m}$E	Horizontal Reference Grid Coordinates (UTM)
365000 FT	Horizontal Reference Grid Coordinates (State Plane)
80° 16’ 52.5”	Corner Coordinates (Latitude, Longitude)