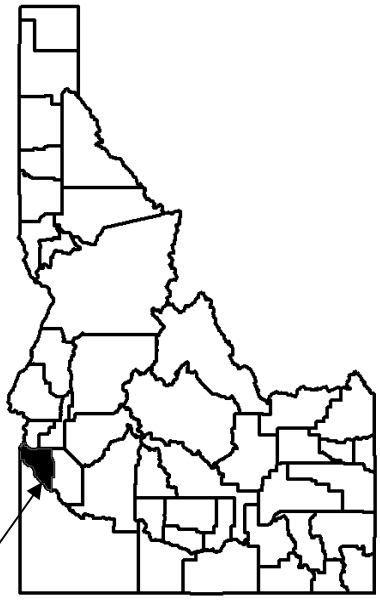
FLOOD INSURANCE STUDY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

Community Name	*Community Number*
CALDWELL, CITY OF	160036
CANYON COUNTY (UNINCORPORATED AREAS)	160208
GREENLEAF, CITY OF	160235
* MELBA, CITY OF	160020
MIDDLETON, CITY OF	160037
NAMPA, CITY OF	160038
NOTUS, CITY OF	160147
PARMA, CITY OF	160039
STAR, CITY OF	160236
* WILDER, CITY OF	160196

* NO SPECIAL FLOOD HAZARD AREAS IDENTIFIED



Canyon County

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

Preliminary: September 16, 2016

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
16027CV001B

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.

ATTENTION: On Flood Insurance Rate Map (FIRM) panels 16027C0064G, 16027C0066G, 16027C0068G, 16027C0182G, 16027C0200G, 16027C0201G, 16027C0202G, 16027C0203G, 16027C0253G, and 16027C0261G, levees have not been demonstrated by the community or levee owner(s) to meet requirements of Section 65.10 of the National Flood Insurance Program regulations in 44 CFR as it relates to the levee's capacity to provide 1% annual chance flood protection. The subject areas are identified on FIRM panels (with notes and bounding lines) and in the FIS report as potential areas of flood hazard data changes based on further review.

FEMA has updated levee analysis and mapping protocols. Until such time as FEMA is able to initiate a new flood risk project to apply the new protocols, the flood hazard information on the aforementioned FIRM panels that are affected by the levees are being added as a snapshot of the prior effective information presented on the FIRMs and FIS dated May 24, 2011. As indicated above, it is expected that affected flood hazard data within the subject area could be significantly revised. This may result in floodplain boundary changes, and/or changes to flood hazard zone designations.

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

Initial Countywide FIS Effective Date: May 24, 2011

Revised Countywide Date(s): To Be Determined

This preliminary FIS report does not include unrevised Floodway Data Tables or unrevised Flood Profiles. These Floodway Data Tables and Flood Profiles will appear in the final FIS report.

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FLOOD INSURANCE STUDY
CANYON COUNTY, IDAHO 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 Canyon County, Idaho, including the Cities of Caldwell, Greenleaf, Melba, Middleton, Nampa, Notus, Parma, Star and Wilder City and the unincorporated areas of Canyon County (referred to collectively herein as Canyon County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community 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 Cities of Melba and Wilder City are non-floodprone. Additionally, the City of Star is located in both Canyon County and Ada County. This FIS contains only the information for the City of Star in Canyon County. Please consult the Ada County FIS for information regarding Star in Ada County.

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

1.2 Authority and Acknowledgments

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

Pre-Countywide

The original hydrologic and hydraulic analyses for the Boise River, Indian Creek, Mason Creek, Mill Creek (Mill Slough), Renshaw Canal, and Renshaw Canal Overflow were performed by the United States Geological Survey (USGS) for the Federal Emergency Management Agency (FEMA) under Interagency Agreement No. IAA-H-8-76, Project Order No. 24 (8-12-76) and Inter-Agency Agreement No. IAA-H-9-77, Project Order No. 2. This work was completed in August 1979.

Revised hydrologic and hydraulic analyses for a reach of the Boise River near Caldwell were performed by Toothman-Orton Engineering Company, Boise, Idaho, for FEMA under Contract EMW-86C-224l. That study was completed in November 1987.

The hydrologic and hydraulic analyses for a restudy of the Boise River, from its confluence with the Snake River upstream to the Canyon-Ada County line with the exception of the reach near Caldwell, were performed by the United States Army Corps of Engineers (USACE)-Walla Walla District, under Interagency Agreement EMW-90-E-3286, Project Order No.7. That work was completed in 1991.

Hydrologic and hydraulic analyses for Mill Creek (Mill Slough) were reviewed by the USACE-Walla Walla District, in 1981, to include new bridges at Boise Street and State Highway 44.

Willow Creek was originally studied by the USGS in 1979. The hydrologic and hydraulic analyses for a restudy of the flooding on Willow Creek were performed by the USACE-Walla Walla District, for FEMA under Interagency Agreement No. EMW-87-E-1137, Project Order No. 37, and Interagency Agreement No. EMW-87-E-2529, Project Order No.9. That study was completed in July 1988.

The work done by Fox Water Engineering, LLC for the July 27, 2006, Willow Creek Letter of Map Revision (LOMR) contained detailed study data from just downstream of Duff Lane to just upstream of Lansing Lane.

The work done by Kunz Engineering for the August 28, 2007, Boise River LOMR contained detailed study data from approximately 9,400 feet to approximately 3,800 feet downstream of Notus Greenleaf Road.

The work done by Kunz Engineering and Holiday Engineering for the July 3, 2003, Boise River LOMR contained detailed study data in the area approximately 2,100 feet downstream of Middleton Road.

The work done by the City of Nampa Engineering Department for the October 24, 1997, Mason Creek LOMR contained detailed study data in the area just upstream of the abandoned Union Pacific Railroad (UPRR) right-of-way to just downstream of the Franklin Road South culvert.

The work done for the April 30, 2009 Tenmile Creek LOMR contained detailed study data in the area from approximately 2,600 feet downstream of Canada Road to just upstream.

The work done for the December 28, 2009 Mason Creek LOMR contained detailed study data in the area from just downstream of South Americana Drive to just upstream of Kings Road.

Countywide Revision

The hydrologic and hydraulic analyses for a restudy of Indian Creek, Mason Creek, and the Boise River were performed by WEST Consultants, Inc. for FEMA under contract number EMS-2001-CO-0068. This preliminary study was completed in October 2007. Base mapping was compiled by Horizons, Inc. from LiDAR coverage at a scale of one inch equals 500 feet.

The preliminary hydraulic modeling for Indian Creek was subsequently modified by CH2M Hill, under contract to the City of Caldwell, to account for recent channel and floodplain modifications. The modeling revisions were completed in July 2008. The preliminary hydrologic analysis for Indian Creek was modified after discussions regarding the contributing drainage area, the joint probability of flows in the New York Canal and Indian Creek and the capacity of the New York Canal. This revised analysis was completed in November 2009. The modified hydrologic analysis results and the modified hydraulic model were used to determine the final water surface elevations, floodplain extents and floodway delineation. This work was completed by Michael Baker Jr., Inc., for FEMA.

1.3 Coordination

Pre-Countywide

Canyon County (Unincorporated Areas)
The initial Consultation and Coordination Officer (CCO) meeting was held on March 4, 1976, and attended by representatives of Canyon County, the City of Caldwell, FEMA, and the study contractor. During that meeting the streams to be studied by detailed or approximate methods, the limit of detailed and approximate study, and the selection of data on local flooding were discussed.

An intermediate coordination meeting was held on February 8, 1979, and was attended by representatives of the study contractor, FEMA, and Canyon County to discuss the results of the study. No major problems were encountered, and the study was acceptable to the county.

The results of the initial study were reviewed at a final community coordination meeting held on September 13, 1979, and attended by representatives of Canyon County, the City of Caldwell, the Federal Insurance Administration (FIA), and the study contractor. No problems were raised at the meeting.

On October 24, 1983, a final CCO meeting was held for Canyon County. In attendance were representatives of the study contractor, FEMA, and the county. No problems were raised at the meeting.

The 1979 FIS was revised in 1988 to add flooding from Willow Creek that affects the unincorporated areas of Canyon County. Willow Creek was studied by detailed methods as part of the FIS for the City of Middleton, Canyon County, Idaho.

A restudy of the Boise River was initiated by FEMA following completion of the new Interstate Highway 84 Bridge over the Boise River and construction of the new frontage roads. Limits of the restudy were determined by the FIA following a meeting with the community and the study contractor held in January 1986.

An intermediate and final CCO meeting concerning the restudy was held on February 2, 1988. Attending the meeting were representatives of the county, FEMA, and the study contractor.

The final CCO meeting was held on January 12, 1993, and was attended by representatives of FEMA, the USACE, and Canyon County. The study was acceptable to the county.

City of Caldwell
The initial CCO meeting was held on March 4, 1976, and attended by representatives of Canyon County, the City of Caldwell, FEMA, and the study contractor. During that meeting the streams to be studied by detailed or approximate methods, the limit of detailed and approximate study, and the selection of data on local flooding were discussed.

The results of the initial study were reviewed at a final community coordination meeting held on September 13, 1979, and attended by representatives of Canyon County, the City of Caldwell, the FIA, and the study contractor. No problems were raised at the meeting.

A restudy of the Boise River was initiated by FEMA following completion of the new Interstate Highway 84 Bridge over the Boise River and construction of the new frontage roads. Limits of the restudy were determined by the FIA following a meeting with the community and the study contractor held in January 1986.

An intermediate and final CCO meeting concerning the restudy was held on February 2, 1988. Attending the meeting were representatives of the county, FEMA, and the study contractor.

City of Middleton

For the original studies for the City of Middleton, the Mayor and members of the Middleton City Council, the Middleton City Engineer, and citizens of Middleton met with representatives of FEMA and the study contractor on March 5, 1976, to determine which streams were to be studied. Coordination was maintained with the USACE.

The results of the original study were reviewed at a final community coordination meeting held on September 13, 1979. Attending the meeting were representatives of FEMA, the study contractor, and the city. No problems were raised at the meeting.

On December 15, 1989, a final community coordination meeting was held to review the results of the restudy of Willow Creek. Attending this meeting were representatives of FEMA, the study contractor, and the City of Middleton.

City of Nampa

For the original studies for the City of Nampa, local officials and citizens of Nampa met with representatives of FEMA and the study contractor on December 12, 1975, to determine which streams were to be studied. City officials furnished general information on flooding within the study area.

The study was reviewed at the intermediate coordination meeting on May 1, 1979. The meeting was attended by representatives of FEMA, the study contractor, and the city. No major problems were encountered and the study was acceptable to the community.

The final community coordination meeting was held on October 24, 1983, and was attended by representatives of FEMA, the study contractor, and the city. All problems with the study have been resolved.

City of Notus

For the original studies for the City of Notus, the initial CCO meeting was held on March 5, 1976, and attended by representatives of the City of Notus, FEMA, and the USGS. During the meeting the streams to be studied by detailed or approximate methods were discussed. City officials furnished general information on flooding within the study area.

The results of the initial study were reviewed at a final community coordination meeting held on February 9, 1979. Attending the meeting were representatives of the FIA, the study contractor, and the city. No problems were raised at the meeting.

The results of the restudy were reviewed at the final CCO meeting held on January 12, 1993, and attended by representatives of FEMA, the City of Notus, and the USACE. All problems raised at that meeting have been addressed.

City of Parma

For the original studies for the City of Parma, the CCO meeting was held on March 3, 1976, and attended by representatives of the Parma City Council, the mayor, the city attorney, FEMA, and the USACE. Three lifelong residents of the city were also present. The streams to be studied by detailed or approximate methods were discussed. Lifelong residents of the area furnished recollections of flooding of the Boise River in 1937.

The results of this study were reviewed at a final community coordination meeting held on September 13, 1979. Attending the meeting were representatives of the FIA, the study contractor, and the city. No problems were raised at the meeting.
The results of the restudy were reviewed at the final CCO meeting held on January 12, 1993, and attended by representatives of FEMA, the City of Parma, and the USACE. All problems raised at that meeting have been addressed.

Countywide Revision

The initial CCO meeting was held on November 5, 2003, and was attended by representatives of FEMA, the State of Idaho, Canyon County, the City of Nampa, the City of Caldwell, and the study contractor.

An intermediate CCO meeting was held on February 15, 2008, and was attended by representatives of FEMA, WEST Consultants, the State of Idaho, the Cities of Nampa, Caldwell, Star, Middleton, Greenleaf, Parma and Greenleaf, Senator Crapo's office, Congressman Sali's office and Quadrant Consulting. Two main issues raised at the meeting include the new channel configuration for Indian Creek and the flow capacity of the New York Canal.

The preliminary analyses for Indian Creek were appealed on January 15, 2009 by the Cities of Caldwell and Nampa. The appeal from the City of Caldwell involved a request to update the channel configuration for Indian Creek to account for the work done by the city to realign and regrade the stream banks of Indian Creek between 5th and 10th Avenues. Both cities appealed the hydrologic analysis conducted on Indian Creek and the New York Canal. The appeal involved a review and changes to the contributing drainage area of Indian Creek, the joint probability of flows in the New York Canal and Indian Creek and the capacity of the New York Canal. The appeal was resolved on December 31, 2009.

The results of the study were reviewed at an intermediate CCO meeting held on February 15, 2008, and attended by representatives of representatives of FEMA, WEST Consultants, the Idaho Department of Water Resources, the Bureau of Reclamation Flood Control Districts 10 and 11, Quadrant Consulting, Senator Crapo, Congressman Sali and the cities of Greeleaf, Star, Middleston, Notus, Caldwell, Parma and Canyon County. All problems raised at that meeting have been addressed in this study.

Once the appeal was resolved it was determined in conversations with FEMA and the communities that no further CCO meetings were necessary so a second CCO meeting was not held.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS report covers the geographic area of Canyon County, Idaho, including the incorporated communities listed in Section 1.1.

The areas studied by detailed methods were selected with priority given to all known flood hazards and areas of projected development.

Pre-Countywide

The August 1979 study performed by USGS provided a detailed study along Boise River from its confluence with Snake River upstream to the Canyon-Ada County line. The November 1987 study performed by Toothman-Orton Engineering Company, Boise, Idaho, provided new detailed study data of the reach of Boise River near Caldwell after construction of the interstate Highway 84 Bridge and new frontage roads. The Boise River (excluding the reach near the City of Caldwell) was then restudied in 1991 by USACE-Walla Walla District.

Indian Creek was studied by detailed method from its confluence with Boise River to the eastern county limits.

Willow Creek was studied by detailed methods from its confluence with Boise River to the northern corporate limits of the City of Middleton. The 1988 hydrologic and hydraulic analyses for the restudy of the flooding on Willow Creek, that were performed by the USACE, provided detailed data along Willow Creek from its confluence with Boise River to the northern corporate limits of the City of Middleton, to include changes in channel geometry and sedimentation built up within the floodplain. The work done by Fox Water Engineering, LLC for the July 27, 2006, Willow Creek LOMR contained detailed study data from just downstream of Duff Lane to just upstream of Lansing Lane.

Renshaw Canal was studied by detailed method from its confluence with Riverside Canal approximately 1.5 miles to Lower Ridge Road. Renshaw Canal Overflow was studied by detailed methods from the overflow back to its confluence with Renshaw Canal.

Mason Creek was studied by approximate methods from its confluence with Boise River upstream to Lone Tree Lane and then by detailed methods from Lone Tree Lane to the eastern county limits. The work done by City of Nampa for the October 24, 1997, Mason Creek LOMR contained detailed study data from the abandoned UPRR right-of-way located approximately 450 feet downstream of Third Avenue North along Mason Creek to just downstream of Franklin Road South Culvert.

The 1981 USACE hydrologic and hydraulic analyses for Mill Creek (Mill Slough) used in the original report constituted a detailed study to include new bridges at Boise Street and State Highway 44.

USGS also provided approximate studies along 12th Avenue Drain, Dixie Drain, Elijah Drain, Mill Creek (downstream of Boise Street), Parma Drain, First Drain west of Parma Drain (flowing southerly through Parma), Second Drain west of Parma Drain, Willow Creek (upstream of the UPRR), and Wilson Drain.

Snake River, Willow Creek upstream of the UPRR, Mill Creek downstream of Boise Street, 12th Avenue Drain, Wilson Drain, Elijah Drain (southeast of Caldwell), Parma Drain, and the First Drain west of Parma Drain (flowing southerly through Parma).

Floods caused by overflow from Conway Drain within the corporate limits of Notus were studied using approximate methods. Approximate analyses revealed that Conway Drain has no known history of flooding in Notus and that only extremely heavy rainstorms and/or debris in the channel would cause flooding.

Approximated 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 Canyon County (including the Cities of Caldwell, Greenleaf, Melba, Middleton, Nampa, Notus, Parma, and Wilder City).

Countywide Revision

The Boise River was restudied using detailed methods from Interstate 84 to the Canyon-Ada County boundary. Indian Creek was restudied using detailed methods from its confluence with the Boise River to the Canyon-Ada County boundary. Mason Creek was studied using detailed methods from its confluence with the Boise River to Lone Tree Lane in the City of Nampa.

2.2 Community Description

Canyon County is located in southwestern Idaho. It is bordered by Payette and Gem Counties to the north, Ada County to the east, Owyhee County to the south (all in Idaho), and Malheur County, Oregon, to the west.

The population of Canyon County was 131,441 in 2000, an increase of approximately 46 percent from 1990 census population of 90,076 (Reference 1). Table 1 below shows the population of the county and incorporated cities.

Table 1. Populations in Canyon County, Idaho

Community	Population
City of Caldwell	25,967
City of Greenleaf	862
City of Melba	439
City of Middleton	2,978
City of Nampa	51,867
City of Notus	458
City of Parma	1,771
City of Star	1,795
City of Wilder City	1,462
Canyon County (Unincorporated Areas)	45,637
Total	133,236

Agriculture is the major industry of the county and is supported heavily by irrigation. About 85 percent of the area is used for irrigated crops or improved pasture. The majority of the surface water diverted for irrigation in Canyon County is from Boise River and its reservoirs. The New York Canal supplies water to Lake Lowell, an irrigation water storage reservoir formed in 1908 by construction of two earth-filled dams. Water from the Payette River Valley is transferred to Canyon County to irrigate land north of Boise River. High-lift pumping from Snake River irrigates land in southern Canyon County. Additional scattered areas are irrigated by groundwater pumping. Broad areas are nearly level and gently sloping sandy loams and silt loams are well suited to intensive cultivation. The soils cannot be cultivated without irrigation, but water of excellent quality is available in adequate amounts.

All streams studied, except for Snake River, are in the Boise River basin. Boise River drains a total area of approximately 4,130 square miles.

The Boise River flows from east to west through the northern half of Canyon County and joins the Snake River in the northwestern corner of the county, a few miles northwest of Parma. The Snake River, flowing northwesterly, forms the southern part of the western boundaries of Canyon County, as well as part of the Idaho-Oregon border. These two rivers are characterized by large, flat valleys with rolling hills along the fringes of old river terraces or benches. Elevations range from 2,200 to 2,800 feet. The Owyhee Mountains, with peaks over 8,000 feet, slope down to the left bank of the Snake River to the south and west of Canyon County. Lake Lowell, covering approximately 13 square miles, is located in the southern half of the county.

Indian Creek originates on Three Point Mountain, east of Boise, Idaho. It flows through rangeland and some farmland to its convergence with the New York Canal approximately 1,200 feet downstream of Stroebel Road near the City of Kuna, Idaho. The New York Canal and Indian Creek continue as one stream until about 2,100 feet upstream of Columbia Road where there is a Callopy gate across the stream channel which controls water diverted through New York Canal west to Lake Lowell. Indian Creek continues to the northwest through the Cities of Nampa and Caldwell to the Boise River.

At its mouth, Indian Creek drains an area of approximately 264 square miles. Indian Creek enters the City of Nampa from the east, flows northwesterly through the northern part of the city, and exits near the northwest corner. Within the Indian Creek floodplain, development consists mostly of residential areas with a few commercial and light industrial areas.

Mason Creek, also a tributary of the Boise River, enters the City of Nampa near the northeast corner, flows northwesterly through the northern part of the city, and exits along the northern boundary. Approximately 25 percent of the Mason Creek floodplain, within the Nampa City limits, lies within Lakeview Park.

Conway Drain enters the City of Notus from the northeast and flows into the Boise River just west of Notus. Conway Drain carries natural flow from Conway Gulch and upstream irrigation-return flow.

Wilson Drain enters the City of Caldwell near the southeastern corner and flows northwesterly, south of the UPRR embankment, until it enters Indian Creek upstream of the commercial, light-industrial center of Caldwell. The drainage area of Wilson Drain at its mouth is approximately 30 square miles.

Dixie Drain enters the City of Caldwell near the southwestern corner and flows northerly to the western edge of the commercial industrial center of Caldwell, where it enters a network of covered drains. The drainage area of Dixie Drain at the point it becomes covered is approximately seven square miles.

Willow Creek enters the City of Middleton from the north and joins the Boise River just outside the southwest corner of the corporate limits of Middleton. Mill Slough enters Middleton in three branches at the eastern corporate limits, and flows southwest. At the UPRR Bridge, Mill Slough becomes one stream and is known as Mill Creek. Vegetation in Middleton consists of common trees, such as willow and cottonwood. Shrubs include sagebrush, rabbit brush, and wild raspberries. Grasses and forbs are representative of desert habitats and include cheatgrass, fescue, and shepherd's purse. Areas adjacent to Willow Creek are mostly open pasture and agricultural land.

The Boise River Valley has a semi-arid to arid continental climate that is characterized by cool, wet winters and warm, dry summers. At Caldwell, for the period 1904 to 2003, the average maximum monthly temperature of 92.4°F occurs in July and the mean minimum monthly temperature of 37.1°F occurs in January. The average total precipitation is equal to 10.6 inches and the average total snowfall is 16.5 inches. Snow cover in the area is usually light and seldom remains on the ground for long periods. The greatest monthly average snowfall of 6.8 inches occurs in January. The average freeze-free growing season is 159 days (Reference 2).

Most precipitation occurs in the cooler months. General rainstorms may last for several days, but precipitation intensities are not great. Summer thunderstorms occasionally produce intense rainfall over parts of the drainage area. Major floods in the study areas would be expected from rainfall or a combination of rainfall and snowmelt, possibly with frozen ground conditions.

The northeastern and south-central parts of the county have dark colored, medium-textured surface soils with loamy and clayey subsoils that range from calcareous to noncalcareous. These deep to moderately deep soils are combinations of fine, silty subsoils with clay and lime accumulations above a calcium silica hardpan; fine, noncalcareous, loamy subsoils with moderate clay accumulations; and fine, montomorillonitic subsoils rich in clay and lime accumulations. These thin, loess-covered lake sediments range from moderately well-drained to well-drained and are nearly level. Wide strips along both banks of Boise River have dark to light-colored surface soils with medium to moderately coarse texture. These soils are deep to moderately deep, with combinations of noncalcareous, coarse, loamy covered, sandy subsoils with poor clay accumulations overlying a rich lime zone. These soils are gently sloping stream bottoms and are somewhat poorly drained. The surface soils north and south of the Boise River fringe and in the western part of the county are medium textured and dark-colored. These soils are deep and consist of fine, silty subsoils with small amounts of clay overlying a rich lime zone, and lake sediments overlain by thin loess. West of Lake Lowell and north of the Snake River, soils are light-colored with coarse to moderately coarse textures. The subsoi1s are calcareous to noncalcareous loams, poor in lime, overlying a sandy soil. These soils are deep to moderately deep and are well to extremely well-drained. In the southeastern part of Canyon County, soils are dark-colored with a medium to very coarse texture. These lake sediments are overlain by thin loess and are developing on lake terraces and lava plains. The coarse, silty subsoils, rich in lime, overlie a thin, calcium silica hardpan, which overlies bedrock. The surface soils north, south, and east of Lake Lowell range from dark to light-colored and are moderately coarse in texture. These lake sediments

are overlain by thin loess and are developing on lake terraces, lava plains, and alluvial fans. The subsoils include clay and fine, lime-poor silt overlying a calcium lime hardpan, and a lime-rich and clay-poor silt overlying a calcium-poor, sandy material. These soils are nearly level to sloping and are well-drained. In the northwestern part of the county, soils range from dark-to-light colored and are moderately coarse in texture. The subsoils include a coarse, lime-poor loam and silt with clay and lime. These soils are developing on well-drained lake deposits overlain by thin loess (Reference 3).

Canyon County lies in a semiarid zone, and the natural vegetation reflects that condition. Natural vegetation away from the perennial streams is of the sagebrush-grass type, characterized by large sagebrush, blue bunch wheatgrass, and Idaho fescue. Stream bank vegetation includes cottonwood and willow trees. Most of the native vegetation has been replaced by agricultural and urban species.

City of Caldwell

The City of Caldwell is located in central Canyon County. It is situated in the Boise River valley, approximately 16 miles east of the Idaho-Oregon State line and approximately 20 miles west of the City of Boise. Neighboring cities include Payette, approximately 40 miles northwest, and Homedale, approximately 10 miles southwest.

Approximately 90 percent of the City of Caldwell has been developed, of which 40 percent is light industrial and commercial areas. Development along the Boise River floodplain within Caldwell is limited to a few light industries, commercial businesses, and scattered single family residences. Indian Creek flows northeasterly from a primarily residential area through downtown Caldwell. Indian Creek has been channelized and is covered through most of downtown.

Terrain in the Caldwell area is generally very level to gently sloping, except for Canyon Hill in the northeastern corner of the city. Caldwell is built on low stream terraces of the Boise River. There are two major soils groups it the area. The soils in northern and western Caldwell are of one major grouping and range from moderately deep to deep, and poorly drained to moderately well-drained. The surface and subsoils are fine, sandy loam and loamy sand, a silt loam and loam, and a strong to moderately calcareous silt loam or loam. The substratum consists of stratified sand and gravel and stratified, fine, sandy loam and coarse sand (which is calcareous in the upper part and noncalcareous in the lower part), or loam and stratified sand and gravel, which is moderately calcareous and strongly alkaline.

The soil group in southern and eastern Caldwell has two types of soils. Both are well-drained and range from deep to moderately deep. The surface and upper subsoils are slightly calcareous to noncalcareous, heavy silt or light, silty, clay loams. The lower subsoils are strong to moderately calcareous silt loam or loams. The substratum ranges from sandy loam and loamy sand and gravel to stratified sand and gravel with some silica calcium carbonate hardpan located in the upper stratum (Reference 3).

Vegetation in the areas adjacent to streams within Caldwell is mostly open pasture and agricultural land. Common trees are willow and cottonwood. Shrubs include sagebrush, rabbit brush, and wild raspberries. Grasses and forbs are representative of dessert habitats and include cheat grass, fescue, and shepherd's purse. Irrigated areas are used to grow a variety of crops.

City of Greenleaf

The City of Greenleaf is located in central Canyon County. It is situated in the Boise River Valley approximately seven miles west of the City of Caldwell and approximately 10 miles east of the Idaho-Oregon state line.

City of Melba

The City of Melba is located in southeastern Canyon County. It is situated approximately 11 miles southeast of the City of Nampa and approximately one mile west of the Canyon-Ada County boundary.

City of Middleton

The City of Middleton is located in northeastern Canyon County. It is situated in the Boise River Valley approximately 20 miles east of the Idaho-Oregon state line and approximately 22 miles northeast of the City of Caldwell.

Terrain in Middleton ranges from fairly level to gently sloping hills. The city is built mostly on low stream terraces of the Boise River. The three major soils types in the area range from moderately deep (20 to 40 inches) and poorly drained, to deep (over 40 inches) and well-drained. Surface and subsoil layers are a fine, sandy loam, a silty loam, or a moderately calcareous silty loam and loam. The substrata are a stratified sand and gravel, a stratified, fine sandy loam and coarse sand (which is calcareous in the upper part and noncalcareous in the lower part), or a loam and stratified sand and gravel, which is moderately calcareous and strongly alkaline (Reference 3).

Development through the City of Middleton is primarily residential. Along the Willow Creek floodplain, most of the land is devoted to agriculture.

City of Nampa

The City of Nampa is located in eastern Canyon County. It is situated approximately 20 miles west of the City of Boise and approximately seven miles southeast of the City of Caldwell. The economy of Nampa is oriented toward agriculture and light industry. Residential communities occupy 65 percent of Nampa's corporate limits.

Terrain in the Nampa area is generally level to gently sloping. Most of the soils in the Nampa area are thin, loess covered stream terraces ranging from deep to moderately deep and from noncalcareous to slightly calcareous. The surface and subsoil area a heavy silt loam or light, silty, clay loam. The substratum is a sandy loam or loamy sand and calcium-silicate hardpan over stratified sand and gravel. In addition, there is a mixed alluvial, dark color, loamy subsoil associated with Indian Creek.

City of Notus

The City of Notus is located in central Canyon County. It is located in the Boise River Valley, approximately six miles northwest of the City of Caldwell and 22 miles southeast of the City of Ontario, Oregon. There is no residential, commercial, or industrial development along the Boise River in Notus, but the land is platted and could be developed in the future. Several homes are located near, but well above, the 1-percent-annual-chance floodplain.

Topography in the Notus area is generally level, with some rolling hills to the northeast. Residential and business areas of Notus are built on an old terrace of the Boise River. The soils are generally deep and well-drained. The surface and subsoil layers consist of silt loams. Below the subsoil layer, in the substratum, there is a series of laminated calcareous lacustrine

silt. These layers slightly restrict the movement of water and roots. At the south edge of Notus, topsoils and subsoils range from fine, sandy loam to silt loam. The substratums consist of stratified sand and gravel, fine, sandy loam and coarse sand, which is calcareous in the upper part and less calcareous in the lower part, and a loam and stratified sand and gravel, which is moderately to slightly calcareous and highly alkaline. All these soils are less well-drained than the other soils in Notus.

City of Parma

The City of Parma is located in northwestern Canyon County. It is situated approximately 14 miles northwest of the City of Caldwell and approximately four miles east of the Idaho-Oregon State boundary at the lower end of the Boise River Valley. There is considerable residential, commercial, and industrial development within the 1-percent-annual-chance floodplain.

In the Parma area, the terrain is generally level, with some rolling hills to the north and east. Residential areas north of the downstream part of Parma lie on an old terrace of the Boise River. The downstream part of Parma and residential areas to the south and west of Parma are built on the floodplain fringe of the Boise River. Average depth of soil is more than 40 inches. Surface and subsoil layers are both silt loams and are well-drained. The substratum is comprised of calcareous laminated lacustrine silt. The laminates layers slightly restrict movement of water and roots.

City of Star

The City of Star is located in eastern Canyon County and has part of its corporate limits located in Ada County. It is approximately 4 miles east of the City of Middleton.

City of Wilder City

The City of Wilder City is located in western Canyon County. It is situated approximately 11 miles west of the City of Caldwell and approximately six miles east of the Idaho-Oregon State line.

2.3 Principal Flood Problems

Canyon County (Unincorporated Areas)

Flooding from the Boise River results primarily from spring snowmelt in the 2,650 square-mile upper watershed. A combination of rainfall and snowmelt could cause large releases from the upstream reservoirs (Anderson Ranch Reservoir, Arrowrock Reservoir, and Lucky Peak Reservoir) during the winter. Significant flooding from tributaries draining the Boise River Valley could be caused by a combination of a winter rainstorm associated with a warm air-mass, melting snow, and possibly frozen ground. Flooding from the Snake River could occur during late winter or early spring when higher-than-normal releases from reservoirs would be necessary. Ice jams during the winter could also cause some localized flood problems.

In 1896, flooding occurred on the Boise River, near Boise. This flood, the maximum on record, was equal to a 47-year event on the natural curve. However, on the regulated floodflow frequency curve developed for this study, it would have a recurrence interval of 500 years (Reference 4).

Flooding also occurred on the Boise River in 1943. Discharge for this flood at Notus was estimated at 20,500 cfs with a recurrence interval of 23 years. This flood occurred before the

Lucky Peak and Anderson Ranch Dams were built on Boise River However, the same discharge would now be greater than the 1-percent-annual-chance flood because of regulated flows.

On February 13, 1979, a peak discharge of approximately 1,160 cfs was measured on Willow Creek just above the railroad bridge at the northeastern edge of Middleton (Reference 4). This discharge approximated the calculated discharge for the 10-year flood event. Willow Creek overflowed its banks almost continuously downstream to its mouth after entering the Boise River Valley, causing shallow to moderate flooding.

On February 13 and 14, 1979, Mill Slough flooded for the first time in more than 33 years. The peak discharge in Mill Slough was approximately 625 cfs at a location just upstream of the railroad tracks at Middleton (Reference 4). This exceeds the 1-percent-annual-chance flood discharge of 317 cfs calculated for this study by a significant amount.

On February 14, 1979, the Governor of Idaho declared Canyon County a disaster area because of the extreme flooding conditions. Widespread flooding occurred throughout Canyon County, mostly from small drains within the Boise River Valley that had rapid snowmelt over frozen ground.

The largest flood in the Boise River since construction of Lucky Peak Dam in 1955 occurred in June 1983 with a discharge of 9,240 cfs, as recorded at the USGS gaging station near Parma.

As reported by the USGS, with the decrease in peak flows below Lucky Peak, aggradation (deposition of materials in the streambed) has caused increased flood elevations over time for the same flow. As an example, a flow of 8,000 cfs flowed in 1972 at Notus, at the same stage as 11,800 cfs flowed in 1938. It is estimated that a flow of approximately 21,000 cfs, which occurred in April 1943, would now flow at approximately 2.5 feet higher than in 1943 (Reference 2).

City of Caldwell

Three bridges span the Boise River near Caldwell. Debris accumulation during high flow at any of these bridge sites could cause flooding due to backwater. Only slight over-bank flooding is known to have occurred.

The largest flood on the Boise River since construction of Lucky Peak Dam in 1955 occurred in June 1983 and had a discharge of 9,240 cfs, as recorded at the USGS gaging station near Parma.

Flooding on Indian Creek would be caused by the runoff from a combination of a rainstorm and melting snow, possibly over frozen ground. There are numerous crossings over Indian Creek, and reaches of the channel, up to approximately 1,200 feet in length, are covered. The banks of Indian Creek have been overtopped.

The channel for Wilson Drain is cleaned periodically, minimizing its over-bank flooding in Caldwell. Dixie Drain has been channelized, which limits over-bank flooding to a low area at the southern end of the Municipal Park Golf Course.

Elijah Drain has no known history of flooding in Caldwell. Flooding could occur only after extremely heavy rainstorms or from lesser runoff if the drain is obstructed by debris. Its flood potential is considered negligible.

City of Middleton

On February 13, 1979, Willow Creek flooded within the City of Middleton. It is estimated that approximately 1,160 cfs. (Reference 4) entered the city limits from above the UPRR Bridge at the northeastern edge of town. This discharge approximated the calculated discharge for the 10-year flood event and showed close agreement with the computed 10-year flood profiles. Willow Creek overflowed its banks almost continuously downstream to its mouth, causing shallow to moderate flooding in most of western Middleton. Flood depths along the left bank ranged from 1.7 feet along the north side of Concord Street to 1.2 feet at the entrance to the Middleton High School football field south of State Highway 44. Flood depths along the right bank ranged from 0.8 feet on the north side of Concord Street to 2.5 feet at the northwest corner of State Highway 44 and Cemetery Road. Shallow flooding occurred as far as 1,000 feet out from the main channel.

On February 13 and 14, 1979, Mill Slough also flooded within the City of Middleton. The estimated peak discharge in Mill Slough was approximately 625 cfs above the railroad tracks and approximately 325 cfs below. The difference is approximately 300 cfs (Reference 4) that flowed over State Highway 44 east of the railroad tracks. The flood in February 1979 was the first flood on Mill Slough in more than 33 years. Flood depths ranged from 3.0 feet along State Highway 44 just east of the railroad tracks to 0.5 foot at Second Street South and Duncan Avenue. South of State Highway 44, most flooding was shallow with depths to 0.5 foot.

City of Nampa

A combination of a rainstorm and melting snow, possibly on frozen ground, is apt to cause flooding on Indian and Mason Creeks. Flooding has occurred many times in the past where debris has lodged on the upstream side of some of the numerous bridges and culverts, causing backwater.

History indicates that Indian Creek overflowed its banks in February 1952, flooding several basements in Nampa and causing road closures due to mud and debris left by the high water.

Elijah, Wilson, and 12th Avenue Drains have no known history of flooding in Nampa. Flooding could occur only after extremely heavy rainstorms, or from lesser runoff if the drain were obstructed by debris.

Cities of Notus and Parma

The maximum discharge of record at the Boise River at Notus gage was 20,500 cfs, recurrence interval of 23 years, on April 20, 1943, before Lucky Peak and Anderson Ranch Dams were built. Since construction of the Lucky Peak and Anderson Ranch Dams, the 1-percent-annual-chance flood of the Boise River at Notus has been determined by the USACE to be 16,600 cfs (Reference 5). The most recent flood having a recurrence interval of approximately 10 years was recorded in 1972 with a discharge of 7,850 cfs.

The 1-percent-annual-chance flood of the Boise River at Parma was determined by the USACE to be 16,600 cfs. Flood discharge at Parma is considered essentially the same as that through the entire Lower Boise River.

In 1937, floodwaters from the Boise River are reported to have reached northward in Parma to the UPRR tracks. This flooding was the result of a 1-percent-annual-chance flood (1,530 cfs), as recorded at the gaging station in Notus, Idaho. However, no flooding in the city from this source has been reported since then.

2.4 Flood Protection Measures

The Boise River flow is regulated, upstream of the City of Boise, by storage in Anderson Ranch Reservoir, Arrowrock Reservoir, and Lucky Peak Lake. These storage areas have a combined active capacity of 988,800 acre-feet. The effect of these reservoirs is to lower the expected discharge for the 10-, 2-, 1-, and 0.2-percent-annual-chance floods. The natural 10-percent-annual-chance flood peak would be approximately 25,000 cfs, as opposed to 7,200 cfs for regulated flow. The natural 0.2-percent-annual-chance flood peak would be approximately 54,000 cfs as opposed to 34,800 cfs for regulated flow.

Flood magnitudes along Lower Indian Creek are affected by operation of the New York Canal. The New York Canal is an irrigation canal that starts from the Boise River just below the Lucky Peak Project. To the south of Eager Road and Kuna Road (in Ada County), the canal splits to the Mora Canal and the New York Canal.

Approximately 1,200 feet downstream of Stroebel Road in the City of Kuna, Idaho, the New York Canal converges with Indian Creek. The New York Canal and Indian Creek continue as one stream until about 2,100 feet upstream of Columbia Road where there is a Callopy gate across the stream channel. Indian Creek splits from the combined channel and flows to the northwest through the Cities of Nampa and Caldwell to the Boise River. The New York Canal continues west to Lake Lowell. The Callopy gate controls how much water is allowed to flow through the New York Canal. The gate currently maintains the design flow of 1,500 cfs in the New York Canal. The flood flow in excess of 1,500 cfs is diverted to Indian Creek over a broad crested weir.

During the flood season (December 1 to March 31) it is assumed that 1,000 cfs is maintained in the joint New York Canal/Indian Creek channel 20% of the time. The percentage of time the canal was in use was determined by analyzing observed records. So during a flood event in the Indian Creek basin, the natural discharges from the Indian Creek basin are increased by the flow diverted to the New York Canal.

Willow Creek was included in the United States Bureau of Reclamation Black Canyon Irrigation Project. Watershed rehabilitation, levee work, channelization, and construction of vertical drops to control velocity were done as part of the project during 1946 through 1950.

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 is 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 one year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of

completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

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

Pre-Countywide Analyses

A flood frequency curve for the Lower Boise River basin, developed in 1976 by the USACE-Walla Walla District, was used for the original Boise River study (Reference 5). Since 1955, when storage in Lucky Peak Lake began, the lower part of the frequency curve has been defined by regulated floodflows as measured at the USGS gaging station at Boise, Idaho. The upper part of the regulated frequency curve was developed by routing the 0.2-percent-annual-chance peak flood through the upstream reservoirs. Values for the 10-, 2-, 1-, and 0.2-percent-annual-chance peak discharges were obtained from a log-Pearson Type III distribution of annual peak flow data (Reference 6).

During the 1987 restudy of the Boise River near Caldwell, it was determined that the 1- and 0.2-percent-annual-chance floods would overtop a portion of the adjacent northerly floodplain between the Interstate Highway 84 Bridge and the UPRR Bridge near Caldwell. This overtopping results in floodflows separating from the main channel and flowing northwesterly in the general area between the UPRR and U.S. Highway 20-26 toward the City of Notus. Therefore, peak discharges in the Boise River and the adjacent floodplains downstream of the railroad bridge are reduced by the amount of lost, or overtopping, split flows. All the split flow returns to the river at or before a point that is approximately 1.25 miles upstream of Notus.

Flood frequency curves for Wilson Drain, Dixie Drain, and Renshaw Canal were developed using the 50-year flood discharges from a regression equation using basin characteristics as presented in A Proposed Streamflow-Data Program for Idaho (Reference 7). Then, a frequency curve was drawn through this value with a shape similar to curves derived from techniques found in Magnitude and Frequency of Floods in Small Drainage Basins in Idaho (Reference 8), and United States Department of Interior Water-Supply Paper 1688, Magnitude and Frequency of Floods in the United States. Part 13: Snake River Basin (Reference 9).

The 1-percent-annual-chance peak flood for Willow Creek was derived as part of a special flood hazard survey by the USACE-Walla Walla District (Reference 10). A value of 2,700 cfs was used as the 1-percent-annual-chance flood. The shape of the frequency curve was determined from curves developed using techniques outlined in the USGS Open-File Report, A Proposed Streamflow-Data Program for Idaho, and USGS Water Resources Investigations 7-73, Magnitude and Frequency of Floods in Small Drainage Basins in Idaho (References 7 and 8).

Peak discharges for Mill Creek (Mill Slough) were taken from the 1981 USACE-Walla Walla District, Mill Slough Flood Study (Reference 11).

The flood frequency curve for Mason Creek upstream of Lone Tree Lane was based on the 1-percent-annual-chance flood discharge determined by the USACE for an FIS in Ada County (Reference 12). This discharge, developed for snow and rainfall runoff conditions, was increased slightly to account for an increase in drainage area at the Canyon-Ada County line.

Curves developed using USGS and USACE methods (Reference 7, 8, and 9) were then used to determine the shape of the curve through the 1-percent-annual-chance discharge. Discharge was not increased with drainage area downstream from the county line into and through Nampa because it was thought that the large number of culverts and bridges would tend to attenuate peaks and moderate flows.

Countywide Analyses

This restudy of the Boise River from Interstate 84 to the Canyon-Ada County boundary used the effective flood frequency discharges estimates from the regulated discharge curve for Lucky Peak Dam (Reference 13).

The estimation of flood frequency discharges for Indian Creek upstream of the Callopy gate was based on a regional regression analysis (Reference 14) and a joint probability approach to reflect the historical use of the New York Canal for the December 1 to March 31 time period (the historical flood season) (Reference 15). The canal was determined to be in use 20% of the time between December 1 and March 31 with an assumed flow of 1,000 cfs. For Indian Creek downstream of the Callopy gate, the discharges were equal to flow in excess of 1,500 cfs (the amount diverted to the New York Canal by the Callopy gate) plus the flows due to the local drainage area.

The estimation of flood frequency discharges for Mason Creek from its confluence with the Boise River upstream to Lone Tree Lane was based on a regional regression analysis (Reference 14).

Peak discharge drainage area relationships studied by detailed methods are shown in Table 2, Summary of Discharges.

Table 2. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharge (cfs) 10-percent-annual-chance	2-percent-annual-chance	1-percent-annual-chance	0.2-percent-annual-chance
Boise River					
At Mouth	4,130	7,200[1]	11,000[1]	16,600[1]	34,800[1]
South of Union Pacific Railroad Bridge (split flow location)	3,220	7,200	11,000	14,200	22,300
North of Union Pacific Railroad Bridge	3,220	7,200[1]	11,000[1]	16,600[1]	34,800[1]
Indian Creek[2]					
At Mouth	264	88	983	1,725	3,900
Between Wilson Drain and New York Canal	234	23	860	1,560	3,630
Willow Creek (Lower)					
Upstream of Middleton	82	1,170	2,160	2,700	4,220
Willow Creek (Upper)					
At Duff Lane	*	*	*	2,700	*
Renshaw Canal					
Above Confluence with West End Drain	9	160	305	385	615
At Downstream End of Study Area	*	300	565	715	1,135
Renshaw Canal Overflow					
At Divergence From Renshaw Canal	*	21	129	200	408
Mason Creek					
At Mouth	52	424	951	1,266	2,255
Upstream of Purdam Gulch Drain	30	326	723	957	1,691
At Kings Road	27	310	686	907	1,595
Mill Slough					
At Union Pacific Railroad	*	345	*	810	1,180

[1]Regulated Discharges from Lucky Peak Dam

[2]Flow partly diverted to New York Canal

* Not Available

3.2 Hydraulic Analyses

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

Pre-Countywide

Water Surface Elevations (WSELs) for the Boise River (excluding the reach near Caldwell) were computed using the USACE 1990 HEC-2 step-backwater computer program (Reference 16). The WSELs for the Boise River near the City of Caldwell, which was restudied by Toothman-Orton, were computed using the USACE 1982 HEC-2 step-backwater computer program (Reference 17). Starting WSELs for the Boise River at its confluence with the Snake River were developed by the slope-area method. Starting WSELs upstream of Caldwell were those computed in the 1987 restudy at Canyon County.

Cross-sections for the reach of Boise River near Caldwell were field surveyed by Toothman-Orton Engineering Company in 1986 and 1987. Cross-section data for the two reaches upstream and downstream of the reach near Caldwell were those utilized to perform the Boise River Floodplain Management Report studies (Reference 18). The 1987 Boise River restudy indicated that a flow split would occur on the right bank of the Boise River, extending from the Interstate 84 interchange at Caldwell downstream to a point approximately 1.25 miles upstream from Notus. Detailed backwater analyses were performed for the 1- and 0.2-percent-annual-chance floods in this area using data obtained from USGS 7.5 minute topographic maps. The split flow analysis for the 1-percent-annual-chance flow indicated that a flow of 2,400 cfs will separate from the channel and adjacent floodplains, and flow northwesterly between the UPRR embankment and U.S. Highway 20-26.

Lesser magnitude floods do not split and flow in this area. It was assumed that the majority of the flow would return as weir flow over the UPRR tracks. For the 0.2-percent-annual-chance flood, two split flow analyses were performed. One on the right overbank area, upstream of the UPRR, with a total of 12,600 cfs involved, and one on the left bank area between West Plymouth and West Kearney Streets, in which 5,800 cfs was computed to overtop the bank area and flow through portions of Caldwell before reentering the river area between West Freeport and West Chicago Streets. A separate flood profile for this portion of the 0.2-percent-annual-chance flood through Caldwell was computed.

Some of the separated flow for the 1-percent-annual-chance flood, as well as the 0.2-percent-annual-chance flood, may return to the river at existing bridges under the railroad, such as the bridge for the Seidenberd Canal. However, due to the approximate nature of the analysis, any intermediate return flow was ignored.

WSELs for floods of the selected recurrence intervals on Mill Creek (Mill Slough) were computed using the USACE March 1977 HEC-2 computer program (Reference 19). Cross-section data for Mill Creek (Mill Slough) were digitized from aerial photography flown on September 17, 1981 (Reference 20). Starting elevations for Mill Creek (Mill Slough) were

taken from the Boise River flood profiles.

WSELs for floods of the selected recurrence intervals on Willow Creek were computed using the USACE March 1977 HEC-2 computer program (Reference 19). Cross-sectional data were obtained from field surveys. Starting elevations for Willow Creek were developed by the critical-depth method and compared with the Boise River profiles at the confluence.

WSELs for floods of the selected recurrence intervals on Renshaw Canal and the Renshaw Canal Overflow were computed using the USGS computer programs E431 and J635 (References 21 and 22). Starting elevations for Renshaw Canal were developed by the slope-area method. The overflow area for Renshaw Canal used starting elevations determined by a WSEL discharge rating curve.

WSELs for floods of the selected recurrence intervals on Mason Creek upstream of Lone Tree Lane were computed using the USGS computer programs E431 and J635 (References 21 and 22). Cross-section data for backwater analyses of the flooding on Mason Creek were obtained by photogrammetric methods from aerial photographs. Below-water sections were obtained by field measurements. Starting elevations for Mason Creek were developed by the slope-area method.

Roughness coefficient factors (Manning's "n" values) used in the hydraulic computations were taken from calibration backwater analyses using high water elevations measured during the June 1983 flood. The 1983 flood is the largest flood on the Boise River since construction of Lucky Peak Dam in 1955 with a discharge recorded at the USGS gaging station near Parma of 9,240 cfs. The roughness coefficients for each flooding source are listed in Table 3.

Countywide Revision

WSELs for the Boise River for this revision from Interstate 84 to the Ada County boundary were computed using HEC-RAS version 3.1.3 (Reference 23). The channel geometry was developed from channel surveys conducted by Minister & Glaeser Surveying, Inc. for the Boise River. Overbank geometry was developed from LiDAR data acquired by Horizons, Inc. Bridge and culvert data was developed from surveys conducted by Minister & Glaeser Surveying, Inc. The starting WSELs were taken from the flood profiles in the effective FIS report (Reference 24).

WSELs for Indian Creek for this revision were computed using HEC-RAS version 3.1.3 (Reference 23). The channel geometry was developed from channel surveys conducted by Quadrant Consulting, Inc. Overbank geometry was developed from LiDAR data acquired by Horizons, Inc. Bridge and culvert data were developed from surveys conducted by Quadrant Consulting, Inc. The starting WSEL was specified as normal depth based on the ground slope near the confluence with the Boise River.

The preliminary channel geometry for some sections of Indian Creek was changed to account for the relocation of the stream channel, the removal of buildings and road pavement to allow access to the stream channel and the regrading of the channel banks. The revised sections were located between the following streets:

1. Between 10th Avenue and 9th Avenue
2. Between 9th Avenue and Kimball Boulevard
3. Between Kimball Boulevard and 5th Avenue

Additionally, two new pedestrian bridges were added to the preliminary model and the bridge at Kimball Boulevard was revised to reflect the new downstream stream channel configuration.

The new cross sections and bridges were surveyed by Quadrant Consulting, Inc.

WSELs for Mason Creek for this revision from its confluence with the Boise River to Lone Tree Lane were computed using HEC-RAS version 3.1.3 (Reference 23). The channel geometry was developed from channel surveys conducted by Quadrant Consulting, Inc. Overbank geometry was developed from LiDAR data acquired by Horizons, Inc. Bridge and culvert data were developed from surveys conducted by Quadrant Consulting, Inc. The starting WSEL was specified as normal depth based on the ground slope near the confluence with the Boise River.

Manning's "n" values used in this revision were based on field inspections and aerial photos.

Channel and overbank roughness coefficients (Manning's "n" values), used in the hydraulic computations, were chosen by engineering judgment based on field observation of stream and floodplain areas. The roughness coefficients for all studied flooding sources are listed in Table 3 below.

Table 3. Manning's "n" Values

Flooding Source	Channel Value	Overbank Value
Boise River	0.030-0.055	0.030-0.085
Indian Creek	0.03-0.055	0.040-0.01
Mason Creek	0.03-0.06	0.025-0.1
Mill Slough	0.050-0.070	0.060-0.100
Renshaw Canal*	0.028-0.060	0.028-0.080
Willow Creek	0.03	0.04

*At Arana Valley Road concrete-lined values are as low as 0.014

The 1-percent-annual-chance flood elevations for streams studied by approximate methods were developed using normal-depth calculations and topographic maps (References 25, 26, and 27).

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.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

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 used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD). With the completion of the North American Vertical Datum of 1988 (NAVD), many FIS reports and FIRMs are now prepared using NAVD as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. Structure and ground elevations in the community must, therefore, be referenced to NAVD88. It is important to note that adjacent communities may be referenced to NGVD29. This may result in differences in Base Flood Elevations across the corporate limits between communities. The conversion factor for streams studied by detailed methods in Canyon County is 3.12 feet. To convert from NGVD29 to NAVD88 use the following:

NVGD29 elevation + 3.12 feet = NAVD88 elevation

For more information on NAVD88, see the FEMA publication entitled Converting the National Flood Insurance Program to the North American Vertical Datum of 1988 (Reference 28), or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Rockville, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

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

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS report provides 1-percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent-annual-chance flood elevations; delineations of the 1- and 0.2-percent-annual-chance floodplains; and a 1-percent-annual-chance floodway. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross-section. Between cross-sections, the boundaries were

interpolated using topographic maps at differing scales and contour intervals. Table 4 below lists the topographic scale and contour interval used for each flooding source.

Table 4. Topographic Data Scales and Contour Intervals

Flooding Source	Scale	Contour Interval	Reference
Boise River	1:4,800	2 feet	Reference 29
	1:24,000	10 feet	Reference 30
Indian Creek	1:4,800	2 feet	Reference 29
	1:24,000	10 feet	Reference 30
Mason Creek	1:4,800	2 feet	Reference 29
	1:24,000	10 feet	Reference 31
Renshaw Canal	1:4,800	2 feet	Reference 29
Renshaw Canal Overflow	1:4,800	2 feet	Reference 29
Mill Creek	1:4,800	2 feet	Reference 29
Willow Creek	1:24,000	10 feet	Reference 32

For this countywide revision topographic maps were generated from aerial photography by Horizons, Inc. The contour interval for these maps was 2 feet (Reference 32).

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

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

Approximate flood boundaries for the Snake River, Willow Creek, and Mill Slough were delineated using topographic maps at a scale of 1:24,000, with contour intervals of 10, 20, and 40 feet (References 25, 26, and 27) in conjunction with their computed elevations.

Approximate 1-percent-annual-chance floodplain boundaries in some portions of the study area were taken directly from the Flood Hazard Boundary Map for Canyon County (Reference 34).

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 base 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 study were computed for certain stream segments on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross-sections. Between cross-sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross-sections (see Table 5, Floodway Data). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the Floodway boundary is 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 base 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.

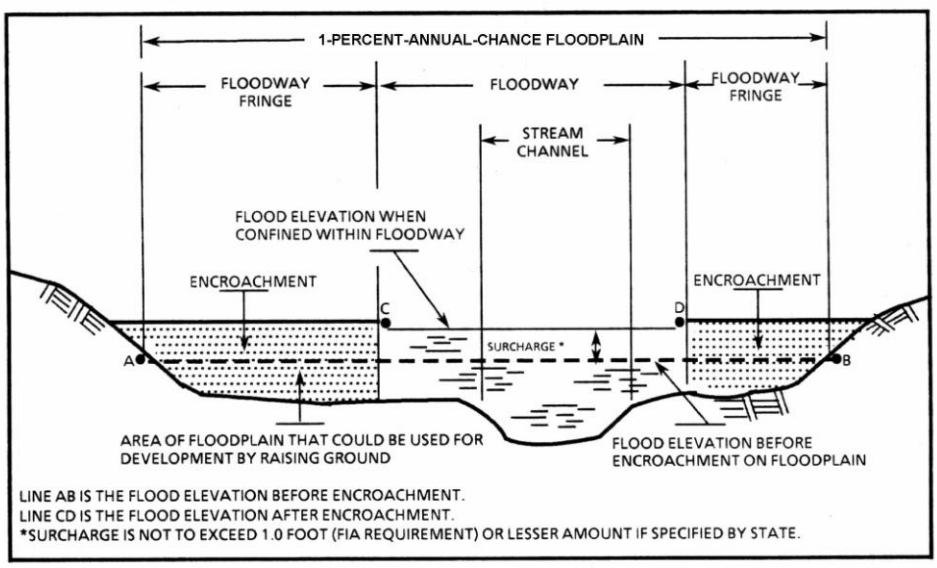

Figure 1. Floodway Schematic

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BOISE RIVER								
A	712	968	4,443	3.7	2,189.2	2,189.2	2,190.2	1.0
B	1,417	1,090	5,016	3.3	2,189.9	2,189.9	2,190.9	1.0
C	1,919	845	3,642	4.6	2,190.4	2,190.4	2,191.3	0.9
D	2,502	1,223	3,570	4.7	2,191.3	2,191.3	2,192.2	0.9
E	3,454	592	2,798	5.9	2,193.2	2,193.2	2,194.1	0.9
F	4,478	910	3,684	4.5	2,195.1	2,195.1	2,196.0	0.9
G	5,327	925	4,670	3.6	2,196.4	2,196.4	2,197.4	1.0
H	6,229	840	4,514	3.7	2,197.3	2,197.3	2,198.2	0.9
I	7,605	595	3,551	4.7	2,198.8	2,198.8	2,199.5	0.7
J	9,616	760	3,899	4.3	2,200.5	2,200.5	2,201.3	0.8
K	10,678	700	3,636	4.6	2,201.8	2,201.8	2,202.6	0.8
L	11,770	645	3,529	4.7	2,203.4	2,203.4	2,204.1	0.7
M	12,714	365	2,279	7.3	2,204.7	2,204.7	2,205.4	0.7
N	13,349	400	2,410	6.9	2,205.8	2,205.8	2,206.5	0.7
O	14,193	410	2,911	5.7	2,207.1	2,207.1	2,208.0	0.9
P	15,360	1,280	5,696	2.9	2,208.6	2,208.6	2,209.4	0.8
Q	16,640	1,350	6,506	3.7	2,209.6	2,209.6	2,210.3	0.7
R	17,659	1,020	4,326	3.8	2,210.4	2,210.4	2,211.2	0.8
S	18,716	1,495	6,506	2.6	2,211.4	2,211.4	2,212.1	0.7
T	19,761	960	3,587	4.6	2,212.3	2,212.3	2,212.8	0.5
U	20,885	1,040	4,835	3.4	2,213.9	2,213.9	2,214.3	0.4
V	21,515	890	4,212	3.9	2,214.6	2,214.6	2,215.0	0.4

[1]Feet above confluence with Snake River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

BOISE RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BOISE RIVER (CONTINUED)								
W	22,386	1,050	2,365	7.0	2,215.9	2,215.9	2,216.4	0.5
X	23,251	1,300	4,252	3.9	2,218.0	2,218.0	2,218.2	0.2
Y	24,551	1,660	6,303	2.6	2,219.2	2,219.2	2,219.5	0.3
Z	25,399	1,474	5,605	3.0	2,219.8	2,219.8	2,220.2	0.4
AA	26,365	1,930	6,291	2.6	2,220.5	2,220.5	2,221.0	0.5
AB	27,281	1,753	5,245	3.2	2,221.4	2,221.4	2,221.6	0.2
AC	28,349	1,970	3,206	5.2	2,222.6	2,222.6	2,222.8	0.2
AD	30,410	1,620	4,389	3.8	2,226.0	2,226.0	2,226.9	0.9
AE[2]	32,413	1,964	4,558	3.6	2,227.8	2,227.8	2,228.6	0.8
AF[2]	33,346	1,678	5,834	2.8	2,228.8	2,228.8	2,229.7	0.9
AG[2]	34,338	1,483	4,608	3.6	2,230.1	2,230.1	2,230.6	0.5
AH[2]	35,093	1,224	3,745	4.4	2,231.6	2,231.6	2,232.0	0.4
AI[2]	36,300	1,317	5,544	3.0	2,233.2	2,233.2	2,233.6	0.4
AJ[2]	37,150	1,550	3,883	4.3	2,234.0	2,234.0	2,234.4	0.4
AK	38,950	855	3,446	4.8	2,236.6	2,236.6	2,237.1	0.5
AL	39,938	795	2,976	5.6	2,238.3	2,238.3	2,238.8	0.5
AM	40,794	523	3,310	5.0	2,239.6	2,239.6	2,240.3	0.7
AN	41,748	945	4,341	3.8	2,241.3	2,241.3	2,241.7	0.4
AO	42,826	1,290	5,669	2.9	2,242.5	2,242.5	2,242.8	0.3
AP	44,020	2,132	6,322	2.6	2,243.6	2,243.6	2,243.7	0.1
AQ	44,841	2,640	6,196	2.7	2,244.1	2,244.1	2,244.2	0.1

[1]Feet above confluence with Snake River

[2]Flood Hazard data republished from previous effective data

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

BOISE RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BOISE RIVER (CONTINUED)								
AR	45,537	2,725	4,529	3.7	2,244.6	2,244.6	2,244.6	0.0
AS	47,048	3,100	7.095	2.3	2,246.1	2,246.1	2,246.4	0.3
AT	48,932	3,190	7,447	2.2	2,248.7	2,248.7	2,249.5	0.8
AU	49,905	3,330	9,275	1.8	2,249.5	2,249.5	2,250.3	0.8
AV	50,751	2,830	8,159	2.0	2,250.4	2,250.4	2,250.8	0.4
AW	51,191	2,805	7,681	2.2	2,250.8	2,250.8	2,251.1	0.3
AX	51,978	3,040	6,770	2.5	2,251.6	2,251.6	2,251.7	0.1
AY	52,731	2,650	6,816	2.4	2,252.5	2,252.5	2,252.6	0.1
AZ	53,934	2,329	6,713	2.3	2,253.4	2,253.4	2,253.6	0.2
BA	55,371	2,407	6,243	2.7	2,254.8	2,254.8	2,255.2	0.4
BB	55,895	2,310	6,474	2.6	2,255.5	2,255.5	2,256.0	0.5
BC	56,667	1,815	4,199	4.0	2,256.5	2,256.5	2,256.9	0.4
BD	57,506	1,295	3,172	5.2	2,258.0	2,258.0	2,258.5	0.5
BE	58,261	1,500	4,603	3.6	2,259.7	2,259.7	2,260.7	1.0
BF[2]	58,913	1,136	2,748	6.0	2,260.2	2,260.2	2,260.7	0.5
BG[2]	59,830	1,368	3,447	4.8	2,262.8	2,262.8	2,262.8	0.0
BH[2]	60,396	2,400	5,957	2.8	2,263.3	2,263.3	2,264.1	0.8
BI[2]	60,832	2,839	8,218	2.0	2,263.5	2,263.5	2,264.5	1.0
BJ[2]	61,694	2,488	4,778	3.5	2,264.5	2,264.5	2,265.0	0.5
BK[2]	64,249	1,391	3,941	4.2	2,267.3	2,267.3	2,267.8	0.5
BL[2]	67,288	1,840	5,276	3.1	2,273.5	2,273.5	2,274.1	0.6

[1]Feet above confluence with Snake River

[2]Flood Hazard data republished from previous effective data

TABLE

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

BOISE RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BOISE RIVER (CONTINUED)								
BM[2]	68,854	1,487	6,022	2.8	2,275.3	2,275.3	2,275.5	0.2
BN[2]	69,793	1,238	3,249	5.1	2,276.1	2,276.1	2,276.3	0.2
BO[2]	70,567	1,361	5,847	2.8	2,277.3	2,277.3	2,277.8	0.5
BP[2]	71,430	2,256	4,918	3.4	2,277.7	2,277.7	2,278.3	0.6
BQ[2]	72,446	2,404	5,195	3.2	2,279.3	2,279.3	2,279.7	0.4
BR	74,284	1,900	5,616	3.0	2,282.4	2,282.4	2,282.6	0.2
BS	75,502	1,870	4,278	3.9	2,283.8	2,283.8	2,283.8	0.0
BT	76,586	1,800	4,455	3.7	2,285.3	2,285.3	2,285.5	0.2
BU	77,365	1,230	4,059	4.1	2,286.4	2,286.4	2,286.6	0.2
BV	78.214	1,315	3,329	5.0	2,287.9	2,287.9	2,288.0	0.1
BW	79,034	1,520	4,510	3.7	2,289.3	2,289.3	2,289.7	0.4
BX	80,211	1,401	4,736	3.5	2,291.2	2,291.2	2,291.3	0.1
BY	81,173	1,170	3,920	4.2	2,292.6	2,292.6	2,292.6	0.0
BZ	82,036	1,070	2,481	6.7	2,293.9	2,293.9	2,293.9	0.0
CA	82,990	1,255	4,091	4.1	2,295.5	2,295.5	2,296.1	0.6
CB	83,672	1,600	4,313	3.9	2,296.5	2,296.5	2,297.0	0.5
CC	84,898	1,360	4,132	4.0	2,298.6	2,298.6	2,298.7	0.1
CD	85,850	1,185	5,474	3.0	2,299.6	2,299.6	2,299.7	0.1
CE	87,320	229	1,706	9.7	2,301.3	2,301.3	2,301.4	0.1
CF	88,032	356	2,290	7.3	2,303.6	2,303.6	2,303.6	0.0
CG	89,523	905	3,333	5.0	2,306.0	2,306.0	2,306.0	0.0

[1]Feet above confluence with Snake River

[2]Flood Hazard data republished from previous effective data

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

BOISE RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BOISE RIVER (CONTINUED)								
CH	90,285	1,225	6,409	2.6	2,307.0	2,307.0	2,307.1	0.1
CI	91,100	1,750	6,209	2.7	2,307.3	2,307.3	2,307.4	0.1
CJ	91,872	1,600	6,000	2.8	2,307.6	2,307.6	2,307.8	0.2
CK	93,266	1,715	6,183	2.7	2,308.4	2,308.4	2,308.8	0.4
CL	93,977	1,626	5,992	2.8	2,309.0	2,309.0	2,309.6	0.6
CM	94,923	1,865	5,704	2.9	2,310.2	2,310.2	2,310.5	0.3
CN	95,648	1,790	5,108	3.3	2,310.9	2,310.9	2,311.1	0.2
CO	96,483	1,800	5,689	2.9	2,312.1	2,312.1	2,312.3	0.2
CP	97,798	1,735	4,747	3.5	2,313.7	2,313.7	2,313.9	0.2
CQ	98,945	1,660	3,632	4.6	2,314.8	2,314.8	2,315.1	0.3
CR	99,844	1,992	4,022	4.1	2,316.3	2,316.3	2,316.6	0.3
CS	100,948	1,435	3,399	4.9	2,318.4	2,318.4	2,318.5	0.1
CT	102,567	1,035	3,998	4.2	2,320.9	2,320.9	2,321.4	0.5
CU	105,122	1,460	3,544	4.7	2,324.3	2,324.3	2,324.8	0.5
CV	106,248	1,655	4,438	3.7	2,326.0	2,326.0	2,326.6	0.6
CW	107,953	2,125	4,633	3.6	2,328.2	2,328.2	2,328.6	0.4
CX	109,365	1,459	3,686	4.5	2,330.3	2,330.3	2,330.9	0.6
CY	110,418	1,785	6,106	2.7	2,331.7	2,331.7	2,332.2	0.5
CZ	111,545	2,490	4,005	4.1	2,332.9	2,332.9	2,333.5	0.6
DA	113,309	3,521	3,856	4.3	2,337.6	2,337.6	2,337.9	0.3
DB	114,318	2,296	5,698	2.9	2,339.4	2,339.4	2,339.8	0.4

[1]Feet above confluence with Snake River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

BOISE RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BOISE RIVER (CONTINUED)								
DC	115,114	1,785	3,770	4.4	2,340.1	2340.1	2340.6	0.5
DD	116,088	2,080	4,808	4.1	2341.4	2341.4	2341.9	0.5
DE	118,738	1,685	2,527	6.6	2347.1	2347.1	2347.4	0.3
DF	120,573	1,255	2,445	6.8	2349.7	2349.7	2350.6	0.9
DG	121,795	800	2,277	7.3	2351.5	2351.5	2352.4	0.9
DH	122,416	1,080	2,838	5.9	2352.4	2352.4	2353.4	1.0
DI	123,107	660	3,110	5.3	2353.2	2353.2	2354.2	1.0
DJ	123,848	285	2,466	6.7	2354.1	2354.1	2355.0	0.9
DK	124,515	268	2,492	6.7	2356.3	2356.3	2356.6	0.3
DL	125,554	432	3,381	4.9	2357.1	2357.1	2357.5	0.4
DM	126,541	280	2,531	6.6	2357.7	2357.7	2358.2	0.5
DN	127,785	570	3,857	4.3	2,359.8	2,359.8	2,360.1	0.3
DO	130,406	293	2,035	8.2	2,360.9	2,360.9	2,361.3	0.4
DP	131,237	684	4,536	3.7	2,364.3	2,364.3	2,364.9	0.6
DQ	132,177	318	2,225	7.5	2,365.0	2,365.0	2,365.4	0.4
DR	133,296	540	3,322	5.0	2,367.4	2,367.4	2,367.8	0.4
DS	134,372	536	3,434	4.8	2,368.6	2,368.6	2,369.0	0.4
DT	135,346	1,045	6,141	2.7	2,369.1	2,369.1	2,370.0	0.9
DU	137,713	963	4,083	4.1	2,369.9	2,369.9	2,370.7	0.8
DV	138,727	659	3,087	5.4	2,371.9	2,371.9	2,372.1	0.2
DW	140,530	1,905	5,577	3.0	2,374.2	2,374.2	2,375.0	0.8

[1]Feet above confluence with Snake River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

BOISE RIVER

FLOODING SOURCE		FLOODWAY				1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY (FEET)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BOISE RIVER (CONTINUED)									
DX	142,675	1,645	4,395	3.8		2,376.2	2,376.2	2,376.9	0.7
DY	145,215	2,121	5,610	3.0		2,381.2	2,381.2	2,381.4	0.2
DZ	147,047	2,123	2,456	6.8		2,383.3	2,383.3	2,383.4	0.1
EA	147,990	1,544	5,356	3.1		2,386.1	2,386.1	2,386.1	0.0
EB	149,374	1,870	2,248	7.4		2,387.0	2,387.0	2,387.0	0.0
EC	150,073	1,799	2,404	6.9		2,389.1	2,389.1	2,389.1	0.0
ED	152,333	1,546	6,033	2.8		2,392.9	2,392.9	2,393.0	0.1
EE	153,436	1,089	3,091	5.4		2,393.3	2,393.3	2,393.4	0.1
EF	155,935	1,283	3,603	4.6		2,396.7	2,396.7	2,396.9	0.2
EG	156,714	1,424	3,204	5.2		2,398.3	2,398.3	2,398.5	0.2
EH	158,304	1,294	5,545	3.0		2,400.0	2,400.0	2,400.2	0.2
EI[2]	160,518	1,919	6,904	4.9		2,403.4	2,403.4	2,403.4	0.0
EJ[2]	163,318	1,901	4,799	3.7		2,406.2	2,406.2	2,407.0	0.8
EK	164,853	1,986	4,458	3.7		2,409.9	2,409.9	2,409.9	0.0
EL	166,237	1,987	3,470	4.8		2,412.2	2,412.2	2,412.2	0.0
EM	168,512	2,310	4,921	3.4		2,416.7	2,416.7	2,416.7	0.0
EN	171,490	3,218	5,574	3.0	862	2,420.0	2,420.0	2,420.6	0.6
EO	172,876	3,265	6,181	2.7	1,571	2,422.5	2,422.5	2,423.3	0.8
EP	173,972	2,803	4,484	3.7	1,425	2,423.7	2,423.7	2,424.4	0.7
EQ	175,600	2,144	2,949	5.6	602	2,427.4	2,427.4	2,427.5	0.1
ER	177,995	1,800	5,378	3.1		2,431.7	2,431.7	2,432.1	0.4

[1]Feet above confluence with Snake River

[2]Flood Hazard data republished from previous effective data

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

BOISE RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BOISE RIVER (CONTINUED)								
ES	179,138	1,799	3,286	5.1	2,433.5	2,433.5	2,433.6	0.1
ET	180,118	2,631	3,010	5.5	2,436.1	2,436.1	2,436.1	0.0
EU	183,018	1,027	3,360	5.2	2,442.4	2,442.4	2,442.4	0.0
EV	185,970	1,682	4,558	3.6	2,446.9	2,446.9	2,446.9	0.0
EW	187,290	2,100	5,049	3.3	2,448.5	2,448.5	2,448.6	0.1
EX	188,235	2,158	5,084	3.3	2,449.3	2,449.3	2,449.4	0.1
EY	189,230	1,292	2,382	7.0	2,450.9	2,450.9	2,,451.3	0.4
EZ	190,422	1,589	5,122	3.2	2,454.4	2,454.4	2,455.3	0.9
FA	191,291	1,357	5,278	3.2	2,455.7	2,455.7	2,456.2	0.5

[1]Feet above confluence with Snake River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

BOISE RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BOISE RIVER OVERBANK								
A	1,091	*	*	*	2,312.6	2,312.6	*	*
B	1,372	*	*	*	2,323.4	2,323.4	*	*
C	1,795	*	*	*	2,324.3	2,324.3	*	*
D	2,520	*	*	*	2,324.8	2,324.8	*	*
E	5,330	*	*	*	2,325.3	2,325.3	*	*
F	6,948	*	*	*	2,325.7	2,325.7	*	*
G	8,518	*	*	*	2,325.8	2,325.8	*	*
H	10,133	*	*	*	2,325.9	2,325.9	*	*
I	11,794	*	*	*	2,326.4	2,326.4	*	*
J	13,505	*	*	*	2,329.6	2,329.6	*	*
K	15,017	*	*	*	2,334.7	2,334.7	*	*
L	16,389	*	*	*	2,337.3	2,337.3	*	*
M	17,828	*	*	*	2,338.4	2,338.4	*	*
N	18,818	*	*	*	2,339.0	2,339.0	*	*
O	20,670	*	*	*	2,341.6	2,341.6	*	*
P	22,366	*	*	*	2,346.3	2,346.3	*	*
Q	23,426	*	*	*	2,348.3	2,348.3	*	*
R	24,343	*	*	*	2,349.7	2,349.7	*	*

[1]Feet above confluence with Boise River

*No floodway data computed

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

BOISE RIVER OVERBANK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BOISE RIVER OVERBANK (CONTINUED)								
S	25,163	*	*	*	2,351.3	2,351.3	*	*
T	26,075	*	*	*	2,353.2	2,353.2	*	*
U	26,964	*	*	*	2,354.5	2,354.5	*	*
V	27,523	*	*	*	2,355.0	2,355.0	*	*
W	28,011	*	*	*	2,355.1	2,355.1	*	*
X	28,371	*	*	*	2,355.1	2,355.1	*	*

[1]Feet above confluence with Boise River

*No floodway data computed

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

BOISE RIVER OVERBANK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
INDIAN CREEK								
A	458	90	389	4.4	2,352.6	2,346.4[2]	2,347.2	0.8
B	1,220	62	231	7.5	2,352.8	2,347.5[2]	2,348.4	0.9
C	1,895	71	381	4.5	2,353.1	2,350.3[2]	2,350.3	0.0
D	2,090	180	349	5.0	2,353.1	2,352.0[2]	2,352.7	0.7
E	3,316	118	639	2.7	2,354.9	2,354.9	2,355.0	0.1
F	3,830	58	263	6.6	2,355.2	2,355.2	2,355.8	0.6
G	4,024	62	286	6.0	2,356.1	2,356.1	2,356.4	0.3
H	5,234	48	237	7.3	2,359.2	2,359.2	2,359.2	0.0
I	5,499	47	292	5.9	2,361.1	2,361.1	2,361.1	0.0
J	5,900	47	265	6.5	2,361.7	2,361.7	2,361.7	0.0
K	6,161	41	244	7.1	2,363.3	2,363.3	2,363.3	0.0
L	6,644	93	342	5.0	2,365.1	2,365.1	2,365.5	0.4
M	7,723	38	340	5.1	2,369.0	2,369.0	2,369.0	0.0
N	7,839	50	369	4.7	2,369.2	2,369.2	2,369.3	0.1
O	8,277	76	394	4.4	2,370.4	2,370.4	2,370.4	0.0
P	8,654	43	252	6.9	2,371.2	2,371.2	2,371.2	0.0
Q	8,961	56	361	4.8	2,372.5	2,372.5	2,372.5	0.0
R	9,209	44	282	6.1	2,372.7	2,372.7	2,372.7	0.0
S	9,403	49	312	5.5	2,373.3	2,373.3	2,373.3	0.0
T	10,067	44	321	5.4	2,374.1	2,374.1	2,374.1	0.0
U	10,168	54	373	4.6	2,375.0	2,375.0	2,375.1	0.1
V	11,201	57	396	4.4	2,375.8	2,375.8	2,375.9	0.1
W	11,563	59	372	4.6	2,376.3	2,376.3	2,376.4	0.1
X	12,617	44	353	4.9	2,377.5	2,377.5	2,377.6	0.1
Y	13,027	50	353	4.9	2,378.0	2,378.0	2,378.0	0.0
Z	13,214	66	438	3.9	2,379.1	2,379.1	2,379.1	0.0

[1]Feet above confluence with Boise River [2]Elevation without consideration of flooding controlled by Boise River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

INDIAN CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
MASON CREEK								
A	631	69	215	5.9	2,369.6	2,363.0[2]	2,363.9	0.9
B	1,010	44	209	6.1	2,369.8	2,364.2[2]	2,365.1	0.9
C	2,074	77	198	6.4	2,370.4	2,367.2[2]	2,367.8	0.6
D	2,779	94	315	4.0	2,370.8	2,368.8[2]	2,369.6	0.8
E	3,964	82	365	3.5	2,371.5	2,370.1[2]	2,371.1	1.0
F	5,110	44	242	5.2	2,372.3	2,370.9[2]	2,371.8	0.9
G	5,660	59	232	5.5	2,372.8	2,371.9[2]	2,372.7	0.8
H	5,809	128	502	2.5	2,375.1	2,375.1	2,376.0	0.9
I	6,359	40	223	5.7	2,375.8	2,375.8	2,376.5	0.7
J	6,551	42	247	5.1	2,376.6	2,376.6	2,377.3	0.7
K	7,058	51	269	4.7	2,377.5	2,377.5	2,377.9	0.4
L	8,104	45	180	7.0	2,379.1	2,379.1	2,379.2	0.1
M	8,700	70	320	4.0	2,380.3	2,380.3	2,380.8	0.5
N	9,072	65	352	3.6	2,380.7	2,380.7	2,381.1	0.4
O	9,201	54	350	3.6	2,381.6	2,381.6	2,382.6	1.0
P	10,262	46	274	4.6	2,382.5	2,382.5	2,383.3	0.8
Q	11,144	42	161	7.9	2,383.9	2,383.9	2,384.6	0.7
R	11,360	194	732	2.5	2,388.6	2,388.6	2,389.5	0.9
S	11,749	190	556	2.9	2,388.7	2,388.7	2,389.5	0.8
T	11,957	93	485	3.0	2,389.9	2,389.9	2,390.8	0.9
U	12,528	99	390	3.7	2,390.4	2,390.4	2,391.2	0.8
V	13,898	43	264	4.8	2,390.9	2,390.9	2,391.9	1.0
W	15,026	30	164	7.7	2,392.7	2,392.7	2,393.4	0.7
X	16,220	34	226	5.6	2,396.8	2,396.8	2,397.4	0.6
Y	16,517	29	172	7.4	2,397.0	2,397.0	2,397.6	0.6
Z	16,683	48	405	3.1	2,398.1	2,398.1	2,398.7	0.6

[1]Feet above confluence with Boise River [2]Elevation without consideration of flooding controlled by Boise River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

MASON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
MIDDLETON CANAL								
A	350	39	119	0.0	2,398.5	2,398.5[2]	2,398.6	0.1
B	678	44	132	0.0	2,398.5	2,398.5[2]	2,398.6	0.1
C	1,118	24	58	0.0	2,398.5	2,398.5[2]	2,398.6	0.1
D	1,716	26	65	0.0	2,398.5	2,398.5[2]	2,398.6	0.1

[1]Feet above Mill Slough
[2]Backwater effects from Mill Slough

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

MIDDLETON CANAL

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
MILL SLOUGH								
A	147	43	174	4.6	2,390.8	2,390.8	2,390.8	0.0
B	745	32	164	4.9	2,394.4	2,394.4	2,393.4	0.0
C	1390	38	150	5.4	2,394.6	2,394.6	2,394.6	0.1
D	1771	42	214	3.8	2,395.9	2,395.9	2,395.9	0.0
E	2069	32	181	4.5	2,396.6	2,396.6	2,396.6	0.0
F	2319	35	153	5.2	2,396.9	2,396.9	2,397.0	0.0
G	2780	35	182	4.4	2,397.9	2,397.9	2,397.9	0.0
H	4135	45	218	3.7	2,399.6	2,399.6	2,399.6	0.0
I	4563	36	158	5.1	2,400.3	2,400.3	2,400.3	0.0
J	4805	41	227	3.6	2,400.8	2,400.8	2,400.8	0.0
K	5447	31	163	4.9	2,401.2	2,401.2	2,401.4	0.3
L	6643	40	217	3.7	2,402.7	2,402.7	2,402.9	0.2
M	7209	41	161	5.0	2,403.5	2,403.5	2,403.6	0.1
N	7349	28	153	5.3	2,406.5	2,406.5	2,407.1	0.6
O	7961	39	264	3.0	2,407.1	2,407.1	2,407.8	0.7
P	8446	58	270	3.0	2,407.3	2,407.3	2,408.0	0.7
Q	9360	45	177	4.5	2,407.9	2,407.9	2,408.9	1.0

[1]Feet above Boise River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

MILL SLOUGH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
WILLOW CREEK								
A	0	43	139	9.2	2,379.7	2,379.7	2,379.8	0.1
B	373	67	167	7.6	2,382.2	2,382.2	2,382.3	0.1
C	754	60	216	5.9	2,383.9	2,383.9	2,384.0	0.1
D	971	40	179	7.1	2,389.1	2,389.1	2,389.2	0.1
E	1,355	38	207	6.2	2,390.3	2,390.3	2,390.4	0.1
F	2,187	103	369	9.5	2,393.0	2,393.0	2,393.0	0.0
G	2,723	240	725	6.2	2,394.5	2,394.5	2,395.4	0.9
H	3,015	136	385	9.4	2,395.4	2,395.4	2,395.8	0.4
I	3,246	66	330	9.4	2,396.5	2,396.5	2,396.6	0.1
J	3,909	214	470	8.6	2,398.9	2,398.9	2,399.5	0.6
K	4,517	257	733	6.3	2,400.4	2,400.4	2,401.4	1.0
L	4,680	345	574	9.0	2,401.2	2,401.2	2,401.8	0.6
M	4,898	560	929	6.6	2,402.2	2,402.2	2,403.2	1.0
N	5,227	452	1,308	4.9	2,404.8	2,404.8	2,405.7	0.9
O	5,664	215	717	5.2	2,405.2	2,405.2	2,406.2	1.0
P	5,820	160	438	11.8	2,406.1	2,406.1	2,406.7	0.6
Q	6,356	140	537	8.4	2,408.6	2,408.6	2,409.4	0.8
R	6,952	130	429	9.3	2,410.2	2,410.2	2,411.0	0.8
S	7,254	263	657	7.2	2,411.4	2,411.4	2,412.3	0.9
T	7,393	305	726	7.3	2,411.9	2,411.9	2,412.6	0.7
U	7,583	362	1,013	6.1	2,413.4	2,413.4	2,414.4	1.0
V	8,179	268	675	6.6	2,414.4	2,414.4	2,415.3	0.9

[1]Feet above Boise River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

WILLOW CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
WILLOW CREEK (CONTINUED)								
W	8,377	332	602	8.5	2,417.2	2,417.2	2,417.6	0.4
X	9,251	331	856	5.3	2,419.4	2,419.4	2,420.4	1.0
Y	9,360	277	645	7.1	2,419.8	2,419.8	2,420.6	0.8
Z	10,122	53	309	9.6	2,422.5	2,422.5	2,423.2	0.7

[1]Feet above Boise River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

WILLOW CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
WILLOW CREEK OVERFLOW								
A	371	879	1,695	1.1	2,387.2	2,387.2	2,388.1	0.9
B	752	402	358	0.0	2,388.7	2,388.7	2,389.1	0.4

[1]Feet above Mill Slough

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

WILLOW CREEK OVERFLOW

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
WILLOW CREEK OVERFLOW 2								
A	276	*	*	*	2,391.8	2,391.8	*	*
B	572	*	*	*	2,393.0	2,393.0	*	*

[1]Feet above confluence with Mill Slough

*No floodway data computed

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

WILLOW CREEK OVERFLOW 2

5.0 INSURANCE APPLICATION

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

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report 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 rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by detailed methods. 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 zone that corresponds to the 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 analysis are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance zone that corresponds to the 1-percent-annual-chance shallow flooding (usually areas of 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 analysis are shown within this zone.

Zone X

Zone X is the flood insurance rate 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 base flood by levees. No BFEs or depths are shown within this zone.

Table 6. Flood Insurance Zones within Each Community

Community	Zone(s)
City of Caldwell	A, AE, X
City of Greenleaf	AE, X
City of Middleton	A, AE, X
City of Melba	X
City of Nampa	AE, X
City of Notus	A, AE, X
City of Parma	AE, X
City of Star	A, AE, X
City of Wilder	X
Canyon County (Unincorporated Areas)	A, AE, X

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 rate 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 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 countywide FIRM presents flooding information for the entire geographic area of Canyon County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood-prone. This countywide FIRM also includes flood hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community are presented in Table 7, “Community Map History.”

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISION DATE(S)
Canyon County (Unincorporated Areas)	May 24, 1977	N/A	September 28, 1984	December 3, 1993
Caldwell, City of	November 19, 1976	N/A	September 3, 1980	September 30, 1988
Greenleaf, City of	May 24, 2011	N/A	May 24, 2011	N/A
[1]Melba, City of	N/A	N/A	N/A	N/A
Middleton, City of	November 2, 1973	July 30, 1976	September 3, 1980	June 17, 1976 September 28, 1980 December 3, 1993
Nampa, City of	May 31, 1974	August 13, 1976 July 19, 1977	September 28, 1984	N/A
Notus, City of	September 26, 1975	N/A	March 18, 1980	December 3, 1993
Parma, City of	May 17, 1974	June 4, 1976	September 30, 1980	December 3, 1993
[2]Star, City of	June 28, 1977 (Ada County)	N/A	December 18, 1984 (Ada County)	December 17, 1991 August 2, 1996 (Ada County)
[1]Wilder City, City of	N/A	N/A	N/A	N/A

[1] No Special Flood Hazard Areas
[2] Map dates for this community were taken from Ada County, Idaho

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CANYON COUNTY, IDAHO AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

FIS reports were published for the City of Nampa on March 28, 1984, for the City of Caldwell on September 30, 1988, and for Canyon County (Unincorporated Areas) and the Cities of Middleton, Notus, and Parma on December 3, 1993 (References 35, 36, 24, 37, 38, and 39).

No previous studies have been prepared for the Cities of Greenleaf, Melba, and Wilder City.

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

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Federal Insurance and Mitigation Directorate, FEMA Region X, Federal Regional Center, 130 228th Street, Southwest, Bothell, Washington 98021-9796.

9.0 BIBLIOGRAPHY AND REFERENCES

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13. U.S. Army Corps of Engineers, Walla Walla District, Water Control Manual for Boise River Reservoirs, December 1988.

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17. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles Users Manual, Davis, California, September 1982

18. U.S. Department of the Army, Corps of Engineers, Walla Walla District, Flood Plain Management Report for the Boise River. Idaho, 1979 (Revised 1982)

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20. U.S. Department of the Army, Corps of Engineers, Aerial Photography. Middleton. Idaho, 1:4,800, flown September 17, 1981

21. U.S. Department of the Interior, Geological Survey, Open-File Report, Computer Program E-431, Computer Applications for Step-Backwater and Floodway Analyses, 1976.

22. U.S. Department of the Interior, Geological Survey, Open-File Report 76-499, Computer Program J-635, Computer Applications for Step-Backwater and Floodway Analyses, J.O. Sherman, 1976.

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25. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1: 24,000, Contour Interval 10 feet: Caldwell, Idaho (1958), Photorevised (1971); Middleton, Idaho (1958), Photorevised (1971); Wilder, Idaho (1957), Photorevised (1971)

26. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 feet: Adrain, Idaho (1967); Givens Hot Springs, Idaho

(1958), Photorevised (1971); Homedale, Idaho (1958), Photorevised (1971); Marsing, Idaho (1958), Photorevised (1971); Southwest Emmett, Idaho (1970); Walters Butte, Idaho (1957), Photorevised (1971)

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10.0 REVISION DESCRIPTIONS

This section has been added to provide information regarding significant revisions made since the original FIS report was printed. Future revisions may be made that do not result in the republishing of the FIS report. To assure that user is aware of all revisions, it is advisable to contact your community's flood hazard data repository.

10.1 First Revision (May 24, 2011)

a. Acknowledgments

The hydrologic and hydraulic analyses for a restudy of Indian Creek, Mason Creek, and the Boise River were performed by WEST Consultants, Inc. for FEMA under contract number EMS-2001-CO-0068. This preliminary study was completed in October 2007. Base mapping was compiled by Horizons, Inc. from LiDAR coverage at a scale of one inch equals 500 feet.

The preliminary hydraulic modeling for Indian Creek was subsequently modified by CH2M Hill, under contract to the City of Caldwell, to account for recent channel and floodplain modifications. The modeling revisions were completed in July 2008. The preliminary hydrologic analysis for Indian Creek was modified after discussions regarding the contributing drainage area, the joint probability of flows in the New York Canal and Indian Creek and the capacity of the New York Canal. This revised analysis was completed in November 2009. The modified hydrologic analysis results and the modified hydraulic model were used to determine the final water surface elevations, floodplain extents and floodway delineation. This work was completed by Michael Baker Jr., Inc., for FEMA.

b. Coordination

The initial CCO meeting was held on November 5, 2003, and was attended by representatives of FEMA, the State of Idaho, Canyon County, the City of Nampa, the City of Caldwell, and the study contractor.

An intermediate CCO meeting was held on February 15, 2008, and was attended by representatives of FEMA, WEST Consultants, the State of Idaho, the Cities of Nampa, Caldwell, Star, Middleton, Greenleaf, Parma and Greenleaf, Senator Crapo's office, Congressman Sali's office and Quadrant Consulting. Two main issues raised at the meeting include the new channel configuration for Indian Creek and the flow capacity of the New York Canal.

The preliminary analyses for Indian Creek were appealed on January 15, 2009, by the Cities of Caldwell and Nampa. The appeal from the City of Caldwell involved a request to update the channel configuration for Indian Creek to account for the work done by the city to realign and regrade the stream banks of Indian Creek between 5th and 10th Avenues. Both cities appealed the hydrologic analysis conducted on Indian Creek and the New York Canal. The appeal involved a review and changes to the contributing drainage area of Indian Creek, the joint probability of flows in the New York Canal and Indian Creek and the capacity of the New York Canal. The appeal was resolved on December 31, 2009.

Once the appeal was resolved it was determined in conversations with FEMA and the communities that no further CCO meetings were necessary so a second CCO meeting was not held.

c. Scope

The Boise River was restudied using detailed methods from Interstate Highway 84 to the Canyon-Ada County boundary. Indian Creek was restudied using detailed methods from its confluence with the Boise River to the Canyon-Ada County boundary. Mason Creek was studied using detailed methods from its confluence with the Boise River to Lone Tree Lane in the City of Nampa.

d. Flood Protection Measures

Flood magnitudes along Lower Indian Creek are affected by operation of the New York Canal. The New York Canal is an irrigation canal that starts from the Boise River just below the Lucky Peak Project. To the south of Eager Road and Kuna Road (in Ada County), the canal splits to the Mora Canal and the New York Canal.

Approximately 1,200 feet downstream of Stroebel Road in the City of Kuna, Idaho, the New York Canal converges with Indian Creek. The New York Canal and Indian Creek continue as one stream until about 2,100 feet upstream of Columbia Road where there is a Callopy gate across the stream channel. Indian Creek splits from the combined channel and flows to the northwest through the Cities of Nampa and Caldwell to the Boise River. The New York Canal continues west to Lake Lowell. The Callopy gate controls how much water is allowed to flow through the New York Canal. The gate currently maintains the design flow of 1,500 cfs in the New York Canal. The flood flow in excess of 1,500 cfs is diverted to Indian Creek over a broad crested weir.

During the flood season (December 1 to March 31) it is assumed that 1,000 cfs is maintained in the joint New York Canal/Indian Creek channel 20 percent of the time. The percentage of time the canal was in use was determined by analyzing observed records. During a flood event in the Indian Creek basin, the natural discharges from the Indian Creek basin are increased by the flow diverted to the New York Canal.

e. Hydrologic Analysis

This restudy of the Boise River from Interstate Highway 84 to the Canyon-Ada County boundary used the effective flood frequency discharges estimates from the regulated discharge curve for Lucky Peak Dam (Reference 13).

The estimation of flood frequency discharges for Indian Creek upstream of the Callopy gate was based on a regional regression analysis (Reference 14) and a joint probability approach to reflect the historical use of the New York Canal for the December 1 to March 31 time period (the historical flood season) (Reference 15). The canal was determined to be in use 20 percent of the time between December 1 and March 31 with an assumed flow of 1,000 cfs. For Indian Creek downstream of the Callopy gate, the discharges were equal to flow in excess of 1,500 cfs (the amount diverted to the New York Canal by the Callopy gate) plus the flows due to the local drainage area.

The estimation of flood frequency discharges for Mason Creek from its confluence with the Boise River upstream to Lone Tree Lane was based on a regional regression analysis (Reference 14).

Peak discharge drainage area relationships studied by detailed methods are shown in Table 2, Summary of Discharges.

f. Hydraulic Analysis

WSELs for the Boise River for this revision from Interstate Highway 84 to the Ada County boundary were computed using HEC-RAS version 3.1.3 (Reference 23). The channel geometry was developed from channel surveys conducted by Minister & Glaeser Surveying, Inc. for the Boise River. Overbank geometry was developed from LiDAR data acquired by Horizons, Inc. Bridge and culvert data was developed from surveys conducted by Minister & Glaeser Surveying, Inc. The starting WSELs were taken from the flood profiles in the effective FIS report (Reference 24).

WSELs for Indian Creek for this revision were computed using HEC-RAS version 3.1.3 (Reference 23). The channel geometry was developed from channel surveys conducted by Quadrant Consulting, Inc. Overbank geometry was developed from LiDAR data acquired by Horizons, Inc. Bridge and culvert data were developed from surveys conducted by Quadrant Consulting, Inc. The starting WSEL was specified as normal depth based on the ground slope near the confluence with the Boise River.

The preliminary channel geometry for some sections of Indian Creek was changed to account for the relocation of the stream channel, the removal of buildings and road pavement to allow access to the stream channel and the regrading of the channel banks. The revised sections were located between the following streets:

1. Between 10th Avenue and 9th Avenue
2. Between 9th Avenue and Kimball Boulevard
3. Between Kimball Boulevard and 5th Avenue

Additionally, two new pedestrian bridges were added to the preliminary model and the bridge at Kimball Boulevard was revised to reflect the new downstream stream channel configuration.

The new cross sections and bridges were surveyed by Quadrant Consulting, Inc.

WSELs for Mason Creek for this revision from its confluence with the Boise River to Lone Tree Lane were computed using HEC-RAS version 3.1.3 (Reference 23). The channel geometry was developed from channel surveys conducted by Quadrant Consulting, Inc. Overbank geometry was developed from LiDAR data acquired by Horizons, Inc. Bridge and culvert data were developed from surveys conducted by Quadrant Consulting, Inc. The starting WSEL was specified as normal depth based on the ground slope near the confluence with the Boise River.

Channel and overbank roughness coefficients (Manning's "n" values), used in the hydraulic computations, were chosen by engineering judgment based on field observation and aerial photos of stream and floodplain areas. The roughness coefficients for all studied flooding sources are listed in Table 3.

g. Vertical Datum

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. Structure and ground elevations in the community must, therefore, be referenced to NAVD88. It is important to note that adjacent communities may be referenced to NGVD29. This may result in differences in Base Flood Elevations across the corporate limits between communities. The conversion factor for streams studied by detailed methods in Canyon County is 3.12 feet. To convert from NGVD29 to NAVD88 use the following:

NVGD29 elevation + 3.12 feet = NAVD88 elevation

h. Floodplain Boundaries

For this revision topographic maps were generated from aerial photography by Horizons, Inc., at a scale of one inch equals 500 feet with a contour interval of 2 feet (Reference 33).

In addition to the above study the following LOMRs were incorporated as part of the countywide study.

Table 8. Letters of Map Revision Incorporated in the First Revision

Case Number	Final Letter Date	Flooding Source	Segment Studied
05-10-0594P	July 27, 2006	Willow Creek	from just downstream of Duff Lane to just upstream of Lansing Lane
07-10-0530P	August 28, 2007	Boise River	from approximately 9,400 feet to approximately 3,800 feet downstream of Notus Greenleaf Road
02-10-391P	July 3, 2003	Boise River	the area approximately 2,100 feet downstream of Middleton Road
97-10-177P	October 24, 1997	Mason Creek	just upstream of the abandoned Union Pacific Railroad (UPRR) right-of-way to just downstream of the Franklin Road South culvert
08-10-0685P	April 30, 2009	Tenmile Creek	from approximately 2,600 feet downstream of Canada Road to just upstream
09-10-0166P	December 28, 2009	Mason Creek	from just downstream of South Americana Drive to just upstream of Kings Road

10.2 Second Revision (Date TBD)

a. Authority and Acknowledgments

This Physical Map Revision (PMR) was revised to incorporate revised hydrology and hydraulics for Boise River, Mason Creek, Middleton Canal, Mill Slough, and Willow Creek in the Cities of Caldwell, Middleton, Nampa, Notus, Parma, and Star, and in Canyon County (Unincorporated Areas). Letters of Map Revision (LOMRs) on the revised panels were also incorporated for this project. The revision was performed by Strategic Alliance for Risk Reduction (STARR) under contract HSFEHQ-09-D-0370, and the U.S. Army Corps of Engineers (USACE) under Inter-Agency Agreement HSFE10-09-X-00091.

b. Coordination

The results of the Lower Boise PMR were reviewed at a meeting held on _____, and attended by representatives of _____. All problems raised at that meeting have been addressed.

c. Scope of Study

For this PMR, portions of Boise River, Mason Creek, Middleton Canal, Mill Slough and Willow Creek were restudied using detailed methods by the USACE. This restudy was completed in 2014. The limits of detailed study are shown in Table 9.

Table 9 – Limits of Detailed Study for the Second Revision

Stream	Limit of Detailed Study
Boise River	From the confluence with the Snake River upstream to the Interstate Highway 84 Bridge at Caldwell
Boise River Overbank	From the confluence with Boise River upstream approximately 5.45 miles
Mason Creek	From the confluence with Boise River upstream approximately 1.1 miles
Middleton Canal	From the confluence with Mill Slough to approximately 595 feet upstream of Triumph Drive
Mill Slough	From the confluence with Boise River to approximately 1,500 feet upstream of State Highway 44
Willow Creek	From the confluence with Boise River upstream to approximately 0.5 miles upstream of the bridge at West Concord Street
Willow Creek Overflow	From the confluence with Mill Slough to approximately 750 feet upstream of Mill Slough
Willow Creek Overflow 2	From the confluence with Mill Slough to approximately 575 feet upstream of Mill Slough

As the result of backwater effects from Mill Slough, a flood profile for Middleton Canal was created for this PMR. The flood profile for Mason Creek was revised for this PMR due to flooding effects controlled by the Boise River. The profiles for these streams are presented in Exhibit 1.

The Boise River was redelineated from Interstate Highway 84 Bridge in the City of Caldwell upstream to the County boundary located approximately 11.85 miles upstream of Middleton Road. This work was completed by STARR in 2015.

Figures 2 and 3 present important considerations for using the information contained in this FIS report and the FIRM and is provided in response to changes in format and content.

Figure 2 – 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 Map Service Center website at http://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 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 Map Service Center at the number listed above.

For community and countywide map dates, refer to Table 7 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.

Figure 2 – Notes to Users (Continued)

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 10.2 (d) 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 Universal Transverse Mercator. The horizontal datum was North American Datum 1983. 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.

ELEVATION DATUM: Flood elevations on the FIRM are referenced to NAVD88. 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 North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/, or contact the National Geodetic Survey at the following address:

Figure 2 – Notes to Users (Continued)

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.

BASE MAP INFORMATION: Base map information shown on the FIRM was provided by U.S. Census Bureau TIGER files, dated 2014 and digital data provided by Canyon County GIS, dated 2014. For information about base maps, refer to Section 10.2 in this FIS Report.

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: As new studies are performed and FIRM panels are updated within Ada County, Idaho and Incorporated Areas, corresponding revisions to the FIRM Index will be incorporated within the FIS Report to reflect the effective dates of those panels. Please refer to Table 7 of this FIS Report to determine the most recent FIRM revision date for each community. The most recent FIRM panel effective date will correspond to the most recent index date.

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

This Notes to Users section was created specifically for Canyon County, Idaho and Incorporated Areas, effective date to be determined.

FLOOD RISK REPORT: A Flood Risk Report (FRR) may be available for many of the flooding sources and communities referenced in this FIS Report. The FRR is provided to increase public awareness of flood risk by helping communities identify the areas within their jurisdictions that have the greatest risks. Although non-regulatory, the information provided within the FRR can assist communities in assessing and evaluating mitigation opportunities to reduce these risks. It can also be used by communities developing or updating flood risk mitigation plans. These plans allow communities to identify and evaluate opportunities to reduce potential loss of life and property. However, the FRR is not intended to be the final authoritative source of all flood risk data for a project area; rather, it should be used with other data sources to paint a comprehensive picture of flood risk.

Figure 3 – FIRM Legend

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, either at cross section locations or as static whole-foot elevations that apply throughout the 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 - FIRM Legend (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.
	Zone X Protected by Accredited Levee: Areas protected by an accredited levee, dike or other flood control structures. 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 determined to be outside the 0.2% annual chance floodplain
FLOOD HAZARD AND OTHER BOUNDARY LINES	
	Flood Zone Boundary (white line)
	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
Dam *Jetty* *Weir*	Dam, Jetty, Weir
	Levee, Dike or Floodwall
Bridge	Bridge

Figure 3 - FIRM Legend (Continued)

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. See Notes to Users for important information.*	
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.
O THERWISE 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 (shown for flooding sources for which no cross sections or profile are available)
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

Figure 3 - FIRM Legend (Continued)

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)

d. Flood Protection Measures

According to the National Levee Database, there are currently 6 levees along the south side of the Boise River in Canyon County that provide minimally acceptable protection to the surrounding areas. These levees are operated and maintained by Flood Control Districts #10 and #11 of Idaho. District #10 operates and maintains the 0.74-mile-long Cromwell Levee at Middleton. District #11 operates and maintains a total of 5 levees totaling 1.65 miles; including the Ray Morden Levee west of the City of Notus; the Ross and Link, Slate-Allen, and Young (Left Bank) Levees near the City of Parma; and the Hitch Levee located near the confluence of the Boise and Snake Rivers.

Within this jurisdiction, there are one or more levees that have not been demonstrated by the community or levee owner(s) to meet the requirements of 44 CFR Part 65.10 of the NFIP regulations as it relates to the levee's capacity to provide 1-percent-annual-chance flood protection. Please refer to the Notice to Flood Insurance Study Users page at the front of this FIS report for more information.

While other levees may exist within Canyon County, levees not identified in this section are not known to have the necessary features to provide protection from the regulatory flood.

e. Hydrologic Analyses

A flood frequency curve for the Lower Boise River basin, developed in 2012 by the USACE, Walla Walla District, was utilized in this restudy. Since 1955, when storage in Lucky Peak Lake began, the lower part of the frequency curve has been defined by regulated flood flows measured at the USGS gaging stations at Boise, Idaho. The upper part of the regulated frequency curve was developed by routing specific frequency hydrographs through the upstream reservoirs.

Flood Peaks for Mill Slough were developed in 1981 by the USACE, Walla Walla District, Mill Slough Flood Study (USACE, 1981). Mill Slough basin is heavily influenced by a complex network of interconnected storm drains and irrigation canals. A complete review was conducted by the USACE in 2012 to include operations of the irrigation canals.

The flood frequency curve for Willow Creek was derived by the USACE, Walla Walla District, regional regression equations. Significant floods in this basin were determined to result from rain on snow flood events. The frequency curve was based on regional frequency analysis utilizing 14 USGS gages in locations with similar basin characteristics. Frequency results were verified using the 1979 flood flow on Willow Creek and gaged data on the adjacent basin.

Table 10 - Summary of Discharges for the Second Revision

Flooding Source and Location	Drainage Area, in Square Miles	Peak Discharges (cubic feet per second)				
		10-Percent-Annual-Chance	4-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Boise River, at Lucky Peak Dam	2,650[1]	7,500[2]	7,900[2]	11,000[2]	16,600[2]	34,800[2]
Mill Slough, downstream of Boise Street	10.7	339	479	598	804	1,174
Willow Creek, downstream of Highway 44	84.6	1,221	1,815	2,349	2,963	4,747

[1] Drainage area above Lucky Peak Dam
[2] Regulated discharges

f. Hydraulic Analyses

Boise River and Boise River Overbank

Water surface elevations for floods of the selected recurrence intervals on the Boise River were computed by the USACE using the USACE computer program, HEC-RAS, version 4.1.0. Cross Sections were developed using 2006 Green LiDAR. Also, new bridge cross sections were obtained in 2012 and 2013 for those bridges without data. Roughness coefficient factors (Manning's "n"), used in the hydraulic computations were chosen by engineering judgment based on field observation of the river and floodplain areas, and aerial imagery. Channel values are predominately 0.032, but varied slightly due to local disparities. Overbank values predominately ranged from 0.03 to 0.08; the median value was 0.045 as much of the floodplain is agricultural land. The large range in overbank values resulted from having a mixture of agricultural, urbanized, residential, and impervious areas. Starting water surface elevations for the Boise River were established using normal depth. Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.1 foot for floods for the selected recurrence intervals.

Mill Slough and Middleton Canal

Water surface elevations for floods of the selected recurrence intervals on Mill Slough were computed by the USACE using the USACE computer program, HEC-RAS, version 4.1.0. Cross Sections were developed as a combination of 2007 and 2012 LiDAR data merged with 2012 below-water field surveys. Roughness coefficient factors (Manning's "n"), used in the hydraulic computations were chosen by engineering judgment based on field observation of the stream and floodplain areas, and aerial imagery. Channel values ranged

from 0.03 to 0.035, and overbank values ranged from 0.03 to 0.08. The large range in overbank values resulted from having a mixture of heavy residential areas, large parking lots and farm fields. Starting water surface elevations for Mill Slough were established using normal depth. Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.1 foot for floods for the selected recurrence intervals.

The 10-, 4-, 2-, 1-, and 0.2-percent-annual-chance flood elevations calculated for Middleton Canal for this PMR are the result of backwater effects from Mill Slough.

Willow Creek, Willow Creek Overflow, and Willow Creek Overflow 2

For Willow Creek, Willow Creek Overflow, and Willow Creek Overflow 2, water surface elevations for floods of the selected recurrence intervals were computed by the Walla Walla District of the USACE using the USACE computer program, HEC-RAS, version 4.1.0. Cross Sections were developed as a combination of 2007 and 2012 LiDAR data merged with 2012 below-water field surveys. Roughness coefficient factors (Manning's "n"), used in the hydraulic computations were chosen by engineering judgment based on field observation of the stream and floodplain areas, and aerial imagery. Channel values ranged from 0.028 to 0.036, and overbank values ranged from 0.04 to 0.06. The range in overbank values resulted from having a mixture of residential areas and farm fields. Starting water surface elevations for Willow Creek were taken from normal depth. Flood profiles are drawn showing computed water-surface elevations to an accuracy of 0.1 foot for floods for the selected recurrence intervals.

For all studied and restudied streams, the hydraulic analyses were based on unobstructed flow and the flood elevations shown on the profiles are only considered valid if any hydraulic structures remain unobstructed, operate properly, and do not fail.

g. Letters of Map Revision

LOMR 16-10-0071P was incorporated during the processing of this PMR.

h. Additional Information

The jurisdictions that are included in this project area, along with the Community Identification Number (CID) for each community and the 8-digit Hydrologic Unit Codes (HUC-8) sub-basins affecting each, are shown in Table 11. The Flood Insurance Rate Map (FIRM) panel numbers that affect each community are listed. If the flood hazard data for the community is not included in this FIS Report, the location of that data is identified.

The location of flood hazard data for any participating communities in multiple jurisdictions is also indicated in the table.

Jurisdictions that have no identified SFHAs as of the effective date of this study are indicated in the table. Changed conditions in these communities (such as urbanization or annexation) or the availability of new scientific or technical data about flood hazards could make it necessary to determine SFHAs in these jurisdictions in the future.

Table 11 - Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)
Canyon County (Unincorporated Areas)	160208	17050103 17050114 17050115	16027C0025F, 16027C0035G, 16027C0045G, 16027C0061G, 16027C0062G, 16027C0063G, 16027C0064G, 16027C0066G, 16027C0067F, 16027C0068G, 16027C0069G, 16027C0075G, 16027C0100F, 16027C0125F, 16027C0150F, 16027C0175F, 16027C0181G, 16027C0182G, 16027C0200G, 16027C0201G, 16027C0202G, 16027C0203G, 16027C0204G, 16027C0206G, 16027C0207G, 16027C0208G, 16027C0209G, 16027C0212F, 16027C0216F, 16027C0225G, 16027C0230G, 16027C0233G, 16027C0234G, 16027C0235F, 16027C0237G, 16027C0240G, 16027C0241G, 16027C0242G, 16027C0243F, 16027C0244F, 16027C0253G, 16027C0254G, 16027C0258G, 16027C0259G, 16027C0261G, 16027C0262G, 16027C0263F, 16027C0264F, 16027C0266G, 16027C0267G, 16027C0270F, 16027C0275F, 16027C0300F, 16027C0325F, 16027C0350F, 16027C0375F, 16027C0376F, 16027C0377F, 16027C0378F, 16027C0381F, 16027C0382F, 16027C0383F, 16027C0384F, 16027C0390F, 16027C0391F, 16027C0392F, 16027C0395F, 16027C0401F, 16027C0403F, 16027C0411F, 16027C0425F, 16027C0450F, 16027C0475F, 16027C0500F, 16027C0525F, 16027C0550F, 16027C0575F
City of Caldwell	160036	17050114	16027C0233G, 16027C0237G, 16027C0240G, 16027C0241G, 16027C0242G, 16027C0243F, 16027C0244F, 16027C0261G, 16027C0262G, 16027C0263F, 16027C0264F, 16027C0375F, 16027C0376F
City of Greenleaf	160235	17050114	16027C0212F, 16027C0216F
City of Melba	160020	17050103	16027C0500F, 16027C0575F
City of Middleton	160037	17050114	16027C0234G, 16027C0235F, 16027C0253G, 16027C0254G, 16027C0258G, 16027C0261G, 16027C0275F
City of Nampa	160038	17050114	16027C0264F, 16027C0270F, 16027C0376F, 16027C0377F, 16027C0379F, 16027C0381F, 16027C0382F, 16027C0383F, 16027C0384F, 16027C0391F, 16027C0392F, 16027C0401F
City of Notus	160147	17050114	16027C0202G, 16027C0206G
City of Parma	160039	17050114	16027C0062G, 16027C0064G, 16027C0066G, 16027C0068G
City of Star	160236	17050114	16027C0258G, 16027C0259G
City of Wilder City	160196	17050114	16027C0200G

Information concerning the pertinent data used in the preparation of this FIS Report can be obtained by submitting an order with any required payment to the FEMA Engineering Library. For more information on this process, see http://www.fema.gov.

The additional data that was used for this project includes the FIS Report and FIRM that were previously prepared for Canyon County and Incorporated Areas (FEMA 2011).

Table 12 is a list of the locations where FIRMs for Canyon County can be viewed. Please note that the maps at these locations are for reference only and are not for distribution. Also, please note that only the maps for the community listed in the table are available at that particular repository. A user may need to visit another repository to view maps from an adjacent community.

Table 12 - Map Repositories

Community	Address	City	State	Zip Code
Canyon County (Unincorporated Areas)	Canyon County Courthouse 115 Albany Street	Caldwell	ID	83605
City of Caldwell	City Hall 621 Cleveland Boulevard, 2nd Floor	Caldwell	ID	83605
City of Greenleaf	City Hall 20523 North Whittier Drive	Greenleaf	ID	83626
City of Melba	City Hall 401 Carrie Rex Avenue	Melba	ID	83641
City of Middleton	City Hall 6 North Dewey Avenue	Middleton	ID	83644
City of Nampa	City Hall 411 3rd Street South	South Nampa	ID	83651
City of Notus	City Hall 375 Notus Road	Notus	ID	83656
City of Parma	City Hall 305 North 3rd Street	Parma	ID	83660
City of Star	City Hall 10769 West State Street	Star	ID	83669
City of Wilder City	City Hall 219 3rd Street	Wilder City	ID	83679

i. Bibliography for the Second Revision

Federal Emergency Management Agency, Flood Insurance Study, Ada County and Incorporated Areas, Flood Insurance Study Number 16001CV000B, revised October 2, 2003.

U.S. Army Corps of Engineers, Mill Slough Section 205 Flood Study, Middleton, Idaho, December 1981.