

TUESDAY STAFF BRIEFINGS

December 6, 2016

****Please Note Briefings Will Begin Immediately Following Hearings****

All items on this agenda are scheduled for immediately following Hearings and will normally be considered in the order the item appears on the agenda. The Board, at their discretion, may choose to alter the order in which items are considered, may break, or may continue any item to be considered on a future date.

Convene immediately following Hearings; BCC Conference Room, 5th Floor

Briefing Items

1. Jefferson County Multi-Hazard Mitigation Plan - 2016 Update Brian Daley
(15 minutes)
2. Children, Youth and Family Request for Renewal of Limited Status Positions (15 minutes) Mary Berg
3. Board of Adjustment - Zoning Resolution, Policy and Bylaws (20 minutes) Jeanie Rossillon
John Wolforth
4. Foothills Park and Recreation District - Release of Park Land Request (30 minutes) Jeanie Rossillon
John Wolforth
5. Agreement Regarding Design and Construction of Drainage and Flood Control Improvements for Lena Gulch - Tributary H at CDOT Infield Upstream of 6th Avenue, City of Golden, Jefferson County (15 minutes) Jeanie Rossillon

County Commissioners' Report

- C-PACE Program - Commissioner Rosier (20 minutes)

County Manager's Report

- Discussion - Appointments to Various Boards and Commissions (15 minutes)

County Attorney's Report

- Red Rocks Centre Application for Disconnect (15 minutes)
- County Surveyor Salary (5 minutes)

Executive Session

- Foothills Park and Recreation District - Release of Park Land Request - Legal Advice C.R.S. 24-6-402(4)(b) (15 minutes)
- Red Rocks Center Application for Disconnect - Legal Advice C.R.S. 24-6-402(4)(b) (15 minutes)
- 4105 Youngfield and 14001 W. 32nd Ave. - Legal Advice C.R.S. 24-6-402(4)(b), Direction to Negotiators C.R.S 24-6-402(4)(e) and Property C.R.S. 24-6-402(4)(a) (20 minutes)
- Litigation Update - Legal Advice C.R.S. 24-6-402(4)(b) (45 minutes)

Jefferson County does not discriminate on the basis of race, color, national origin, sex, religion, age or disability in the provision of services. Disabled persons requiring reasonable accommodation to attend or participate in a County service, program or activity should call 271-5000 or TDD 271-8071. We appreciate a minimum of 24 hours advance notice so arrangements can be made to provide the requested auxiliary aid.

TUESDAY STAFF BRIEFINGS

December 6, 2016

Briefing Items			Total Estimated Time: 1 hour 35 minutes
Begin	End	Agenda No.	Title
10:30	10:45	1.	Jefferson County Multi-Hazard Mitigation Plan 2016 Update
10:45	11:00	2.	Children, Youth and Family Request for Renewal of Limited Status Positions
11:00	11:20	3.	Board of Adjustment - Zoning Resolution, Policy and Bylaws
11:20	11:50	4.	Foothills Park and Recreation District - Release of Park Land Request
11:50	12:05	5.	Agreement Regarding Design and Construction of Drainage and Flood Control Improvements for Lena Gulch - Tributary H at CDOT Infield Upstream of 6 th Avenue, City of Golden, Jefferson County
Commissioners Report			Total Estimated Time: 20 minutes
Begin	End	Agenda No.	Title
12:05	12:25	6.	C-PACE Program
County Manager Report			Total Estimated Time: 15 minutes
Begin	End		Title
12:25	12:40		Discussion - Appointments to Various Boards and Commissions
County Attorney Report			Total Estimated Time: 20 minutes
Begin	End	Agenda No.	Title
12:40	1:00		Red Rocks Centre Application for Disconnect County Surveyor Salary
Executive Session			Total Estimated Time: 1 hour 35 minutes
Begin	End		Title
1:00	1:15		Foothills Park and Recreation District - Release of Park Land Request - Legal Advice C.R.S. 24-6-402(4)(b)
1:15	1:30		Red Rocks Centre Application for Disconnect - Legal Advice C.R.S. 24-6-402(4)(b)
1:30	1:50		4105 Youngfield and 14001 W. 32 nd Ave. - Legal Advice C.R.S. 24-6-402(4)(b), Direction to Negotiators C.R.S 24-6-402(4)(e) and Property C.R.S. 24-6-402(4)(a)(20 minutes)
1:50	2:35		Litigation Update - Legal Advice C.R.S. 24-6-402(4)(b)

BOARD OF COUNTY COMMISSIONERS' (BCC) SCHEDULE

<u>Time*</u>	<u>Topic*</u>
	<u>Monday, December 5, 2016</u>
8:00 a.m.	2017 Pre-Session Legislative Breakfast Three Tomatoes Grille, Fossil Trace Golf Club 3050 Illinois Street, Golden
2:00 p.m.	Historical Commission Joint Meeting Jefferson County Courts & Administration Building 100 Jefferson County Parkway, Westminster Room #1566/1567
	<u>Tuesday, December 6, 2016</u>
7:00 a.m.	LDS Church Leadership Annual Meeting Jefferson County Courts & Administration Building 100 Jefferson County Parkway, BCC Board Room
8:00 a.m.	Public Comment and Public Hearings Jefferson County Courts & Administration Building 100 Jefferson County Parkway, Hearing Room One
Immediately following Public Hearings	Staff Briefings Jefferson County Courts & Administration Building 100 Jefferson County Parkway, BCC Board Room
Immediately following Staff Briefings	Ralph Schell Jefferson County Courts & Administration Building 100 Jefferson County Parkway, BCC Board Room
	<u>Wednesday, December 7, 2016</u>
10:00 a.m.	Stephen Gould Jefferson County Courts & Administration Building 100 Jefferson County Parkway, BCC Board Room
11:30 a.m.	Jeffco EDC Executive Committee City of Lakewood Offices 480 S. Allison Parkway, Cabinet Room
	<u>Thursday, December 8, 2016</u>
7:15 a.m.	Commissioners/Municipalities Breakfast Jefferson County Courts & Administration Building 100 Jefferson County Parkway, Lookout Mountain Room
9:00 a.m.	Elected Officials/Personnel Board Meeting Jefferson County Courts & Administration Building 100 Jefferson County Parkway, BCC Board Room
	<u>Friday, December 9, 2016</u> NO TOPICS SCHEDULED TO DATE

*Emergency Items Or Other County Business For Which Prior Notice Was Not Possible May Be Considered.

BOARD OF COUNTY COMMISSIONERS BRIEFING PAPER

Jefferson County Multi-Hazard Mitigation Plan - 2016 Update

December 6, 2016

 For Information For Discussion/Approval
Prior to Future Hearing For Action

Issue: FEMA Region VIII has completed its review of the Jefferson County Multi-Hazard Mitigation Plan, 2016 Comprehensive Update, and has determined that it meets the requirements established by Title 44 CFR §201.6. FEMA will issue an approval letter upon receipt of the adoption resolutions from the County. The formal adoption of this Plan by the West Metro Fire Protection District Board of Directors is the final step in this updating process. This action signifies their commitment to reducing the impact of disasters throughout the county, and ensures their eligibility to receive federal assistance for on-going mitigation efforts, through FEMA Hazard Mitigation Assistance grant programs (HMA), including Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM), and Flood Mitigation Assistance (FMA). Adoption of this plan also aligns with the planning elements of the National Flood Insurance Program's Community Rating System (CRS) which can lead to lower flood insurance premiums in their communities.

Background: Each year in the United States, disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. Additional expenses to insurance companies and nongovernmental organizations are not reimbursed by tax dollars, making the costs of disasters several times higher than calculated amounts. However, some types of hazards are predictable, and much of the damage caused by these events can be mitigated through the use of various zoning, construction and permitting vehicles and other preventative actions.

Hazard mitigation planning is the process through which hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies to lessen impacts are determined, prioritized, and implemented. Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of \$4 in avoided future losses in addition to saving lives and preventing injuries.

Jefferson County, including the participating jurisdictions of the cities of Arvada, Edgewater, Golden, Lakewood, and Wheat Ridge; the towns of Lakeside, Morrison, and Mountain View; the fire districts of Evergreen, Indian Hills, Golden Gate, Fairmount North Fork and West Metro; Lookout Mountain Water District, Denver Water and Pleasant View Metropolitan District; and the Jefferson Conservation District have prepared this multi-hazard mitigation plan to better protect the people and property of the County from the effects of hazard events. This plan demonstrates the community's commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. This plan was also developed to position Jefferson County and its participating jurisdictions for the eligibility of certain federal mitigation funding assistance, specifically, the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance grant programs (HMA), which include Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM), and Flood Mitigation Assistance (FMA). This plan also aligns with the planning elements of the National Flood Insurance Program's Community Rating System (CRS) which provides for lower flood insurance premiums in CRS communities.

This plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the *Federal Register* on February 26, 2002 (44 CFR §201.6) and finalized on October 31, 2007. (Hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act or DMA.) While the act emphasized the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations established the requirements that local hazard mitigation plans must meet in order for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). Because the Jefferson County planning area is subject to many kinds of hazards, access to these programs is vital.

Discussion: This plan is a comprehensive update to the plan which was developed in 2010, and documents Jefferson County's hazard mitigation planning process, identifies relevant hazards and risks, and identifies the strategy the County and participating jurisdictions will use to decrease vulnerability and increase resiliency and sustainability. Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to the community and its property owners by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruption. The Jefferson County planning area has been affected by hazards in the past and is thus committed to reducing future disaster impacts and maintaining eligibility for federal funding.

Fiscal Impact: Development of this plan was subsidized through a Hazard Mitigation Grant Program (HMPG) matching grant. Any additional expenditure would be associated with undertaking specific mitigation projects, and would need to be budgeted accordingly.

Recommendation: The formal adoption of the plan is the final step in this project. The Jefferson County Board of Commissioners, and the other nineteen of the participating agency's governing bodies, need to adopt this plan for it to be implemented. This action signifies their commitment to reducing the impact of disasters throughout the county, and ensures their eligibility to receive federal assistance for on-going mitigation efforts, through FEMA Hazard Mitigation Assistance grant programs (HMA), including Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM), and Flood Mitigation Assistance (FMA). Adoption of this plan also aligns with the planning elements of the National Flood Insurance Program's Community Rating System (CRS) which can lead to lower flood insurance premiums in their communities.

Originator: Brian Daley, Emergency Management (303) 271-4901

Contacts for Additional Information:

Jefferson County Multi-Hazard Mitigation Plan

Comprehensive Update
April 2016





EXECUTIVE SUMMARY

Plan Overview

Each year in the United States, disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters, as additional expenses to insurance companies and nongovernmental organizations are not reimbursed by tax dollars. Many disasters are predictable, and much of the damage caused by these events can be alleviated or even eliminated.

Jefferson County's Multi-Hazard Mitigation Plan is an effort to reduce the impacts of natural hazards on citizens and property in Jefferson County by outlining actions that will mitigate the hazards' effects and break the cycle of repetitive disaster losses. Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." Hazard mitigation planning is the process through which hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies to lessen impacts are determined, prioritized, and implemented. The Jefferson County Multi-Hazard Mitigation Plan documents Jefferson County's hazard mitigation planning process, identifies relevant hazards and risks, and outlines the strategy the County and participating jurisdictions will use to decrease hazard vulnerability and increase resiliency and sustainability.

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to the community and its property owners by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruption. The Jefferson County planning area has been affected by hazards in the past and is thus committed to reducing future disaster impacts and maintaining eligibility for federal funding.



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Annex P – Indian Hills Fire Protection District
Annex Q – Evergreen Fire Protection District
Annex R – West Metro Fire Protection District



1 INTRODUCTION

1.1 Purpose

Jefferson County, including the participating jurisdictions of the cities of Arvada, Edgewater, Golden, Lakewood, and Wheat Ridge; the towns of Lakeside, Morrison, and Mountain View; the fire districts of Evergreen, Indian Hills, Golden Gate, Fairmount North Fork and West Metro; Lookout Mountain Water District, Denver Water and Pleasant View Metropolitan District; and the Jefferson Conservation District have prepared this multi-hazard mitigation plan to better protect the people and property of the County from the effects of hazard events. This plan demonstrates the community's commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. This plan was also developed to position Jefferson County and its participating jurisdictions for the eligibility of certain federal mitigation funding assistance, specifically, the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance grant programs (HMA), which include Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM), and Flood Mitigation Assistance (FMA). This plan also aligns with the planning elements of the National Flood Insurance Program's Community Rating System (CRS) which provides for lower flood insurance premiums in CRS communities.

1.2 Background and Scope

Each year in the United States, disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. Additional expenses to insurance companies and nongovernmental organizations are not reimbursed by tax dollars, making the costs of disasters several times higher than calculated amounts. However, some types of hazards are predictable, and much of the damage caused by these events can be mitigated through the use of various zoning, construction and permitting vehicles and other preventative actions.

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spent on mitigation saves society an average of \$4 in avoided future losses in addition to saving lives and preventing injuries.¹

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¹ National Institute of Building Science Multi-Hazard Mitigation Council, 2011

1.3 Plan Organization

The Jefferson County Multi-Hazard Mitigation Plan is organized in alignment with the DMA planning requirements and the FEMA plan review crosswalk, as follows:

- Chapter 2: Community Profile
- Chapter 3: Planning Process
- Chapter 4: Risk Assessment
- Chapter 5: Mitigation Strategy
- Chapter 6: Plan Adoption
- Chapter 7: Plan Implementation and Maintenance
- Annexes
- Appendices

Jurisdictional Annexes

Each jurisdiction participating in this plan developed its own annex, which provides a more detailed assessment of the jurisdiction's unique risks as well as their mitigation strategy to reduce long-term losses. Each jurisdictional annex contains the following:

- Community profile summarizing geography and climate, history, economy, and population
- Hazard information on location, previous occurrences, probability of future occurrences, and magnitude/severity for geographically specific hazards
- Hazard map(s) at an appropriate scale for the jurisdiction, if available
- Number and value of buildings, critical facilities, and other community assets located in hazard areas, if available
- Vulnerability information in terms of future growth and development in hazard areas
- A capability assessment describing existing regulatory, administrative, technical, and fiscal resources and tools as well as outreach efforts and partnerships and past mitigation projects
- Mitigation actions specific to the jurisdiction



2 COMMUNITY PROFILE

2.1 Geography and Climate

Situated in the north-central part of Colorado, west of the City of Denver, Jefferson County is split between foothills on the west and plains on the east. In addition, the county may be divided into north and south characterizations. The majority of the population is located in the northern portion of the county, while the southern portion is dominated by Pike National Forest. The county is 773 square miles in size, and 655 square miles are unincorporated areas.² The ecologies located in the county include prairies, forests, and tundra environments. This area includes a significant interfacing between development and forest areas, which increases the wildfire risks in those regions. The land is divided approximately 70% mountains and 30% plains, with about 23% of the land use devoted to national forest land.³ Jefferson County is home to three state parks. Golden Gate Canyon State Park, Staunton State Park and Chatfield State Recreation area offer a variety of activities, trails, boating, and other events. Chatfield State Recreation is also home to the Denver Botanic Gardens at Chatfield⁴. In addition to the national forest state parks, the county has a robust network of open space parks (Jefferson County Open Space, or JCOS) with 28 regional park units⁵. Jefferson County is marked by some distinctive geologic features. The hogback formations, which are rock formations that rise sharply just at the base of the foothills and provide a steep valley between the formation and the formal foothill regions, are unique in appearance and easily identified by travelers. One of the most notable elements of the hogback is the Dinosaur Ridge foundation, where fossils and dinosaur tracks are easily accessible.⁶ Other notable geologic features include Green Mountain, North and South Table Mountains and Red Rocks Amphitheater and Park.⁷ Several large reservoirs are located in the County as well, including, Arvada, Chatfield, Bear Creek, Ralston; as well as Marston, Bow Mar, Sloan, and Standley Lake. The site of the former Rocky Flats facility is also located in the county, and is now a National Wildlife Refuge (US Fish and Wildlife Service). Jefferson County's climate is fairly temperate but demonstrates four distinct seasons. The average temperature in July (the hottest month) is 74°F and in January (the coldest month) is 30°F. The county averages 15.4 inches of precipitation and 60.3 inches of snow.⁸ There are periods of extreme temperature variations, but they are generally accompanied by other climactic considerations such as drought or winter storms. Basemaps of Jefferson County are shown Figure 2.1 and Figure 2.2.

² http://www.co.jefferson.co.us/jeffco/planning_uploads/demographics/at_a_glance.pdf

³ <http://www.co.jefferson.co.us/aboutjeffco.htm>

⁴ <http://www.botanicgardens.org/content/our-gardens-chatfield-location>

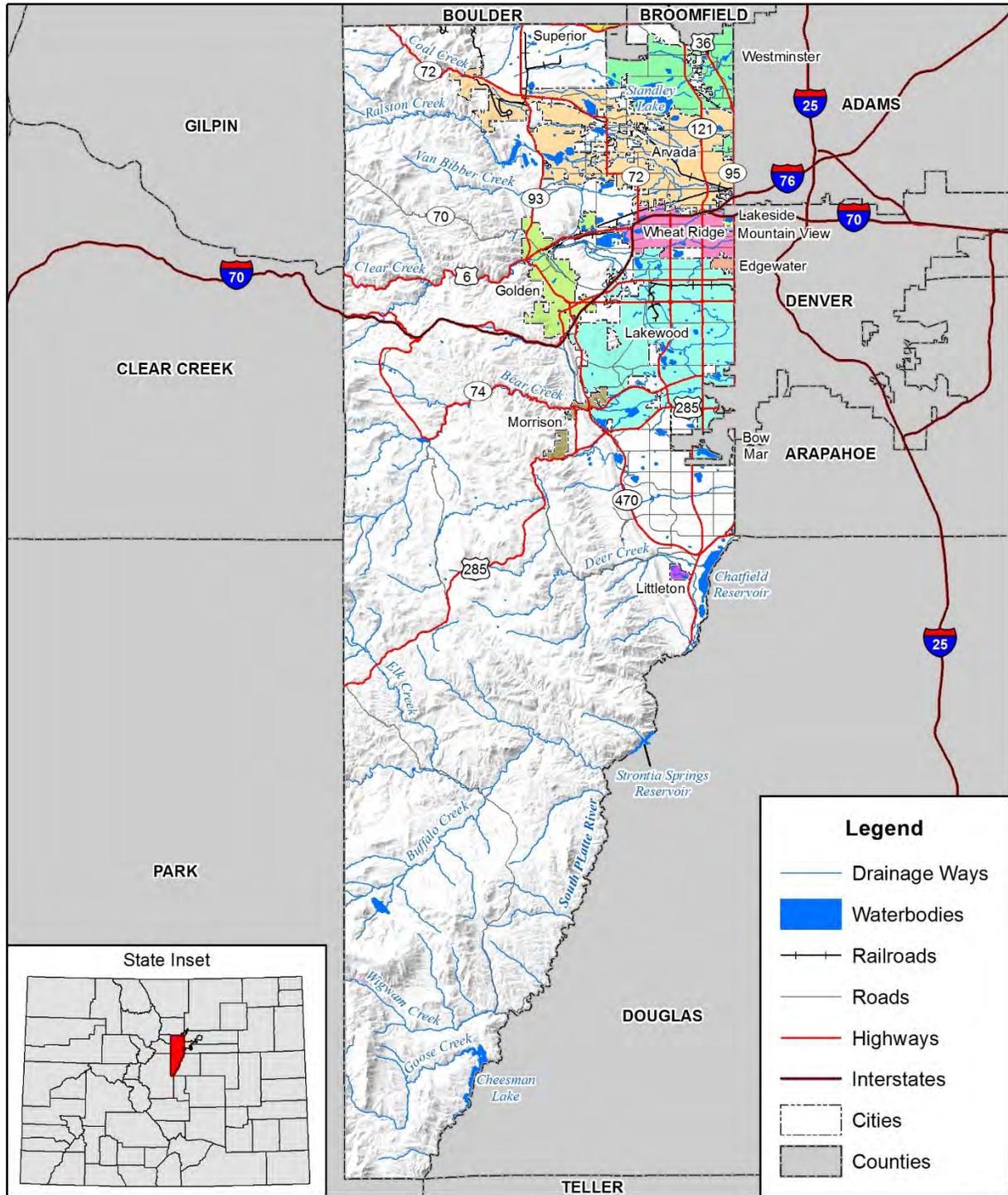
⁵ <http://jeffco.us/open-space/parks/>

⁶ <http://parks.state.co.us/NaturalResources/CNAP/NaturalAreasInfo/AlphabeticalListing/DakotaHogback.htm>

⁷ http://www.cliffshade.com/colorado/dakota_hogback/

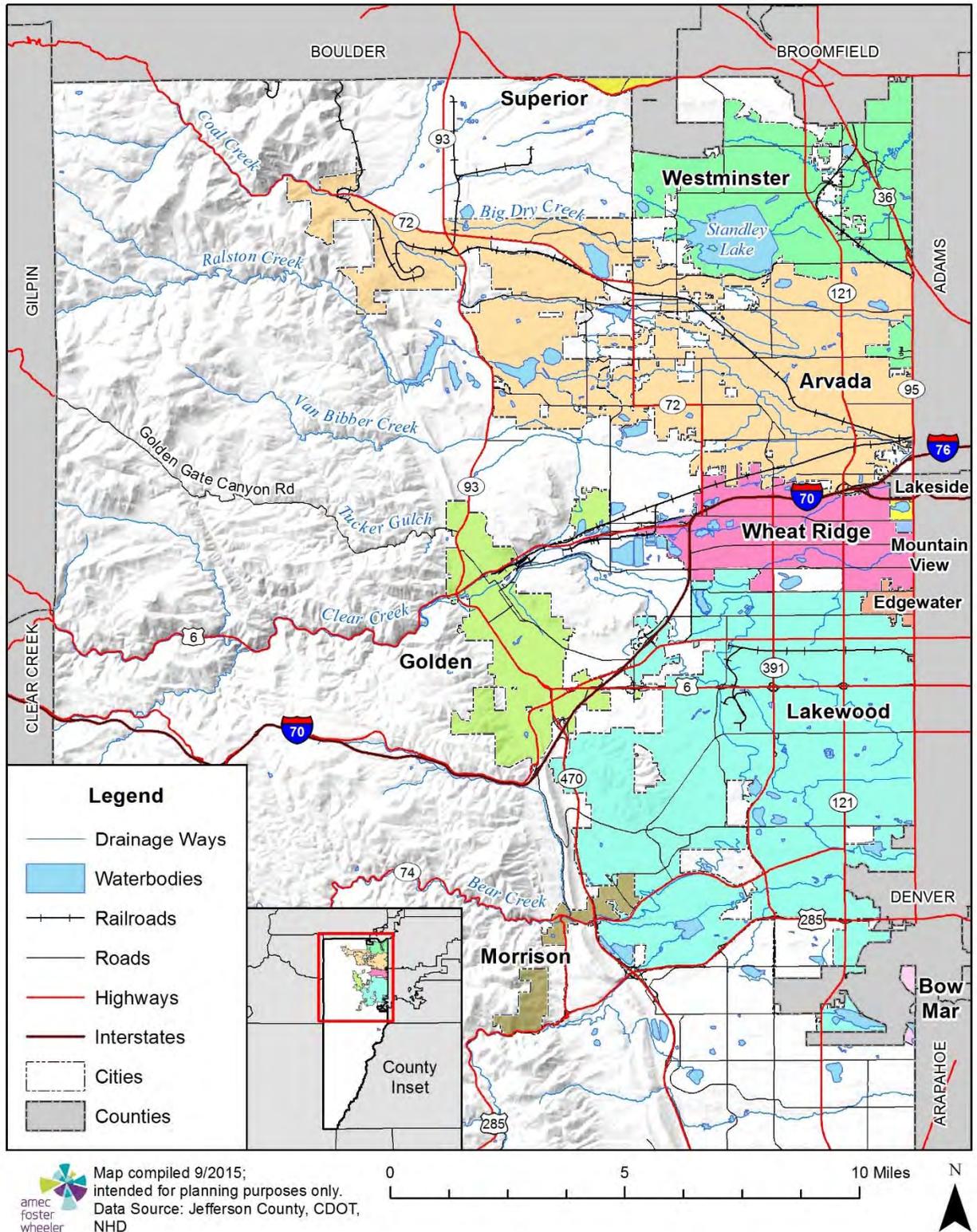
⁸ <http://www.co.jefferson.co.us/aboutjeffco.htm>

Figure 2.1 Jefferson County Base Map




 Map compiled 9/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD

Figure 2.2 Jefferson County Base Map North Section



2.2 Population

Jefferson County has grown by an estimated 38,817 residents since the 2000 U.S. Census, totaling 565,535 people in 2015. This equals an average yearly growth rate of 0.5% for this 15 year period. The majority of the population resides in the unincorporated areas of the county and the cities of Westminster, Lakewood, Arvada and Littleton. Population estimates for 2010 (the year of the last Census) and 2014 are provided in Table 2.1.

In the period between 2009 and 2015, the County has improved a total of 4,726 parcels adding 5,057 buildings with the majority of this growth happening in Arvada, Lakewood and the unincorporated parts of the County. See Table 2.2.

Table 2.1 Jefferson County Population

Jurisdiction	2010 Population (est.)	2014 Population (est.)	% Change 2010 to 2014
Arvada	106,474	113,574	6.67%
Edgewater	5,159	5,289	2.5%
Golden	18,905	20,201	6.86%
Lakeside	8	N/A	N/A
Lakewood	142,995	149,643	4.65%
Morrison	428	N/A	N/A
Mountain View	507	N/A	N/A
Pleasant View	4,196	N/A	N/A
Wheat Ridge	30,192	31,034	2.79%
Total	534,583	558,503	4.47%

Source: Quickfacts.census.gov

Table 2.2 Jefferson County Recently Built 2009 to 2015

Jurisdiction	Improved Parcels	Building Count
Arvada	2,016	2,178
Edgewater	10	9
Golden	130	151
Lakeside	3	2
Lakewood	1,017	1,017
Morrison	2	0
Mountain View	2	2
Wheat Ridge	73	78
Unincorporated	1,473	1,620
Total	4,726	5,057

Source: Jefferson County Assessor's data, 2015

Select Census and American Community Survey demographic and social characteristics for Jefferson County are shown in Table 2.3. Characteristics for Jefferson County are for the entire County.

Table 2.3 Jefferson County Demographic and Social Characteristics, 2010-2013

Characteristic	Jefferson County	Arvada	Edgewater	Golden	Lakeside*	Lakewood	Morrison*	Mountain View*	Pleasant View*	Wheat Ridge
Male (%)	49.7	48.8	48.5	56.6	75	48.9	44.4	49.5	55.7	48.6
Female (%)	50.3	51.2	51.5	43.4	25	51.1	55.6	50.5	44.3	51.4
Under 5 yrs. (%)	5.3	5.9	8.1	4.8	0	6	2.6	3.7	5.5	5.4
65 yrs. and over (%)	14.2	13.9	9.8	10	12.5	14.5	42.5	5.1	9.1	18.6
Foreign born (%)	6.2	4.9	9.0	7.5	N/A	8.2	N/A	N/A	N/A	6.2
Speak language other than English at home (%)	10.3	8.4	19.3	10.7	N/A	14.2	N/A	N/A	N/A	10.7
Average household size	2.42	2.5	2.11	2.28	1.0	2.29	2.07	1.97	2.35	2.16
High school graduate or higher (%)	93.7	93.6	87.9	94.5	N/A	91.1	N/A	N/A	N/A	88.8

Source: US Census and American Community Survey.

* Only 2010 Census data available

2.3 History

Jefferson County has a history rich in people, events and progress. Taking the name of the third U.S. president Thomas Jefferson, the county was formally organized in 1861 by the Colorado Territorial Legislature. The need for an organized local government began in the late 1850s when droves of gold-seeking settlers came west. In 1858, when gold was discovered in the Rocky Mountains, there were fewer than 200 settlers in the area. An influx of nearly 35,000 people arrived two years later, lured by the glitter of gold. The first provisional governor of Jefferson Territory was Robert W. Steele, who lived at Mount Vernon. County offices were located in Loveland Hall until 1877 when the first Jefferson County Courthouse was built. Commissioners in 1862 were paid \$3 per day for their meetings plus mileage to the meeting hall. The City of Golden served as the capital for the Colorado Territory from 1862 to 1867.⁹

The county tax was 6 mills and the school tax was 2.5 mills in 1862. County taxes for that year amounted to \$1,594.61. By comparison, in 1996 Jefferson County's mill levy was 25.584 and property taxes alone exceeded \$96,000,000. In the early years, farmers and ranchers thrived by supplying food and supplies to the mining towns scattered throughout the mountains. Mining occurred along the Hogback in Idledale, on Lookout Mountain, and in Genesee.¹⁰

Contemporary elements within the County include a variety of industries. Some of these are aerospace engineering from companies such as Lockheed Martin, environmental engineering from Ball Corp., the Coors brewery, the Colorado School of Mines, local grocery chains such as King Soopers, and numerous private, locally owned, or large corporate businesses. Many of these, such as the School of Mines and Coors Brewery, were established in the late 1800s and are nearly as old as the territory itself. Dinosaur Ridge, where fossils were first discovered in 1877, remains a prominent and archaeologically significant resource. Mount Olivet Cemetery, which opened in 1892 and was called "The New City of the Dead" remains one of the largest cemeteries in Colorado and is still active.

2.4 Economy

As of 2015, the top employers in the county are¹¹:

- Lockheed Martin 4,875 employees
- MillerCoors Brewing 2,800 employees
- St Anthony Hospital 2,800 employees
- Lutheran Medical Center 2,500 employees
- Terumo BCT 2,035 employees

⁹ Jefferson County Archives and Records Website. http://www.co.jefferson.co.us/archives/archives_T77_R66.htm

¹⁰ Jefferson County website. http://www.co.jefferson.co.us/archives/archives_T77_R8.htm

¹¹ Jefferson County Economic Profile, EDC: <http://www.jeffcoedc.org/pdfs/2015Profile.pdf>

- National Renewable Energy Lab (USDOE) 1,720 employees
- CoorsTek 1,300 employees
- Ball Corporation 1,220 employees
- FirstBank 1,190 employees
- HomeAdvisor 790 employees

Select economic characteristics for Jefferson County from the 2012-2013 American Community Estimates and 2010 Census are shown in Table 2.4. Characteristics for Jefferson County are for the entire County.

Table 2.4 Jefferson County Economic Characteristics

Characteristic	Jefferson County	Arvada	Edgewater*	Golden	Lakeside*	Lakewood	Morrison*	Mountain View*	Pleasant View*	Wheat Ridge
Individuals below poverty level (%)	8.6	8.5	N/A	15.5	N/A	12.8	N/A	N/A	N/A	14.1
Median home value (\$)	\$262,400	\$242,700	N/A	\$353,600	N/A	\$238,500	N/A	N/A	N/A	\$237,500
Median household income (\$)	\$68,984	\$68,210	N/A	\$57,883	N/A	\$56,492	N/A	N/A	N/A	\$48,063
Per capita income (\$)	\$36,087	\$33,204	N/A	\$35,465	N/A	\$31,094	N/A	N/A	N/A	\$30,647
Homeownership rate (%)	70.6	73.3	43.3	56.4	12.5	58.7	63.2	62	56.4	55.2
Unemployment rate (%)	3.4	5.4	N/A	4.8	N/A	6.2	N/A	N/A	N/A	6.3

Source: US Census and American Community Survey

* Only 2010 Census data available



3 PLANNING PROCESS

Requirements §201.6(b) and §201.6(c)(1) of the 2000 Disaster Mitigation Act (DMA): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

- 1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;**
- 2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and**
- 3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.**

The plan shall document the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

3.1 Background on Mitigation Planning in Jefferson County

Jefferson County has been involved in DMA compliant hazard mitigation planning since 2003. The Denver Regional Council of Governments was one of the first governmental entities in FEMA Region VIII to pursue a regional Mitigation Plan in 2003, which included Jefferson County and the cities of Arvada, Lakewood, and Wheat Ridge. Jefferson County, including the participating jurisdictions noted previously, had the choice to continue to be a participant in the 2009-2010 update of the Denver Regional Council of Governments (DRCOG) Natural Hazard Mitigation Plan or develop a separate more detailed Jefferson County specific multi-jurisdictional mitigation plan. The County and the participating jurisdictions chose to separate out from the DRCOG Region plan in order to develop a more specific risk assessment, goals, objectives, and action items. In addition to the four jurisdictions that participated in the original DRCOG plan, ten additional jurisdictions were included in the planning process in 2009-2010. Thus the 2010 plan was tailored to be a more specific countywide plan. In 2015-2016 the plan underwent a comprehensive five year update as required by the DMA.

The 2016 planning process and development of this plan was formally initiated in August of 2015 under the coordination of the Jefferson County Office of Emergency Management. Prior to that funding was secured through the Hazard Mitigation Grant Program administered by FEMA to enable a consultant to be hired to facilitate the process and develop the plan. Amec Foster Wheeler Environment and Infrastructure (Hazard Mitigation and Emergency Management program, Boulder Colorado) contracted with the County to provide professional planning services. As a component of the grant application process letters of commitment were solicited from jurisdictions willing to be part of the 2015-2016 update.

Jefferson County and its communities has been an integral constituent in nurturing partnerships across boundaries for decades. This proactive approach established the County as a leader to the Front Range communities for hazard mitigation and overall emergency management program planning. This plan builds from the accumulated efforts of previous planning mechanisms that clearly align with the planning regulations set forth by the Disaster Mitigation Act of 2000 (DMA).

3.2 What's New in the Plan Update

Requirements §201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

This HMP update involved a comprehensive review and update of each section of the 2010 plan and includes an assessment of the progress of the participating communities in evaluating, monitoring and implementing the mitigation strategy outlined in the initial plan. Only the information and data still valid from the 2010 plan was carried forward as applicable into this HMP update.

Also to be noted, Section 7.0 Plan Implementation of this plan update identifies key requirements for updating future plans including:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Document hazard events and impacts that occurred within the five-year period;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate documentation of continued public involvement;
- Incorporate documentation to update the planning process that may include new or additional stakeholder involvement;
- Incorporate growth and development-related changes to building inventories;
- Incorporate new project recommendations or changes in project prioritization;
- Include a public involvement process to receive public comment on the updated plan prior to submitting the updated plan to DHSEM/FEMA; and
- Include re-adoption by all participating entities following DHSEM/FEMA approval.

These requirements and others as detailed throughout this plan were addressed during the 2015-2016 plan update process.

Plan Section Review and Analysis – 2016 Update

During the 2015-2016 plan update, the HMPC updated each of the sections of the previously approved plan to include new information. Amec Foster Wheeler developed a summary of each section in the plan and guided the HMPC through the elements that needed updating during the kickoff meeting in August 2015. This included analyzing each section using FEMA’s local plan update guidance (2013) to ensure that the plan met the latest requirements. The HMPC and Amec Foster Wheeler determined that nearly every section of the plan would need revision to align the plan with the latest FEMA planning guidance and requirements. A summary of the changes in this plan update is highlighted in the table below.

Table 3.1 Jefferson County Hazard Mitigation Plan Update Highlights

Plan Section	Summary of Plan Review, Analysis, and Updates
1. Introduction	Updated language to describe purpose and requirements of the Jefferson County Multi-Hazard Mitigation Plan update process. Identified new participating jurisdictions.
2. Community Profile	Updated with recent census data and current economy description
3. Planning Process	Described and document the planning process for the update, including coordination among agencies Described how 2010 plan was integrated with/into other planning efforts. Removes 2010 planning process info. Describes any changes in participation in detail. Described 2015-16 public participation process.
4. Risk Assessment	Revisited former hazards list for possible modifications. Reviewed hazards from the 2013 Colorado State Hazard Mitigation Plan (CSHMP) for consistency. Updated list of disaster declarations to include recent data. Updated NCDRC tables to include recent data. Updated past occurrences for each hazard to include recent data. Updated critical facilities identified from the 2010 plan. Updated growth and development trends to include recent Census and local data sources. Updated historic and cultural resources using local/state/national sources. Updated property values for vulnerability and exposure analysis, using updated building information based on assessor’s data. Updated estimate flood losses using the latest Jefferson County Digital Flood Insurance Rate Map (DFIRM) and assessor’s data. Updated National Flood Insurance Program (NFIP) data and Repetitive Loss structure data from the previous plan. Incorporated new hazard loss estimates since 2010, as applicable. Used new GIS data to assess wildfire threat to the County Updated HAZUS-MH Level I earthquake vulnerability analysis data with study conducted by the Colorado Geological Survey. Updated information regarding specific vulnerabilities to hazards, including maps and tables of specific assets at risk, specific critical facilities at risk, and specific populations at risk. Created risk summaries for each jurisdiction Updated maps in plan where appropriate. Reviewed mitigation capabilities and update to reflect current capabilities.

Plan Section	Summary of Plan Review, Analysis, and Updates
5. Mitigation Strategy	<p>Indicated what projects have been implemented that may reduce previously identified vulnerabilities.</p> <p>Updated Chapter 5 based on the results of the updated risk assessment, complete mitigation actions, and implementation obstacles and opportunities since the completion of the 2010 plan.</p> <p>Reviewed and updated goals and objectives based on HMPC input.</p> <p>Revised to include more information on the Community Rating System (CRS) categories of mitigation measures (structural projects, natural resource protection, emergency services, etc.) and how they are reviewed when considering the options for mitigation.</p> <p>Included updated information on how actions are prioritized.</p> <p>Reviewed mitigation actions from the 2010 plan and develop a status report for each; identified if actions have been completed, deleted, or deferred/carried forward. Updated priorities on actions.</p> <p>Identified examples of successful implementation to highlight positive movement on actions identified in 2010 plan.</p> <p>Identified and detailed new mitigation actions proposed by the HMPC.</p>
6. Plan Adoption	Plan will be re-adopted as part of the update process
7. Plan Maintenance	<p>Reviewed and updated procedures for monitoring, evaluating, and updating the plan.</p> <p>Revised to reflect current methods.</p> <p>Updated the system for monitoring progress of mitigation activities by identifying additional criteria for plan monitoring and maintenance.</p>
Jurisdictional Annexes	<p>Developed annexes for new participating jurisdictions in 2015-2016.</p> <p>Updated previous participants' annexes with recent Census data.</p> <p>Updated past event history and hazard loss estimates.</p> <p>Added new maps and updated old maps as needed.</p> <p>Updated mitigation actions from 2010 and added new mitigation actions.</p>
Appendices	<p>Updated references.</p> <p>Updated planning process documentation.</p> <p>Updated mitigation alternatives analyzed in the process.</p> <p>Public participation plan updated</p> <p>Plan Adoption.</p>

3.3 Local Government Participation

In the 2015-2016 plan update the following communities and jurisdictions participated in the process:

Lead Jurisdiction

- Jefferson County

Municipalities

- Arvada
- Edgewater
- Golden
- Lakewood
- Wheat Ridge
- Lakeside
- Morrison
- Mountain View

Special Districts

- Evergreen Fire Protection District
- Indian Hills Fire Protection District
- North Fork Fire Protection District
- Lookout Mountain Water District,
- Denver Water
- Jefferson Conservation District
- Pleasant View Metropolitan District.

The following entities were added as new participating jurisdictions in the 2015-2016 plan update:

- Denver Water
- West Metro Fire Protection District
- Golden Gate Fire Protection District
- Fairmount Fire Protection District

The Town of Bow Mar elected not to participate in the Jefferson County multi-jurisdictional planning process. The City of Westminster has its own hazard mitigation plan and did not participate in the Jefferson County multi-jurisdictional planning process since the City lies within both Jefferson and Adams County. The Town of Superior has a portion of their Town in Jefferson County but opted to participate in the Boulder County Hazard Mitigation Plan. The City of Littleton also has a small area in Jefferson County but participated in the Arapahoe County Multi-Hazard Mitigation Plan update.

The DMA planning regulations and guidance requires each local government seeking FEMA approval of its mitigation plan must participate in a planning process effort in the following ways:

- Participate in the process as part of the Hazard Mitigation Planning Committee (HMPC),
- Differentiate geographical locations or jurisdictions within the planning area where the hazard risk differs from that facing the entire planning area,
- Identify mitigation projects, specific to each jurisdictional entity, to be eligible for funding, and
- Engage the governing body for formal adoption of the plan.

For the Jefferson County Multi-Hazard Mitigation Plan’s HMPC, “participation” meant:

- Attending and participating in the HMPC meetings,
- Providing available data requested of the HMPC,
- Reviewing and providing comments on the plan drafts,
- Collecting and providing other requested data (as available);
- Managing administrative details;
- Making decisions on plan process and content;
- Identifying mitigation actions for the plan;
- Reviewing and providing comments on plan drafts; including annexes
- Informing the public, local officials, and other interested parties about the planning process, and providing opportunity for them to comment on the plan;
- Coordinating, and participating in the public input process; and
- Coordinating the formal adoption of the plan by the governing boards.

The County and all jurisdictions with annexes to this plan seeking FEMA approval met all of these participation requirements. In most cases one or more representatives for each jurisdiction attended the HMPC meetings described in **Appendix F** and also brought together a local planning team to help collect data, identify mitigation actions and implementation strategies, and review and provide data on plan drafts. **Appendix F** provides additional information and documentation of the planning process.

3.4 The 10-Step Planning Process

Amec Foster Wheeler established the planning process for Jefferson County’s plan using DMA planning requirements and FEMA’s associated guidance. This guidance is structured around a four-phase process:

- 1) Organize Resources
- 2) Assess Risks
- 3) Develop the Mitigation Plan
- 4) Implement the Plan and Monitor Progress

Into this four-phase process, Amec Foster Wheeler integrated a more detailed 10-step planning process used for FEMA’s Community Rating System (CRS) and Flood Mitigation Assistance programs. Thus, the modified 10-step process used for this plan meets the funding eligibility requirements of the Hazard Mitigation Assistance grants (including Hazard Mitigation Grant Program - HMGP, Pre-Disaster Mitigation program - PDM, Flood Mitigation Assistance - FMA), Community Rating System, and the flood control projects authorized by the U.S. Army Corps of Engineers (USACE). Jefferson County, the City of Arvada, Golden, Lakewood, Wheat Ridge, and the town of Morrison participate in the CRS, and thus could potentially earn planning credits from the development of this plan.

In 2013, FEMA released the “Local Mitigation Planning Handbook” that has become the official guide for local governments to develop, update and implement local mitigation plans. While the requirements under §201.6 have not changed, the Handbook provides guidance to local governments on developing or updating hazard mitigation plans to meet the requirements under the Code of Federal Regulations (CFR) Title 44 – Emergency Management and Assistance §201.6, Local Mitigation Plans for FEMA approval and eligibility to apply for FEMA Hazard Mitigation Assistance grant programs. It also offers practical approaches, tools, worksheets and local mitigation planning examples for how communities can engage in effective planning to reduce long-term risk from natural hazards and disasters. The Handbook complements and liberally references the Local Mitigation Plan Review Guide (October 1, 2011), which is the official guidance for Federal and State officials responsible for reviewing local mitigation plans in a fair and consistent manner.

Table 3.2 shows how the modified 10-step process fits into FEMA’s four-phase process, and how these elements correspond to the tasks in the FEMA “Mitigation Planning Handbook.”

Table 3.2 Jefferson County Hazard Mitigation Planning Process

FEMA's 4-Phase DMA Process	Modified 10-Step CRS Process	FEMA Local Mitigation Planning Handbook Tasks
<i>1) Organize Resources</i>		
201.6(c)(1)	1) Organize the Planning Effort	1: Determine the planning area and resources
201.6(b)(1)	2) Involve the Public	2: Build the planning team - 44 CFR 201.6 (C)(1)
201.6(b)(2) and (3)	3) Coordinate with Other Departments and Agencies	3: Create an outreach strategy - 44 CFR 201.6(b)(1)
		4: Review community capabilities - 44 CFR 201.6 (b)(2)&(3)
<i>2) Assess Risks</i>		
201.6(c)(2)(i)	4) Identify the Hazards	5: Conduct a risk assessment - 44 CFR 201.6 (C)(2)(i) 44 CFR 201.6(C)(2)(ii)&(iii)
201.6(c)(2)(ii)	5) Assess the Risks	
<i>3) Develop the Mitigation Plan</i>		
201.6(c)(3)(i)	6) Set Goals	6: Develop a mitigation strategy - 44 CFR 201.6(c)(3)(i); 44 CFR 201(c)(3)(ii) and 44 CFR 201.6(c)(3)(iii)
201.6(c)(3)(ii)	7) Review Possible Activities	
201.6(c)(3)(iii)	8) Draft an Action Plan	
<i>4) Implement the Plan and Monitor Progress</i>		
201.6(c)(5)	9) Adopt the Plan	7: Review and adopt the plan
201.6(c)(4)	10) Implement, Evaluate, and Revise the Plan	8: Keep the plan current
		9: Create a safe and resilient community - 44 CFR 201.6(c)(4)

3.4.1 Phase 1: Organize Resources

Planning Step 1: Organize the Planning Effort

The Jefferson County Sheriff's Office of Emergency Management (OEM) worked to establish the framework and organization for the development of the plan update. This process began with the FEMA planning grant application in August of 2014. Participating jurisdictions indicated their commitment to participate as evidenced by executing a letter of commitment as a component of the FEMA planning grant. Award of the grant in April of 2015 allowed the planning consultant, Amec Foster Wheeler, to be procured through a competitive bid process.

Amec Foster Wheeler worked with the County to get organized for the plan update. Organizational efforts were initiated with the County and participating jurisdictions in July 2015 to inform and educate the plan participants of the purpose and need for updating the countywide hazard mitigation plan. An initial meeting between Amec Foster Wheeler and County OEM was held to discuss the organizational aspects of this plan update process. Invitations to the kickoff meeting for this plan update were extended to key County departments, the eight incorporated communities, and representatives from special districts for the County and municipalities, as well as to other federal, state, and local stakeholders that might have an interest in participating in the planning process. Representatives from participating jurisdictions and HMPC members to the 2010 plan were used as a starting point for the invite list, with additional invitations extended as appropriate throughout the planning process. The list of initial invitees is included in **Appendix B**.

Key stakeholders were identified including representatives from the various county departments, each municipal jurisdiction, and other state and local government agencies. An email was sent from County OEM to describe the upcoming mitigation planning efforts and invite potential members to participate in a kickoff meeting where the HMPC would be formally organized. Suggested representation from each municipality included city/town manager, emergency manager, floodplain manager, public works/engineering, building department and fire department/district representative. Table 3.3 lists the HMPC participants and their respective jurisdiction in the development of the plan. Other stakeholders that participated in the planning process are discussed under Planning Step 3: Coordinate with Other Departments and Agencies.

Hazard Mitigation Planning Committee

The HMPC was re-established as a result of this initial effort, as well as through interest generated during outreach conducted during the project. The HMPC, comprising key County, city, special district, and other government and stakeholder representatives, developed the plan with leadership from the County OEM and facilitation by Amec Foster Wheeler. Each participating jurisdiction seeking FEMA approval of the plan had representation on the HMPC. In addition to representation by participating jurisdictions, the HMPC also included other agency

and public stakeholders with an interest in hazard mitigation. The following participated on the HMPC:

Table 3.3 Jefferson County Hazard Mitigation Planning Committee Framework

Jurisdiction	Departments Represented
Jefferson County	Sheriff's Office - Emergency Management Assessor Building Safety County Administration County Commissioners Finance and Information Technology - GIS Open Space Planning & Zoning Services Road and Bridge Transportation and Engineering
Municipalities	
Arvada	Emergency Management Utilities
Edgewater	Community Services
Golden	Police Department Public Works
Lakeside	Mayor
Lakewood	Emergency Management Public Works
Morrison	Town Administration Police Floodplain Manager
Mountain View	Mayor
Wheat Ridge	Public Works Police
Special Districts	
Denver Water	Emergency Management
Evergreen Fire Protection District	District Management
Fairmount Fire Protection District	District Management
Golden Gate Fire Protection District	District Management
Indian Hills Fire Protection District	District Management
Jefferson Conservation District	District Management
Lookout Mountain Water District	District Management
North Fork Fire Protection District	District Management
Pleasant View Metropolitan District	District Management
West Metro Fire Protection District	District Management

The makeup of representatives from various County departments was structured to ensure there was expertise with six mitigation categories as defined by the CRS. The following table indicates the department and area of mitigation expertise.

Table 3.4 Department Expertise with Mitigation Categories

Department	Prevention	Property Protection	Public Education and Awareness	Natural Resource Protection	Critical Facilities Protection	Structural Projects
Jefferson County Planning and Zoning	X	X				
Jefferson County Sherriff's Office		X	X			
Jefferson County Open Space	X	X	X	X		
Jefferson County Transportation and Engineering					X	X
Jefferson County Road and Bridge				X	X	X
Jefferson County Assessor's Office	X					
Jefferson County Building Safety	X	X	X		X	X
Jefferson County Information Technology	X					
Jefferson County Public Health			X			

In addition to Table 3.2 a list of participating HMPC representatives for each jurisdiction is included in **Appendix B** by name and title. Each jurisdiction also utilized the support of many other staff in order to collect and provide requested data and to conduct timely reviews of the draft documents. Additional personnel supporting the plan update efforts for each jurisdiction are identified in the jurisdictional annexes to this plan. This accomplishes tasks one (1) and two (2) in the FEMA Local Mitigation Planning Handbook.

The participation of the HMPC is documented by their attendance in the planning meetings held, in meeting summaries recorded, by participation in conference calls, by email and phone conversation notes, and tracking of time for in-kind grant match purposes. Four specific planning meetings were held during the plan development phase between August 2015 and

January 2016. The meeting schedule and topics are listed in Table 3.5. The Kickoff Meeting was held at the West Metro Fire Training Center (3535 S. Kipling St, Lakewood, CO). Sign-in sheets and agendas for each of the meetings can be viewed in **Appendix F**. In addition to the HMPC meetings noted the participating jurisdictions held internal meetings to discuss and provide input to the planning effort. Other sidebar meetings included a discussion with Amec Foster Wheeler project staff and the County Emergency Manager and Sheriff’s Office Fire Management Officer on the wildfire vulnerability assessment on October 27th, 2015.

Table 3.5 Schedule of HMPC Meetings

Meeting Type	Meeting Topic	Meeting Date(s)	Meeting Location(s)
HMPC #1 Kick-off Meeting	1) Introduction to DMA and the planning process 2) Overview of current HMP; 3) Organize Resources: the role of the HMPC, planning for public involvement, coordinating with other agencies/stakeholders 4) Introduction to Hazard Identification	August 25, 2015	West Metro Fire Training Facility, Lakewood, CO
HMPC #2 Risk Assessment	1) Risk assessment overview and work session 2) Development of mitigation goals and objectives;	November 10, 2015	West Metro Fire Training Facility, Lakewood, CO
HMPC #3 Goals	1) Development of mitigation goals	November 10, 2015	West Metro Fire Training Facility, Lakewood, CO
HMPC #4 Mitigation Strategy	1) Finalization of mitigation goals and objectives; Development of mitigation action strategy and review of alternatives.	January 7, 2016	West Metro Fire Training Facility, Lakewood, CO

The planning process officially began with a kick-off meeting held at the West Metro Fire District training facility, on August 25, 2015. The kickoff meeting was designed to bring stakeholders together with the intent of developing a Hazard Mitigation Planning Committee who will take responsibility for developing a mitigation plan specific to their jurisdictions, to present information on the scope and purpose of a mitigation plan, what the participation requirements of the HMPC members are, and the proposed project work plan and schedule. A plan for public involvement (CRS Step 2) and coordination with other agencies and departments (CRS Step 3) were discussed. The hazard identification for the county and its municipalities was discussed at this meeting. An Amec Foster Wheeler data collection tool was presented and distributed as a guide for the collection of pertinent initial information and data needed to support the first phases of plan development, particularly for those jurisdictions that were new to the plan. The participating jurisdictions from the 2010 planning effort were asked to review their respective jurisdictional annex and return updated information in an edited working draft of the annex. Each participating jurisdiction was responsible for returning information on historic hazard events, at risk locations, vulnerabilities, mitigation capabilities and an update on existing

planning mechanisms that could be leveraged to strengthen mitigation capabilities or foster plan implementation. This helps accomplish task four (4) in the FEMA Local Mitigation Planning Handbook.

Planning Step 2: Involve the Public

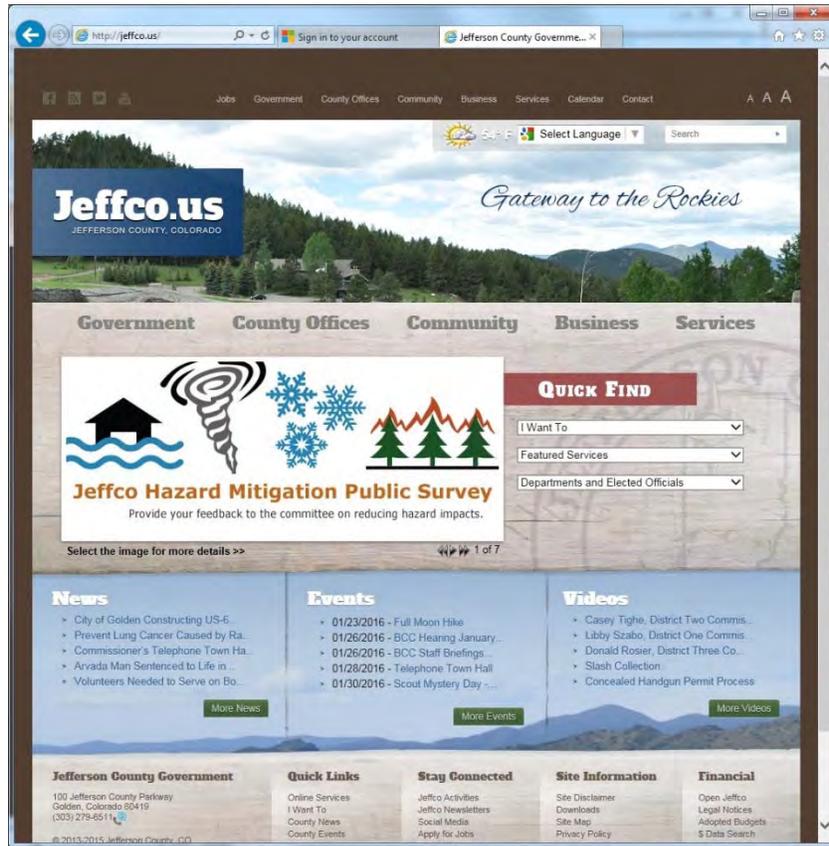
Involving the public assures support from the community at large and is a part of the planning process. A Public Participation Plan (PPP) was developed in 2010 as an appendix to the plan (**Appendix E**). The PPP captures ideas for ways the public could be involved in the process, as suggested by HMPC members at the kick off meeting, and outlines the public participation strategy. The public participation strategy relies upon several input tools for different circumstances to gather public input. This appendix was updated in 2015 with public outreach methods and strategies and upcoming opportunities for outreach noted by the HMPC.

At the kickoff meeting, strategies to involve the public were discussed. A number of members of the Committee were eager to explore alternatives to hosting public meetings that may generate little attendance. The group listed a number of current and ongoing public forums and meetings that could be used to raise awareness about the hazard mitigation planning process including: town hall meetings, community plan meetings, the annual Wheat Ridge Flood Forum in March 2016 the Somerset Festival in Clement Park, the Health and Safety Day on the 9th of September, the Evergreen Wildfire Forum, the annual fire fundraiser and the annual fire meeting at the training facility. Television spots (Channel 9) and social media opportunities were also discussed as possibilities. In addition online surveys were discussed as an alternative or supplement to hosting physical meetings.

A public involvement ‘backgrounder’ document (see **Appendix F**) was prepared and presented to the HMPC at the kickoff meeting. The document outlines the FEMA definition of hazard mitigation, explains why hazard mitigation is important, gives some background on hazard mitigation plans and the process of updating the plans, and finally offers information on how the public can become involved in the process. This backgrounder was used as handout at various public meetings and events as a mechanism to outreach and engage the public in the planning process for the update. An example of where this was used was at a community meeting regarding the Conifer/285 Corridor Area Community Plan on September 1, 2015.

During the plan update’s drafting stage, a public survey was developed as a tool to gather public input. The survey was for the public to provide feedback to the Jefferson County multi-jurisdictional Hazard Mitigation Planning Committee on reducing hazard impacts. The survey provided an opportunity for public input during the planning process, prior to finalization of the plan update. The survey is gathered public feedback on concerns about wildfires, floods, winter storms and other hazards and strategies to reduce their impacts. The survey was released on January 12th and closed on February 17, 2016. The HMPC provided links to a public survey by distributing it using social media, email, and posting the link on websites. The Lookout

Mountain Water District attached a hard-copy version of the public input survey to their newsletter and a number of write-in surveys were received.



Hazard Mitigation Planning Survey Link on Jefferson County Home Page

One hundred and fifty seven people filled out the survey online and in hardcopy (which was faxed or scanned and emailed). Results showed that the public perceives the most significant hazards to be wildfire, lightning and severe winter storms. Wildfire fuels treatment projects, evacuation route development and assistance with defensible space projects were cited as the most popular mitigation actions. A summary of the survey data can be found in **Appendix G**.

Following the HMPC review draft a public review draft of the plan was prepared. The public was also given an opportunity to provide input on this draft of the complete plan prior to its submittal to the State and FEMA. The County provided the plan draft for review and comment on the County's emergency management web page (<http://jeffco.us/sheriff/emergencies/emergency-management/hazard-mitigation-plan>). The plan was available at this location from March 18 to April 15, 2016. A copy of the press release is provided in Appendix F, which was advertised through Jefferson County and Wheat Ridge public information channels. An online survey tool was utilized to collect feedback on the plan; one comment was received that concurred that wildfire was a top concern, but would like to see Elk Creek and Inter-Canyon Fire engaged in the process. Another public comment was received

via email outside of the survey related to flood concerns and damages to a homeowners association. The citizen was interested in speaking with a representative of the County on this issue and was referred to the County floodplain manager.

A public meeting occurred during the draft review stage. The meeting was being held as part of the City of Wheat Ridge Floodplain Open House and originally scheduled for March 23, but was postponed to March 31, 2016 due to a blizzard. The meeting went from 5:00 and 6:30 pm at the Wheat Ridge City Council Chambers at 7500 W 29th Ave. The meeting introduced the draft plan to the public, announced the public comment period, and provided a forum for questions and answers. A feedback form was provided but no specific comments were received. There were 13 public attendees, and three HMPC members present and provided additional comments on the draft.

This accomplishes task three (3) in the FEMA Local Mitigation Planning Handbook (Create an outreach strategy).

Planning Step 3: Coordinate with Other Departments and Agencies

Early in the planning process, state, federal, and local agencies and organizations were invited to participate as stakeholders in the process. Stakeholders could participate in various ways, either by contributing input at HMPC meetings, being aware of planning activities through an email group, providing information to support the effort, or reviewing and commenting on the draft plan. Based on their involvement in other hazard mitigation planning efforts, status in the County, and interest as a neighboring jurisdiction, representatives from the following agencies were invited to participate as stakeholders in the process:

- Special Districts
 - JeffCo School District*
 - Urban Drainage and Flood Control District*
 - Evergreen Metropolitan District
 - Foothills Fire Protection District*
- Neighboring county/municipality emergency management and floodplain management
 - Adams County
 - Arapahoe County
 - Boulder County
 - Broomfield County
 - Clear Creek County
 - Denver City and County*
 - Douglas County
 - Gilpin County
 - Park County
 - Westminster, City of
- Denver Regional Council of Governments (DRCOG)

-
- Business and Industry including major private sector employers
 - Xcel Energy*
 - Lockheed Martin*
 - Molson Coors
 - Non profits
 - Coal Creek Canyon Watershed Partnership
 - Coalition for the Upper South Platte
 - Bear Creek Watershed Association
 - Chatfield Watershed Authority
 - Jefferson County Fire Chiefs Association*
 - State Agencies
 - Colorado Division of Homeland Security and Emergency Management*
 - Colorado Water Conservation Board
 - Colorado Department of Parks and Wildlife
 - Colorado State Forest Service
 - Colorado Division of Water Resources – Dam Safety
 - Colorado Department of Transportation (CDOT)*
 - Federal Agencies
 - FEMA Region VIII*
 - National Weather Service
 - US Forest Service
 - United States Geological Survey (USGS)
 - Universities
 - Colorado School of Mines – Colorado Geological Survey

* Participated in HMPC meetings

The majority of the listed stakeholders were invited to participate through an email from the Jefferson County Emergency Manager on August 7, 2015, which included an invitation to the kickoff meeting. A complete list of agencies and persons invited to the kick off meeting, plus the invitation itself, can be referenced in **Appendix B**. Some additional stakeholders were identified during the plan update process and invited by email by the Jefferson County Emergency Manager on December 3rd, 2015 to participate in HMPC meetings or comment on the draft plan.

Coordination with key agencies, organizations, and advisory groups throughout the planning process allowed the HMPC to review common problems, development policies, and mitigation strategies as well as identifying any conflicts or inconsistencies with regional mitigation policies, plans, programs and regulations. Phone calls and emails were used during plan development to directly coordinate with key individuals representing other regional programs.

As part of the public review and comment period for the draft plan, key agencies were again specifically solicited to provide any final input to the draft plan document. This input was solicited both through membership on the HMPC and by direct emails to key groups and associations to review and comment on the plan. As part of this targeted outreach, these key

stakeholders were also specifically invited to attend the HMPC and public meeting to discuss any outstanding issues and to provide input on the draft document and final mitigation strategies.

The HMPC also used technical data, reports, and studies from the following agencies and groups, just to name a few:

- Colorado Water Conservation Board
- Colorado Geological Survey
- FEMA
- Urban Drainage and Flood Control District

Appendix D References provides a detailed list of references used in the preparation of this plan update. Specific references relied on in the development of this plan are also sourced throughout the document as appropriate.

Several opportunities were provided for the groups listed above to participate in the planning process. At the beginning of the planning process, invitations were extended to these groups to actively participate on the HMPC. Specific participants from these groups are detailed in **Appendix B**. Others assisted in the process by providing data directly as requested or through data contained on their websites or as maintained by their offices. Further as part of the public outreach process, all groups were invited to attend the public meetings and to review and comment on the plan prior to submittal to DHSEM and FEMA. In addition, as part of the review of the draft plan, key agency stakeholders were contacted and their comments specifically solicited.

This process was accomplished as part of planning tasks two and three in the FEMA Local Mitigation Planning Handbook.

Other Community Planning Efforts and Hazard Mitigation Activities

The coordination and synchronization with other community planning mechanisms and efforts are vital to the success of this plan. To have a thorough evaluation of hazard mitigation practices already in place, appropriate planning procedures should also involve identifying and reviewing existing plans, policies, regulations, codes, tools, and other actions are designed to reduce a community's risk and vulnerability from natural hazards. Jefferson County uses a variety of mechanisms to guide growth and development. Integrating existing planning efforts, mitigation policies, and action strategies into this plan establishes a credible, comprehensive document that weaves the common threads of a community's values together. The development of this plan involved a comprehensive review of existing plans, studies, reports, and initiatives from Jefferson County and each participating municipality.

The following table includes a comprehensive list of the documents reviewed and how they informed the HMP update.

Table 3.6. Incorporated Planning Mechanisms

Plan	How Incorporated
Jefferson County Comprehensive Master Plan (CMP) 2013	Used as baseline for update and incorporated into Community Profile, Planning Process, Risk and Vulnerability Assessment, Capabilities Assessment, Mitigation Strategy, and Implementation
Jefferson County Open Space Master Plan 2014-2019	Incorporated into Community Profile, Capabilities Assessment and Wildfire Vulnerability Assessment
Individual Community Land Use Plans (12 separate documents)	Incorporated data into Jurisdictional Annexes for Future Planning and Development patterns
Rules and Regulations for Regulatory Floodplains in Colorado - Colorado Water Conservation Board 2010	Incorporated into Risk and Vulnerability Assessment and Mitigation Strategy
Jefferson County Economic Profile, JeffCo Economic Development Corporation 2015	Incorporated into Community Profile and Risk and Vulnerability Assessment
County Community Wildfire Protection Plan	Incorporated into Community Profile and Wildfire Vulnerability Assessment
Individual Community Wildfire Protection Plans (16 separate documents)	Incorporated data into Jurisdictional Annexes and Wildfire Vulnerability Assessment
Jefferson County Land Development Regulation	Informed Capabilities, Risk and Vulnerability Assessments and goals update in Chapter 5
Jefferson County Zoning Resolution	Incorporated into Capabilities Assessment
Jefferson County Floodplain Regulations	Incorporated into Capabilities Assessment
Small Site Erosion Control Manual	Incorporated into Capabilities Assessment
Construction/Land Disturbance Activities	Incorporated into Capabilities Assessment
Jefferson County Roadway Design and Construction Manual	Incorporated into Capabilities Assessment
Denver Regional Council of Governments Hazard Mitigation Plan 2010	Informed data sources and information gathering
The State of Colorado Natural Hazards Mitigation Plan 2013	Informed data sources and information gathering and goals update
Colorado Drought Mitigation & Response Plan 2009 and 2013	Informed data sources and information gathering
City of Arvada Comprehensive Plan	Used as baseline for Annex update and incorporated into Community Profile, Planning Process, Risk and Vulnerability Assessment, Mitigation Strategy, and Implementation
City of Arvada Sustainable Action Plan (ASAP)	Informed Annex update
City of Arvada Land Development Code	Informed Annex update

Plan	How Incorporated
City of Arvada Parks and Open Space Master Plan	Informed Annex update
City of Lakewood Community Resources Master Plan	Informed Annex update
City of Lakewood Comprehensive Plan	Used as baseline for Annex update and incorporated into Community Profile, Planning Process, Risk and Vulnerability Assessment, Mitigation Strategy, and Implementation
City of Lakewood Zoning Ordinance/Floodplain Management	Informed Annex update
City of Wheat Ridge Strategic Plan	Informed Annex update
City of Wheat Ridge Comprehensive Plan	Informed Annex update
City of Wheat Ridge Parks and Recreation Master Plan	Informed Annex update
City of Wheat Ridge Zoning and Development Code	Informed Annex update
City of Golden Comprehensive Plan	Used as baseline for Annex update and incorporated into Community Profile, Planning Process, Risk and Vulnerability Assessment, Mitigation Strategy, and Implementation
City of Golden Land Use Plan	Informed Annex update
City of Edgewater Master Plan	Informed Annex update
Town of Morrison Ordinances	Informed Annex update
Town of Mountain View Master Plan	Informed Annex update

Other documents were reviewed and considered, as appropriate, during the collection of data to support Planning Steps 4 and 5, which include the hazard identification, vulnerability assessment, and capability assessment.

2010 Mitigation Plan Inclusion in Other Planning Mechanisms

The 2010 HMP was integrated into other planning mechanisms in the County. The risk assessment portion of the 2010 plan was integrated into the other planning mechanisms listed in Table 3.7. The table lists the jurisdiction and what planning mechanism the 2010 Regional Plan was integrated into. In some cases communities have deferred this for future planning mechanisms, as discussed in the Chapter 7 Plan Implementation and Maintenance.

Table 3.7. 2010 Mitigation Plan Inclusion in Other Planning Mechanisms

Jurisdiction	Planning Mechanism
Jefferson County	Local Emergency Operations Plan – used to inform Hazard Vulnerability Assessment
	The Jefferson County Comprehensive Plan references the 2010 HMP in the Wildfire Hazards section of the plan
	The 2010 Jefferson County HMP is still available on the Emergency Management and Preparedness page on the Sherriff’s Office web portal
Wheat Ridge	City of Wheat Ridge Local Energy Assurance Plan 2012. Hazard Mitigation Plan is cross referenced in several sections. Provided the basis for hazard profiles in the vulnerability assessment
State of Colorado	The 2013 Colorado Natural Hazards Mitigation Plan provides a meta-level analysis of local and multi-jurisdictional hazards profiled (with rankings for each hazard in each jurisdiction) in respective plans. Jefferson County’s 2010 plan is included in this analysis.
State of Colorado	The 2013 Colorado Drought Mitigation Response Plan references local hazard mitigation plans and efforts, including Jefferson County.
Lakewood	City of Lakewood Local Energy Assurance Plan 2012
Arvada	Deferred for incorporation by reference in future planning mechanisms
Edgewater	Deferred for incorporation by reference in future planning mechanisms
Golden	Deferred for incorporation by reference in future planning mechanisms
Lakeside	Deferred for incorporation by reference in future planning mechanisms
Morrison	Deferred for incorporation by reference in future planning mechanisms
Mountain View	Deferred for incorporation by reference in future planning mechanisms
Fire Districts	Deferred for incorporation by reference in future planning mechanisms, where applicable
Jefferson Conservation District	Deferred for incorporation by reference in future planning mechanisms, where applicable
Pleasant View Metro District	Deferred for incorporation by reference in future planning mechanisms, , where applicable

Coordination with Ongoing Planning Efforts

A key example of coordinating with other planning efforts is the coordination of this HMP with stormwater master plans and community wildfire protection plans. This is critical for two important reasons. First, flooding and wildfire problems don’t stop at corporate or jurisdictional boundaries and evaluating flood and wildfire problems on a regional basis provides a comprehensive approach to understanding and addressing identified flood and wildfire issues.

Second, a successful mitigation strategy requires that these planning efforts be coordinated. During the plan update this plan was coordinated with the following planning efforts that were also underway at the same time:

- Conifer/285 Corridor Area Community Plan

3.4.2 Phase 2: Assess Risks

Planning Step 4 Identify the Hazards

Amec Foster Wheeler led the HMPC in an effort to identify and document all the hazards that have, or could, impact the planning area, including documenting recent drought, flood, wildfire and winter storm events. Data collection worksheets were used in this effort to aid in determining hazards and vulnerabilities and where risk varies across the planning area. The profile of each of these hazards was then developed and updated in 2015 with information from the HMPC and additional sources. Web resources, existing reports and plans, and existing GIS layers were used to compile information about past hazard events and determine the location, previous occurrences, probability of future occurrences, and magnitude/severity of each hazard. Geographic information systems (GIS) were used to display, analyze, and quantify hazards and vulnerabilities. A more detailed description of the hazard identification and risk assessment process and the results are included in Chapter 4 Risk Assessment.

Planning Step 5 Assess the Risks

After updating the profiles of the hazards that could affect the County, the HMPC collected information to describe the likely impacts of future hazard events on the participating jurisdictions. This step included two parts: a vulnerability assessment and a capability assessment.

Vulnerability Assessment—Participating jurisdictions updated their assets at risk to natural hazards—overall and in identified hazard areas. These assets included total number and value of structures; critical facilities and infrastructure; natural, historic, and cultural assets; and economic assets. The HMPC also analyzed development trends in hazard areas. The DFIRM was used to refine the estimate flood losses during the update, where available for the NFIP participating communities.

Capability Assessment— The HMPC also conducted a capability assessment update to review and document the planning area’s current capabilities to mitigate risk and vulnerability from natural hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the HMPC can assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. This information for the County is included in Section 4.4 and in the respective jurisdictional annexes. This addressed FEMA planning task 4: Review community capabilities - 44 CFR 201.6 (b)(2)&(3).

Amec Foster Wheeler provided the draft risk assessment to the HMPC in November 2015 for review and comment. Results of the risk assessment were presented and comments discussed at the second meeting of the HMPC.

3.4.3 Phase 3: Develop the Mitigation Plan

Planning Step 6: Set Goals

Amec Foster Wheeler facilitated a discussion session with the HMPC to review the 2010 plan's goals and objectives. The HMPC discussed definitions and examples of goals, objectives, and actions and considered the goals of the state hazard mitigation plan and other relevant local plans when reviewing and revising the goals and objectives. The resulting updated goals and objectives are presented in Chapter 5 Mitigation Strategy.

Planning Step 7: Review Possible Activities

Amec Foster Wheeler facilitated a discussion at an HMPC meeting to review the alternatives for mitigating hazards. This included a brainstorming session with the HMPC to identify a comprehensive range of mitigation actions for each identified hazard, and a method of selecting and defending recommended mitigation actions using a series of selection criteria. More specifics on the process and the results of this collaborative process are captured in Chapter 5 Mitigation Strategy.

Planning Step 8: Draft an Action Plan

Based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7, Amec Foster Wheeler produced a complete first draft of the plan. This complete draft was delivered electronically for HMPC review and comment. HMPC and agency comments were integrated into the second draft, which was advertised and distributed to collect public input and comments. Other agencies were invited to comment on this draft as well. Amec Foster Wheeler integrated comments and issues from the public, as appropriate, along with additional internal review comments and produced a final draft for the Colorado Division of Homeland Security and Emergency Management and FEMA Region VIII to review and approve, contingent upon final adoption by the governing boards of each participating jurisdiction.

3.4.4 Phase 4: Implement the Plan and Monitor Progress

Planning Step 9: Adopt the Plan

In order to secure buy-in and officially implement the plan, the plan was re-adopted by the governing boards of each participating jurisdiction on the dates included in the adoption resolutions in **Appendix C** Plan Adoption.

Planning Step 10: Implement, Evaluate, and Revise the Plan

The true worth of any mitigation plan is in the effectiveness of its implementation. Up to this point in the planning process, all of the HMPC's efforts have been directed at researching data, coordinating input from participating entities, and developing appropriate mitigation actions. Each recommended action includes key descriptors, such as a lead manager and possible funding sources, to help initiate implementation. An overall implementation strategy is described in Chapter 7 Plan Implementation and Maintenance.

Finally, there are numerous organizations within the Jefferson County planning area whose goals and interests interface with hazard mitigation. Coordination with these other planning efforts, as addressed in Planning Step 3, is vital to the ongoing success of this plan and mitigation in Jefferson County and is addressed further in Chapter 7. A plan update and maintenance schedule and a strategy for continued public involvement are also included in Chapter 7.

Implementation and Maintenance Process: 2010 Plan

The 2010 Hazard Mitigation Plan included a process for implementation and maintenance which was generally followed, with some variation. Implementation of the plan including the status of mitigation actions is captured in Chapter 5 and the jurisdictional annexes. In general the County and participating jurisdictions have made good progress in the implementation of the plan. Successes of note are detailed in Chapter 5. As a result of revisiting the implementation and maintenance chapter some modifications were made including:

- Changed annual review from October to January.

An updated implementation and maintenance chapter can be referenced in Chapter 7.



4 RISK ASSESSMENT

44 C.F.R. Requirement 201.6(c)(2):[The plan shall include] a risk assessment that provides the factual basis for activities proposed in the strategy to reduce the losses from identified hazards.

Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

As defined by the Federal Emergency Management Agency (FEMA), risk is a combination of hazard, vulnerability, and exposure. “It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.”

The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The process allows for a better understanding of a jurisdiction’s potential risk to natural hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

This risk assessment followed the methodology described in the FEMA publication: Local Mitigation Planning Handbook (March 2013), which breaks the risk assessment down to a four-step process:

1. Describe Hazards
2. Identify Community Assets
3. Analyze Risks
4. Summarize Vulnerability

Data collected through this process has been incorporated into the following sections of this chapter:

- **Section 4.1 Hazard Identification** identifies the hazards that threaten the planning area and describes why some hazards have been omitted from further consideration.
- **Section 4.2 Hazard Profiles** discusses the threat to the planning area and describes previous occurrences of hazard events and the likelihood of future occurrences.
- **Section 4.3 Vulnerability Assessment** assesses the County’s total exposure to natural hazards, considering assets at risk, critical facilities, evaluates where risks vary by jurisdiction within the planning area and future development trends. This also includes a summary of vulnerability.
- **Section 4.4 Capabilities Assessment** inventories existing mitigation activities and policies, regulations, and plans that pertain to mitigation and can affect net vulnerability.
- **Jurisdictional Annexes** discusses each participating jurisdiction’s individual exposure to natural hazards, including an asset inventory. The HMPC also conducted a mitigation

capability assessment, which inventoried existing mitigation activities and existing policies, regulations, and plans that pertain to mitigation and can affect net vulnerability. The findings from this undertaking are in the respective jurisdictional annexes.

4.1 Hazard Identification

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type of all natural hazards that can affect the jurisdiction.

The Hazard Mitigation Planning Committee (HMPC) conducted a hazard identification study to determine the hazards that threaten the planning area.

4.1.1 Results and Methodology

Using existing hazards data, plans from participating jurisdictions, and input gained through planning and public meetings, the HMPC agreed upon a list of hazards that could affect Jefferson County. Hazards data from FEMA, the Colorado Division of Homeland Security and Emergency Management (including the State of Colorado Natural Hazards Mitigation Plan), the National Oceanic and Atmospheric Administration, the Spatial Hazard Events and Losses Database for the United States (SHELDUS), and many other sources were examined to assess the significance of these hazards to the planning area. The hazards evaluated in this plan include those that have occurred historically or have the potential to cause significant human and/or monetary losses in the future.

The following hazards, listed alphabetically, were identified and investigated for the Jefferson County Multi-Hazard Mitigation Plan:

- Avalanche
- Dam Failure
- Drought
- Earthquake
- Erosion and Deposition
- Expansive Soils
- Extreme Temperatures
- Flood
- Hailstorm
- Landslides/Debris Flows/Rockfalls
- Lightning
- Severe Winter Storms
- Subsidence
- Tornado
- Wildfire
- Windstorm

Each of the hazards were identified based on geographic extent, previous occurrences, potential for future occurrence, and a discussion on the potential severity and magnitude of the event. Once these elements were examined, each hazard was assigned an overall rating for the County. The

more significant hazards (high or medium overall ratings) have a more detailed hazard profile in this section and are analyzed further in **Section 4.3 Vulnerability Assessment** to the extent possible. Low hazards are profiled in a little less detail in this section, with an explanation of potential impact and vulnerability. In some cases, the overall significance of the hazard may vary between jurisdictions. The jurisdictional annexes provide more explicit detail to explain the variance levels.

4.1.2 Hazard Identification Summary

Table 4.1 reflects the hazard identification summaries discussed in detail in the rest of this section. The table is based on the Jefferson County Hazards Identification Worksheet, but also reflects the input from the HMPC to address magnitude and severity, which in some cases altered the overall rating of the hazard compared to the other hazards profiled. When viewing these ratings, it is particularly important to remember that the hazards are all possible in the planning area, and therefore are potentially dangerous. The overall rating is not a reflection of significance, but a method of prioritizing hazards relative to one another for the development of mitigation actions and goals.

The list of hazards were revisited and validated during the 2015 update process by the HMPC. The list did not change; however, the potential severity/magnitude rating for lightning was downgraded from critical to limited based on discussion with the HMPC. The potential severity/magnitude rating for Drought was changed from limited to critical to better reflect the extensive impacts of this hazard.

Table 4.1 Hazards Identification Summary

Hazard	Geographic Extent	Potential of Future Occurrence	Potential Severity/Magnitude	Overall Significance
Avalanche	Negligible/Limited	Unlikely	Negligible	Low
Dam Failure	Significant	Occasional	Critical	High
Drought	Extensive	Likely	Critical	Medium
Earthquake	Significant	Unlikely	Catastrophic	Medium
Erosion and Deposition	Significant	Likely	Critical	Medium
Expansive Soils	Extensive	Likely	Limited	Medium
Extreme Temperatures	Extensive	Likely	Limited	Low
Flood	Limited	Likely	Critical	High
Hailstorm	Significant	Likely	Critical	High
Landslides, Debris flows, Rockfalls	Limited	Likely	Negligible	Medium
Lightning	Limited	Highly Likely	Limited	Medium
Severe Winter Storms	Extensive	Likely	Critical	High
Subsidence	Limited	Occasional	Limited	Medium
Tornado	Limited	Likely	Limited	Medium
Wildfire	Significant	Highly Likely	Critical	High
Windstorm	Significant	Likely	Limited	Medium

Geographic Extent

Negligible: Less than 10 percent of planning area or isolated single-point occurrences
Limited: 10 to 25 percent of the planning area or limited single-point occurrences
Significant: 25 to 75 percent of planning area or frequent single-point occurrences
Extensive: 75 to 100 percent of planning area or consistent single-point occurrences

Magnitude/Severity

Negligible: Less than 10 percent of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first aid or within the response capability of the jurisdiction.
Limited: 10 to 25 percent of property is severely damaged, facilities and services are unavailable for between 1 and 7 days, injuries and illnesses require sophisticated medical support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities.
Critical: 25 to 50 percent of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period of time, or result in many permanent disabilities and a few deaths.
Catastrophic: More than 50 percent of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the medical response system is overwhelmed for an extended period of time or many deaths occur.

Probability of Future Occurrences

Unlikely: Less than 1 percent probability of occurrence in the next year, or has a recurrence interval of greater than every 100 years.
Occasional: Between a 1 and 10 percent probability of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Likely: Between 10 and 90 percent probability of occurrence in the next year, or has a recurrence interval of 1 to 10 years
Highly Likely: Between 90 and 100 percent probability of occurrence in the next year, or has a recurrence interval of less than 1 year.

Significance

Low: Two or more of the criteria fall in the lower classifications or the event has a minimal impact on the planning area. This rating is also sometimes used for hazards with a minimal or unknown record of occurrences and impacts or for hazards with minimal mitigation potential.
Medium: The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is also sometimes utilized for hazards with a high impact rating but an extremely low occurrence rating.
High: The criteria consistently fall along the high ranges of the classification and the event exerts significant and frequent impacts on the planning area. This rating is also sometimes utilized for hazards with a high psychological impact or for hazards that the jurisdiction identifies as particularly relevant.

4.1.3 Hazards Not Profiled

Other hazards were discussed by the HMPC but ultimately not included in this plan. Thunderstorm is not identified as an individual hazard, but is recognized for its role in the flood, lightning, and windstorm hazards, and addressed accordingly in those hazard profiles. Fog was removed after discussion with the HMPC, which determined that it is not a true disaster-level hazard for the planning area. The volcano hazard was also removed due to the extraordinary circumstances required for such a disaster event to severely impact the planning area. The natural hazards of coastal erosion, coastal storm, hurricane, and tsunami were excluded from this plan because they are not applicable in Jefferson County. After extensive discussion during the kickoff meeting, man-made and technological hazards were also excluded from the scope of this plan, as it focuses on natural hazards. The secondary impacts of natural hazards which may contribute to technological or man-driven hazards, such as a hazardous materials exposure, will be addressed in the applicable vulnerability assessments.

Pandemic flu and other disease events are also not profiled in this plan. While disease is, technically, a naturally occurring hazard, it is greatly impacted by technological and man-driven considerations. For example, the spread of pandemic diseases is, by definition, conducted through sustained peer-to-peer contact and heightened by modern transportation methods such as air travel. In Jefferson County, the concerns for mass care and mass casualty incidents caused by disease are addressed in public health planning efforts. These plans include efforts by the public health departments at a state, county, and local level. In addition to the specific pandemic event plans, they are often closely tied to portions of Emergency Operations Plans, Donations and Volunteer Management efforts, and Continuity of Operation (COOP) or Continuity of Government (COG) plans. Individuals interested in obtaining information on the preparation and prevention of, response to, and recovery from widespread-disease events should contact the Jefferson County Office of Emergency Management or the Jefferson County Department of Public Health for more information.

It is important to be aware that hazard events that happen outside of the County boundaries also can have direct and indirect impacts to Jefferson County. For instance, transportation routes or power supply could be interrupted by severe winter storms or wildfire hazards outside of the County.

4.1.4 Disaster Declaration History

One method the HMPC used to identify hazards was the researching of past events that triggered federal and/or state emergency or disaster declarations in the planning area. Federal and/or state disaster declarations may be granted when the severity and magnitude of an event surpasses the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that

both the local and state governments' capacities are exceeded, a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

The federal government may issue a disaster declaration through FEMA, the U.S. Department of Agriculture (USDA), and/or the Small Business Administration (SBA). FEMA also issues emergency declarations, which are more limited in scope and without the long-term federal recovery programs of major disaster declarations. The quantity and types of damage are the determining factors. The Fire Management Assistance Grant Program provides funding “for the mitigation, management, and control of fires on publicly or privately owned forests or grasslands, which threaten such destruction as would constitute a major disaster.” The quantity and types of damages, as well as the type of event, determine the source of federal aid.

A USDA declaration will result in the implementation of the Emergency Loan Program through the Farm Services Agency. The SBA also offers low interest loans for eligible businesses that suffer economic losses in declared and contiguous counties that have been declared by the USDA. This program enables eligible farmers and ranchers in the affected county as well as contiguous counties to apply for low interest loans. In 2012 the USDA streamlined the declaration process which now provides for nearly an automatic designation for any county in which drought conditions, as reported in the U.S. Drought Monitor when any portion of a county meets the D2 (Severe Drought) drought intensity value for eight consecutive weeks. A county that has a portion of its area in a drought intensity value of D3 (Extreme Drought) or higher at any time during the growing season also would be designated as a disaster area. Table 4.2 provides information on federal emergencies and disasters declared in Jefferson County between 1953 and November 2015.

Table 4.2 Federal Disaster Declarations in Jefferson County

Year	Declaration	Disaster Type
1969	Federal Disaster Declaration	Severe Storms and Flooding
1973	Federal Disaster Declaration	Heavy Rains, Snowmelt
2002	Fire Management Assistance Declaration	Schoonover Fire
2002	Fire Management Assistance Declaration	Black Mountain Fire
2002	Fire Management Assistance Declaration	Snaking Fire
2002	Fire Management Assistance Declaration	Hayman Fire
2003	Emergency Declaration	Snow
2005	Emergency Declaration	Hurricane Katrina Evacuation*
2007	Emergency Declaration	Snow
2011	Fire Management Assistance Declaration	Indian Gulch Fire
2012	Fire Management Assistance Declaration	Lower North Fork Fire
2012	USDA Drought Declaration (Primary S3260)	Drought, excessive heat, high winds
2013	Emergency Declaration	Severe Storms, Flooding, Landslides and Mudslides
2013	Federal Disaster Declaration	Severe Storms, Flooding, Landslides and Mudslides

Source: State of Colorado Natural Hazards Mitigation Plan, 2013; Federal Emergency Management Agency, PERI Presidential Disaster Declaration Site. U.S. Department of Agriculture; (*) indicates that Jefferson County was included in the declaration but did not receive funding.

4.2 Hazard Profiles

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the...location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

The hazards identified in **Section 4.1: Hazard Identification** are profiled individually in this section. Much of the profile information came from the same sources used to initially identify the hazards.

4.2.1 Profile Methodology

Each hazard is profiled in a similar format that is described below. It is important to note that the profiles are data driven, and that potential errors or omissions may exist in the data. In particular, there is a time variance between the different data sets. For example, winter storms have been tracked in the planning area for a longer period of time than swelling soils hazards have been documented, so the comparison of severity, previous occurrences, and rates of future occurrences between the two hazards is somewhat skewed. This variance exists between all known hazards in this plan. The information presented is for planning level assessments only.

Description

This subsection gives a generic description of the hazard and associated problems, followed by details on the hazard specific to Jefferson County.

Geographic Extent

This subsection discusses how extensive the hazard is expected to be relative to Jefferson County. It may also include specific discussions regarding which areas of the County are most likely to be affected by the profiled hazard. An extent rating is assigned based on the following methodology:

- **Negligible:** Less than 10 percent of planning area or isolated single-point occurrences
- **Limited:** 10 to 25 percent of the planning area or limited single-point occurrences
- **Significant:** 25 to 75 percent of planning area or frequent single-point occurrences
- **Extensive:** 75 to 100 percent of planning area or consistent single-point occurrences

Percent of planning area is calculated by comparing the amount of area affected to the total county area: $(\text{affected acres}/\text{total county acres}) * 100 = \text{percent of affected planning area}$. Single point events, such as lightning, are evaluated for geographic extent by examining the density of the events collectively.

Previous Occurrences

This subsection contains an overview history of the hazard's occurrences, compiled from multiple data sources. This includes information provided by the HMPC. Significant or historic incidents are profiled in greater detail and include scope, severity and magnitude, and known impacts.

Probability of Future Occurrences

This subsection utilizes the frequency of past (known) events to calculate a probability of future occurrences. The likelihood is categorized into four different classifications:

- **Unlikely:** Less than 1 percent probability of occurrence in the next year, or has a recurrence interval of greater than every 100 years.
- **Occasional:** Between a 1 and 10 percent probability of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
- **Likely:** Between 10 and 90 percent probability of occurrence in the next year, or has a recurrence interval of 1 to 10 years
- **Highly Likely:** Between 90 and 100 percent probability of occurrence in the next year, or has a recurrence interval of less than 1 year.

Each hazard is calculated for a probability of future occurrence by comparing the known number of events to the available historic record: *(# of known events/years on historic record)*100=Probability of Future Occurrence*. Stated mathematically, the methodology for calculating the probability of future occurrences is:

$$\frac{\text{\# of known events}}{\text{years of historic record}} \times 100$$

This formula evaluates that the probability of a given hazard occurring in any given year in Jefferson County. The period of record will vary for each hazard and is based upon available data. In some instances, additional prediction methods are also measured by recurrence intervals, such as floods or hazards where the events occur more than once a year.

Magnitude and Severity

This subsection summarizes the anticipated magnitude and severity of a hazard event based largely on previous occurrences and specific aspects of risk as it relates to the planning area. Magnitude and Severity are classified in the following manner:

- **Negligible:** Less than 10 percent of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first aid or within the response capability of the jurisdiction.
- **Limited:** 10 to 25 percent of property is severely damaged, facilities and services are unavailable for between 1 and 7 days, injuries and illnesses require sophisticated medical

support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities.

- **Critical:** 25 to 50 percent of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period of time, or result in many permanent disabilities and a few deaths.
- **Catastrophic:** More than 50 percent of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the medical response system is overwhelmed for an extended period of time or many deaths occur.

The rating is calculated by evaluating the event of record against these criteria. Since most events incur different levels of severity for each element, the rating is assigned to the classification with the most documented occurrences. The purpose of a magnitude and severity rating is to establish the highest known potential threshold of an event to help guide the mitigation goals and actions development. If there are significant events with much lower magnitude and severity ratings than the event of record, this discrepancy will be noted.

Overall Hazard Significance

Overall potential impact of each hazard is summarized in this subsection, based on geographic extent, probability of future occurrences, and the magnitude and severity of the event of record. These ratings are averaged to provide an overall hazard significance rating, which is useful for comparing the hazards to one another and for guiding the development of actions and priorities. The overall hazard significance ratings are classified as follows:

- **Low:** Two or more of the criteria fall in the lower classifications, or the event has a minimal impact on the planning area. This rating is also sometimes used for hazards with a minimal or unknown record of occurrences and impacts or for hazards with minimal mitigation potential.
- **Medium:** The criteria fall mostly in the middle ranges of classifications, and the event's impacts on the planning area are noticeable but not devastating. This rating is also sometimes utilized for hazards with a high impact rating but an extremely low occurrence rating.
- **High:** The criteria consistently fall along the high ranges of the classification and the event exerts significant and frequent impacts on the planning area. This rating is also sometimes utilized for hazards with a high psychological impact or for hazards that the jurisdiction identifies as particularly relevant.

4.2.2 Avalanche

Description

Avalanche hazards occur predominantly in the mountainous regions of Colorado above 8,000 feet. The vast majority of avalanches occur during and shortly after winter storms. Avalanches typically occur when loading of new snow increases stress to a snow covered slope at a rate faster than strength in the snowpack develops. Critical stresses develop more quickly on steeper slopes, and where deposition of wind-transported snow is common. While most avalanches are caused simply

by the weight of accumulated snow, other triggers can be a human (e.g., skier, snowshoer, snowmobiler), and animals.

The combination of steep slopes, abundant snow, weather, snowpack, and an impetus to cause movement create an avalanching episode. According to the Colorado Avalanche Information Center (CAIC), about 90 percent of all avalanches start on slopes of 30-45 degrees, and that increases to about 98 percent in the slope range of 25-50 degrees. Avalanches release most often on slopes above timberline that face away from prevailing winds (leeward slopes collect snow blowing from the windward sides of ridges). Avalanches can also run on small slopes well below timberline, such as gullies, road cuts, and small openings in the trees. Very dense trees can anchor the snow to steep slopes and prevent avalanches from starting; however, avalanches can release and travel through a moderately dense forest. An average-sized avalanche travels around 80 mph; the typical range of impact pressure from an avalanche is from 0.5 to 5.0 tons per square foot.

Historically, avalanches in Colorado occur during the winter and spring between November and April. The avalanche danger increases with major snowstorms and periods of thaw followed by heavy snows. About 2,300 avalanches are reported to the CAIC during an average winter. More than 80 percent of these fall during or just after large snowstorms. The most avalanche-prone months are: February, March, and January. Avalanches caused by thaw occur most often in April.

The 2013 State Hazard Mitigation Plan indicates that between the winter of 1950/1951 and 2008/2009, Colorado suffered the highest number of avalanche fatalities in the United States. This hazard generally affects climbers, backcountry skiers, snowmobilers, and skiers and snowboarders. A smaller number of motorists along highways are also at risk of injury and death due to avalanches, as are residents who live in avalanche-prone areas and other individuals working in those areas. Road and highway closures, damaged structures, and destruction of forests are also a direct result of avalanches. Some residents may live in areas prone to avalanches, and may be impacted directly if an avalanche occurs on their property, or indirectly if an avalanche limits or removes accessibility to the property, both for the resident(s) and for emergency response personnel. Recognizing areas prone to avalanches is critical in determining the nature and type of development allowed in a given area.

Geographic Extent

Avalanches typically occur above 8,000 feet and on slopes ranging between 25 and 50 degrees incline. Only about 10% of the entire County falls into these two categories. The CAIC website provides backcountry forecasts for avalanche conditions for various forecast zones within the state. Almost all of Jefferson County falls outside of the zone boundaries. Only a small portion located just south of I-70, along the southeastern border of Clear Creek County, falls into the Front Range forecast zone. The Front Range zone extends from the Wyoming border south, west to Loveland Pass, and includes the Pikes Peak Area. Overall, this equates to far less than 10% of the planning area.

Geographic Information Systems (GIS) data for the planning area was examined to determine how many slopes in the County are 30% or higher. This information reflects that the majority of vulnerable area in the County lies west of the C-470 corridor, with isolated areas along North and South Table Mountains, the hogback formations and Green Mountain. Most of the areas east of the foothills have strict development restrictions, which minimizes the exposure of the population. In the mountainous areas, the greatest areas of potential occurrence which may impact developments lie along Highway 6, Bear Creek Canyon, Coal Creek Canyon, Ralston Creek Road, and Clear Creek Canyon. Not unexpectedly, these areas are also the areas with greatest potential for rock falls, landslides, or unstable slope events. However, while these areas demonstrate a slope with a known vulnerability to avalanches, the occurrence and tracking records indicate that the areas lack some other element that contributes to avalanche events, such as consistent snowpack.

Based on this information, the geographic extent rating for avalanches in Jefferson County is **negligible** or, at most, **limited**.

Previous Occurrences

The Colorado Avalanche Information Center (CAIC) database recorded 136 occurrences in the State of Colorado between late 1996 and October 2015. However, the database only captures accidents with unusual circumstances, fatalities, and injuries, and therefore represents only a fraction of occurrences.

According to the 2013 State Hazard Mitigation Plan, Jefferson County has had 4 avalanches that caused damage between 1960 and 2008, causing \$8,333 in damage. The HMPC could not find any additional details on these, likely due to the small amount of damage. There have been many more occurrences in neighboring Clear Creek County, which have indirect impacts on Jefferson County. Clear Creek County falls almost entirely in the Front Range forecast zone, with the western-most area falling into the Vail-Summit forecast zone. These zones are explained in the ‘geographic extent’ section below. Impacts from avalanches as far away as Summit County may also impact Jefferson County. Avalanches along the I-70 corridor and US Highway 6 threaten transportation routes into Jefferson County from the Western Slope, and may threaten water supplies for downstream residents by jamming creeks, damaging dams, or destroying infrastructure. Several previous occurrences which indirectly impacted the planning area are recounted below, but none of them were within Jefferson County. These occurrences help establish the threat of secondary impacts of avalanches on Front Range counties.

January 7, 2008. The Channel 7 website records avalanche mitigation efforts along I-70 halfway between the Eisenhower Tunnel and Silverthorne covered all six lanes of the highway and ranged from 6 to 10 feet deep. Other efforts closed down I-70 over Vail Pass and various other Colorado and U.S. highways across the western slope, heightening the dangers that avalanche conditions pose to travelers.

December 30, 2007. The Channel 7 website reported that avalanche dangers and high winds closed all six lanes of I-70 stranding almost 2,000 travelers along the highway from Floyd Hill to

Vail. Interviews with stranded travelers indicate a range of destinations, including the Denver International Airport, sporting events, and New Year's Eve celebration destinations, which underscores the economic impact of the danger on the entire state.

March 23, 2003. The CAIC database recounts a very large avalanche just west of Silver Plume. The avalanche extended all the way down the mountain into Clear Creek and across I-70, spilling into the eastern lanes of the highway and damming the creek, which in turn threatened downstream water supplies. The event was considered unusual because of its long run out in an area that normally is not avalanche prone.

Probability of Future Occurrences

There have been no known incidents in Jefferson County, thus it is difficult to calculate a recurrence interval. This corresponds to a probability of future occurrences rating of **unlikely**.

Magnitude and Severity

According to the Colorado Avalanche Information Center (CAIC), there have been no reported deaths in Jefferson County due to avalanches between 1950 and 2014. This corresponds to the 0 known avalanche events in the planning area as well. In addition, indirect impacts of avalanches on the planning area, such as economic losses due to road closures, are a matter of speculation rather than quantifiable data. With no reported damage amounts and no impact to the operation and delivery of critical services and functions it is difficult to consider the hazard very severe.

In order to calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it is a reflection of common occurrence. There is no event of record for Jefferson County; therefore the magnitude and severity ratings for avalanches must remain **negligible** until additional information becomes available.

Overall Hazard Significance

Avalanches in Jefferson County do not have a particular impact on the planning area. In general, the impacts of avalanches for Jefferson County will be secondary. Avalanches in counties with a higher risk or vulnerability, such as Clear Creek County, may close roads and access points into Jefferson County or those counties may request mutual aid assistance to deal with the event occurrence. The geographic extent of the hazard is considered **negligible** to **limited**. The probability of future occurrences is considered **unlikely** and the magnitude/severity for the event of record is **negligible**. In addition, the HMPC considers the hazard to have a **low** impact on the County. This equates to an overall impact rating of **low**.

4.2.3 Dam Failure

Description

Dams are man-made structures built for a variety of uses, including flood protection, power, agriculture, water supply, and recreation. Dams typically are constructed of earth, rock, concrete, or mine tailings. Two factors that influence the potential severity of a full or partial dam failure are the amount of water impounded and the density, type, and value of development and infrastructure located downstream.

Dam failures can result from any one or a combination of the following causes:

- Prolonged periods of rainfall and flooding, which result in overtopping
- Earthquake
- Inadequate spillway capacity resulting in excess overtopping flows
- Internal erosion caused by embankment or foundation leakage or piping or rodent activity
- Improper design
- Improper maintenance
- Negligent operation
- Failure of upstream dams on the same waterway

Dam failure occurs when the retention function of the dam is compromised, in part or in its entirety. Damage to a dam structure that may result in a failure may be caused by many sources. Possible damages include poor maintenance, age, animal incursion (particularly in earthen dams), erosion, and damages sustained as a result of seismological activity. A dam failure is not the only type of emergency associated with dams. Spillway discharges that are large enough to cause flooding in downstream areas or flooding upstream of dams due to backwater effects or high pool levels are both considered dam emergencies and may cause significant property damage and loss of life.¹

Dam failures result in a unique source of flash flooding, when a large amount of previously detained water is suddenly released into a previously dry area due to a failure in some way of the dam. Dams are classified into four classes. The 2013 State Hazard Mitigation Plan defines Class I (High Hazard) dams as those rated based on an expected loss of human life, should the dam fail, and Class II (Significant Hazard) dams as those rated based on expected significant damage, but not loss of human life. Significant damage refers to structural damage where humans live, work, or recreate; or public or private facilities exclusive of unpaved roads and picnic areas. Damage refers to making the structures inhabitable or inoperable.²

¹ US Army Corps of Engineers *Flood Emergency Plans: Guidelines for Corps Dams*. Hydrologic Engineering Center, (June 1980) p 4.

² Colorado Office of Emergency Management, *2013 Colorado State Hazard Mitigation Plan* (Flooding 3-49)

Privately owned Class I and II dams are required by Colorado regulations to have Emergency Action Plans (EAPs) in place.³ Class I dams are required to have inundation maps as well. Federally-owned Class I dams are also required to have EAPs by Federal Regulations.⁴ According to the 2013 State Hazard Mitigation Plan, all high-hazard dams in Colorado have EAPs in place, which provide for the emergency response procedures in the event of a dam emergency event.

Levees are defined by the Army Corps of Engineers as “earthen embankments whose primary purpose is to furnish flood protection from seasonal high water for a few days or weeks a year. Levees are broadly classified as either urban or agricultural because of different requirements from each.”⁵ Riverine levees are those built to protect from flooding of river ways, whereas coastal levees are those built to protect from coastal water flooding. Levee failures can occur when a flood occurs that exceeds the designed level of protection. In this case the levee may fail or be overtopped. Levees that are not maintained are at risk from failure due to erosion, rodent activity, or piping along roots from vegetation growing on the levee. According to the Colorado Levee Report dated February 2009 and the Jefferson County HMPC, there are no levees in the planning area.

Jefferson County contains 27 high hazard, 14 significant hazard and 101 low hazard dams.⁶ In addition, there are communities inside Jefferson County that are at risk to dam failures from outside of the County. This information was added during the 2015 update and includes 17 high hazard dams and 10 significant hazard dams have been identified as potentially impacting areas of Jefferson County if breached. Dams outside the county along the in the South Platte River watershed to the south would impact the southern, unincorporated areas of Jefferson County; dams located to the north would affect the more-populated jurisdictions along Clear Creek.

Geographic Extent

Table 4.3 lists the high and significant hazard dams within Jefferson County. Figure 4.1 shows where these dams are located. Table 4.4 lists the high and significant hazard dams that are located outside the County, but whose failure could have impacts inside the County. These regional dams are presented in Figure 4.2.

³ Further information regarding the regulations governing dams in the State of Colorado can be found in the “Guide to Construction and Administration of Dams in Colorado”, available online at <http://water.state.co.us/damsafety>

⁴ Dam Operations Management Policy, ER 1130-2-419.

⁵ U.S. Army Corps of Engineers, *Levees Website: Last Updated October 16, 2007*. Available online at <http://www.mvm.usace.army.mil/floodcontrol/levees/levees.htm>, last accessed July 13, 2009.

⁶ This information is provided by the Jefferson County Office of Emergency Management.

Table 4.3 High and Significant Hazard Dams in Jefferson County⁷

Name	Dam ID	River/ Stream	Downstream City	Rating	Dam Owner
Bear Creek	090112	Bear Creek	Lakewood	High	U.S. Army Corps of Engineers
Bergen East	090104	Weaver Gulch	Lakewood	High	Bergen Ditch & Reservoir Company
Blunn	070302	Ralston Creek	Arvada	High	City Of Arvada
Chatfield	080324	South Platte River	Littleton	High	U.S. Army Corps Of Engineers
Cheesman	800102	South Platte River	Deckers	High	Denver Board of Water Commissioners
East	075309	Weir Gulch	Lakewood	High	Agricultural Ditch & Reservoir Company
Evergreen	090111	Bear Creek	Evergreen	High	Evergreen Metropolitan District
Fairmount Reservoir	070312	Clear Creek	Wheat Ridge	High	Consolidated Mutual Water Co.
Welton Res. (FKA Fortune)	020635	Turkey Creek	Lakewood	High	Consolidated Mutual Water Co.
Genesee No. 2	090240	Bear Creek	Evergreen	High	Genesee Water and Sanitation District
Great Western	020212	Walnut Creek	Westminster	High	City Of Broomfield
Leyden	070209	Leyden Creek	Arvada	High	City Of Arvada
Lookout Mountain	070104	Clear Creek	Golden	High	Lookout Mountain Water District
Main	075310	Weir Gulch	Lakewood	High	Agricultural Ditch & Reservoir Company
Maple Grove	070219	Lena Gulch	Lakewood, Wheat Ridge	High	Consolidated Mutual Water Co.
Morrison Raw Water	090208	Bear Creek	Morrison	High	Town Of Morrison
Ralston	070224	Ralston Creek	Arvada	High	Denver Board Of Water Commissioners
Smith	075311	Bear Creek	Lakewood	High	Agricultural Ditch & Reservoir Company
Standley Lake	020326	Big Dry Creek	Westminster	High	Farmers Reservoir And Irrigation Company
Tucker Lake – North Dam	070232	Ralston Creek	Arvada	High	Denver View Reservoir & Irrigation Co.
Tucker Lake – South Dam	070320	Ralston Creek	Arvada	High	Denver View Reservoir & Irrigation Co.

⁷ This information is provided from the Jefferson County Office of Emergency Management

Name	Dam ID	River/ Stream	Downstream City	Rating	Dam Owner
Wellington	800116	S. Fork Buffalo Creek	Buffalo Creek	High	Wellington Reservoir Co.
Willow Springs #1	090204	Turkey Creek	Lakewood	High	Red Rocks Country Club
Woman Creek	020633	Woman Creek	Westminster	High	Woman Creek Reservoir Authority
Beers Sisters Lake	090102	S. Platte River	Littleton	Significant	Foothills Recreation District
Bergen West	090105	Weaver Gulch	Lakewood	Significant	Bergen Ditch & Reservoir Company
Bowles #1	090109	South Platte River	Bowmar	Significant	Joseph Bowles Reservoir Co.
Carmody	090110	Sanderson Gulch	Lakewood	Significant	City Of Lakewood – Parks Dept.
Devinney	070321	S. Lakewood Gulch	Lakewood	Significant	City of Lakewood – Public Works
Harriman	090115	Weaver Creek	Lakewood	Significant	Denver Board Of Water Commissioners
Harwood's Storage Reservoir	090117	Weaver Gulch	Lakewood	Significant	Red Rocks Country Club
Hyatt	070136	Van Bibber Creek	Arvada	Significant	Farmers Highline Canal & Reservoir Co.
Johnston	095220	Lilley Gulch	Littleton	Significant	Foothills Recreation District
Kendrick	095223	Sanderson Gulch	Lakewood	Significant	City Of Lakewood
Ketner	020226	Walnut Creek	Westminster	Significant	City Of Westminster
Lockport	090217	Troublesome Creek	Kittredge	Significant	Evergreen Parks & Recreation District
Lower Long Lake	070115	Ralston Creek	Arvada	Significant	Denver Board Of Water Commissioners
Magic Mountain #1	070214	Apex Gulch	Pleasant view	Significant	Eagle Admixtures Ltd
Oberon Lake No. 1	070220	Ralston Creek	Arvada	Significant	Oberon Water Co.
Polly A. Deane	090131	Dutch Creek	Littleton	Significant	Bergen Ditch & Reservoir Company
Pomona No. 2 And No. 3	070223	Little Dry Creek	Arvada	Significant	City Of Arvada
Strontia Springs	02219	South Platte	Littleton	Significant	Denver Board of Water Commissioners
Upper Church Lake	060220	Big Dry Creek	Broomfield	Significant	Jefferson County Airport
Upper Long Lake	070114	Ralston Creek	Arvada	Significant	Denver Board Of Water Commissioners

Table 4.4 High and Significant Hazard Dams Outside Jefferson County⁸

Name	Dam ID	River/ Stream	Downstream City	Rating	Dam Owner
Antero	230102	S. Fork S. Platte River	Unincorporated Jefferson County	High	Denver Board of Water Commissioners
Eleven Mile Canyon	230115	South Platte River	Unincorporated Jefferson County	High	Denver Board of Water Commissioners
Spinney Mountain	230304	South Platte River	Unincorporated Jefferson County	High	City of Aurora
Cheesman	800102	South Platte River	Unincorporated Jefferson County	High	Denver Board of
Upper Beaver Brook	070103	Beaver Brook	Golden	High	Lookout Mountain Water District
Chase Gulch	070314	Chase Gulch	Golden	High	City of Central
Jefferson Lake	230123	Jefferson Creek	Unincorporated Jefferson County	High	City of Aurora
Lower Beaver Brook	070102	Beaver Brook	Golden	High	Lookout Mountain Water District
Tarryall	230208	Tarryall Creek	Unincorporated Jefferson County	High	Colorado Parks and Wildlife
Clear Lake	02187-03-01	South Clear Creek	Golden	High	Public Service Company of Colorado
Cabin Creek Lower	02351-02-01	South Clear Creek	Golden	High	Public Service Company of Colorado
James Tingle	230317	Michigan Creek – OS	Unincorporated Jefferson County	High	Centennial Water and Sanitation District
Guanella	070318	West Fork of Clear Creek – OS	Golden	High	City of Golden
Strontia Springs	06916-01-01	South Platter River	Unincorporated Jefferson County	High	Denver, City and County Of
Idaho Springs	070111	Chicago Creek	Golden	High	City of Idaho Springs
Fall River	070129	Fall River	Golden	High	Agricultural Ditch and Reservoir Company
Montgomery	230134	Middle Fork S. Platte	Unincorporated Jefferson County	High	Colorado Springs Utilities
Lake George	230126	South Platte River - OS	Unincorporated Jefferson County	Significant	Lake George County
Burgess #1	CO-00001153	Rule Creek	Unincorporated Jefferson County	Significant	Spring Valley Property Owners & Rec. Corporation

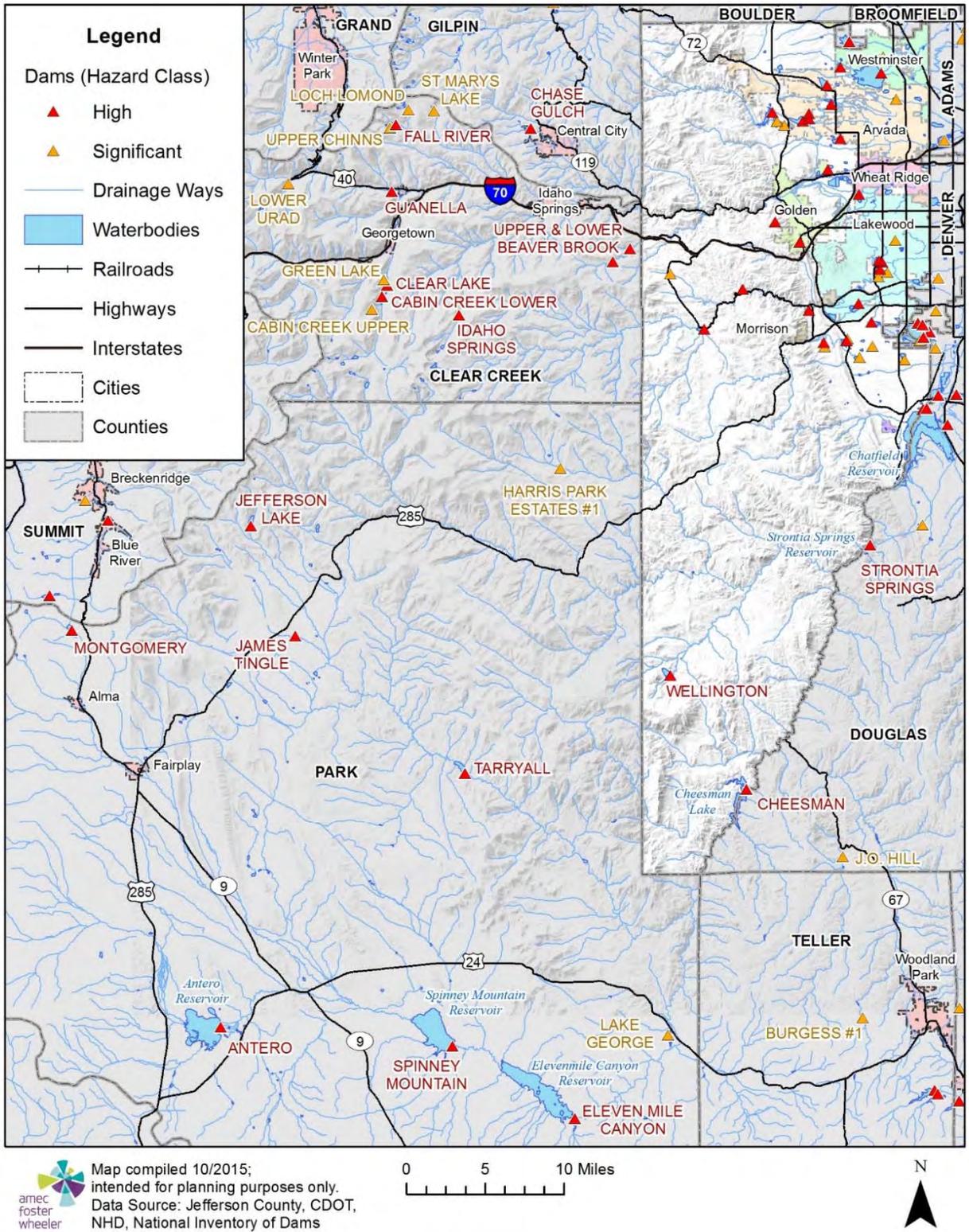
⁸ This information is provided from the Jefferson County Office of Emergency Management

Name	Dam ID	River/ Stream	Downstream City	Rating	Dam Owner
Loch Lomond	070210	Fall River – TR	Golden	Significant	Agricultural Ditch and Reservoir Company
Upper Chinns	070112	Fall River – TR	Golden	Significant	Agricultural Ditch and Reservoir Company
St. Mary's Lake	070227	Silver Creek – OS	Golden	Significant	Coors Brewing Company Land and Water Resources
Harris Park Estates #1	800106	Elk Creek	Unincorporated Jefferson County	Significant	Harris Park Water and Sanitation District
J. O. Hill	080213	West Creek	Unincorporated Jefferson County	Significant	Westcreek Lakes Water District
Green Lake	070134	South Clear Creek Lake – OS	Golden	Significant	City of Blackhawk
Lower Urad	0500790-06	Woods Creek	Golden	Significant	City of Golden
Cabin Creek Upper	02351-01-01	South Clear Creek	Golden	Significant	Public Service Company of Colorado

Figure 4.1. High and Significant Hazard Dams, Jefferson County



Figure 4.2. High and Significant Hazard Dams Within and Upstream of Jefferson County



This data indicates that a large portion of the County and County population centers, certainly more than 25%, are exposed to potential dam failures. For example, in a failure of **Ralston Reservoir Dam** and **Blunn Dam** at Arvada Reservoir, almost 5% of the County would be impacted. Based on this information, the geographic extent rating for dam failure is **significant**.

Previous Occurrences

While there are numerous dams in Jefferson County, there have only been four incidents reported to the National Performance of Dams database housed at Stanford University. Those incidents are recorded below. Specifics related to these dam failures are not available, but a brief profile of the anticipated impacts for dam failures for the high hazard dams, based on the contents of the dam emergency action plans (EAP) is discussed.

Table 4.5 Jefferson County Dam Incidents

Date	Dam Name	Waterway	Nearest Town	Dam Class	Event	Failure?
1952	Clear Lake*	Clear Creek	Georgetown	Class II (significant)	Inflow flood-hydrologic event	Yes
1974	Oberon Lake No. 1	Ralston Creek	Arvada	Class II (significant)	Inflow flood-hydrologic event	Yes
February 1979	Maple Grove	Lena Gulch	Lakewood, Wheat Ridge	Class I (high)	Vandalism	Yes
January 1993	Standley Lake	Big Dry Creek	Westminster	Class I (high)	Reservoir-Wind Waves	No
April 1998	Fairmount	Clear Creek	Wheat Ridge	Class I (high)	Reservoir Incident	No

* This dam is located in Clear Creek County, but the dam failure affected the City of Golden in Jefferson County

2013 Flooding Event

In September 2013, Jefferson County and the entire Front Range experienced heavy rainfall over an eight-day period from the 11th to the 18th. The rainfall caused many dam spillways to flow in Jefferson County and the surrounding area. The dam spillway overflows mitigated structural damage to the dam, but was cause for concern for some downstream communities not used to seeing spillways full of water. There was also concern that spillway flows and outlet discharges could cause flooding downstream. Per a CBS Denver report, residents living near Leyden Dam in Arvada were voluntarily evacuated on September 12th, 2013. While there was no fear of the dam failure, concern was centered around excess runoff from the spillway creating dangerous flooding on roadways. The event caused damage to Indiana Street that caused the road to be closed for several weeks for repairs. According to the Urban Drainage and Flood Control District “A September to Remember” document the flooding exposed an 18-inch water main encased in a 36-inch concrete pipe, overtopped the upstream embankment of the Croke Canal, and resulted in shallow flooding of several homes and businesses along Leyden Creek. The document also suggests that dam improvements in 2001 likely averted a catastrophic dam failure, which would have caused severe property damage and likely cost lives.

Ralston Reservoir is owned by Denver Water and is a water supply reservoir on Ralston Creek west of Arvada. Because it has no flood storage it released water over its emergency spillway on September 12, 2013, causing significant erosion on a steep hillside near Highway 93. The spillway discharge added to the downstream watershed contribution, causing substantial channel and erosion damage before reaching Arvada/Blunn Reservoir.

For the most part, communities in Jefferson County had seen substantial investment in dam improvements prior to the 2013 floods, which paid off when the storm and its impacts arrived. Pat Dougherty, Arvada City Engineer was quoted in “*A September to Remember*” as saying “the story is that there is no story, because the story is what we did over the years to prevent flood damages.” Bear Creek Reservoir was constructed to protect Lakewood and Denver from flooding. A significant amount of water was impounded during 2013 and 2015 flood events. While this caused some damage to the City of Lakewood’s park facilities it likely prevented flood damage to residents and businesses downstream.

Non-jurisdictional dams or impoundments did not fare so well. These are low hazard dams that are not inspected by the State Engineer. At least two of these structures breached, both located west of Highway 93 near Leyden. One of these created severe erosion that was visible from the highway.

Maple Grove: The dam, which reaches 41’ in height and covers a surface area of 50.27 acres, has a capacity of 1,103 acre feet. According to the dam’s EAP, flooding from this dam is anticipated to reach the nearest home in less than three minutes, which indicates that warning time for evacuations from a failure is minimal. Two major hospitals are within five miles of the site, but no major critical infrastructure facilities are within the predicted floodplain of a dam failure. However, numerous private structures are expected to be damaged or destroyed by a failure of this dam. Other potentially impacted structures include the Wheat Ridge Recreation Center, numerous roadways, pedestrian bridges, and open park spaces. The dam is part of the Lena Gulch Flood Warning Plan.

Standley Lake: This earthen dam has a height of 123’ and an unspecified surface area and capacity. According to the dam’s EAP, the areas directly impacted by a dam failure are Wadsworth Boulevard just south of 100 Ave., the Union Pacific Railroad tracks south of 100 Ave, housing developments in unincorporated Jefferson County south of 100 Ave. between Wadsworth By-Pass and Old Wadsworth Blvd, and the area just north and south of 100 Ave. in Westminster. The Boulder Turnpike (Highway 36) north of 100 Ave. across Sheridan Blvd. in Adams County and down into Denver County would also be impacted. In addition, the dam is protected from contamination from the Rocky Flats facility by Woman Creek Dam. The date of this EAP is May 14, 2009.

Fairmount: This dam is 35’ high and covers a surface area of 38.7 acres. The capacity for the dam is 978.6 acre feet. According to the EAP, flooding from this dam is anticipated to reach the nearest homes in less than three minutes, indicating a minimal warning time. The EAP indicates

there are no critical facilities in the floodplain for this dam. The inundation map indicates that Highway 58, railroad tracks, Arapahoe Park, significant portions of Mount Olivet Cemetery, and housing and commercial districts between approximately 48th Avenue and Highway 58 (north to south) and approximately Table Mountain Parkway to Tabor Road north of I-70 (west to east).

Probability of Future Occurrences

There have been 4 incidents in Jefferson County since 1890. The methodology for calculating the probability of future occurrences is described in Section 4.2.1. This formula evaluates that the probability of a dam failure occurring in any given year is 3.2%. This corresponds to a probability of future occurrences rating of **occasional**.

Magnitude and Severity

In order to calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it is a reflection of common occurrence. There is no event of record for Jefferson County with a sufficiently detailed profile that allows for a specific discussion on the severity and magnitude of such an event. However, the rating systems utilized in dam classification is a useful measurement for assessing the potential magnitude and severity of a dam failure. In addition, all high-hazard dams in Colorado are required to have Emergency Action Plans (EAPs) that include predicted inundation maps for dam failure scenarios. These tools allow planners to measure the estimated worst-case or event-of-record occurrences for a dam failure. The Jefferson County Office of Emergency Management indicated in 2010 that the most hazardous dam within the planning area is Ralston Reservoir Dam. This dam had spillway erosion issues in 2013 and will serve as the hypothetical event of record for this profile. Since the information for the assessment is drawn from the dam's EAP, the results reflect the best estimate of potential affects, rather than those drawn from a known occurrence. As such, the magnitude and severity may vary from the predictions issued here. The intent is to portray the extreme worst case, with the hope that any actual failures in the County will incur lesser impacts.

Based on the inundation maps provided in the dam's EAP, a failure of Ralston Reservoir Dam is estimated to directly impact a 12-mile long path of damage (from the Reservoir to the County line) and an area up to three miles in width. This equates to only approximately 36 square miles, or 4.6% of the total area of the County. However, within that area, floodwaters are anticipated to arrive within 80 minutes and reach the maximum flood depth in no more than 100 minutes. Maximum flood depths range from 20' to 27', indicating that many properties in the inundation areas will be destroyed or severely damaged. The damages inflicted on critical facilities and services (critical infrastructure) may result a loss or disruption of serves for several days and may extend into weeks or longer, depending on the nature of the dam failure. While the inundation maps reflect that the only critical infrastructure located in the inundation area are schools, this impacts the ability of the area to provide shelters and presents potential evacuation challenges if a failure occurred during a school day. The inundation area also includes numerous parks, golf

courses, recreation centers, cemeteries, power lines, commercial centers, main roadways and highways, and rail lines.

While no fixed facility hazardous materials sites, police stations, fire stations, or health care facilities are located directly in the inundation area, they would be indirectly impacted by the event, which would not only overwhelm local emergency response capabilities (who would be entirely consumed in the evacuation process and require additional assistance from neighboring counties to assist in both the evacuation and routine calls), but hinder response activities through the direct impacts on roads, bridges and railways.

Potential injuries caused by a failure are considered numerous and severe, and the high-hazard rating placed on the dam indicates that human fatalities are anticipated during a failure. The medical response of the County would be severely impacted or overwhelmed, though nearby jurisdictions are anticipated to help. However, the dam break would also impact Denver, Adams, and Weld Counties directly, which would stretch support resources even thinner. Based on these factors, the magnitude severity ratings for dam failure are considered **critical** and perhaps even **catastrophic**.

Overall Hazard Significance

Dam Failures in Jefferson County have a large potential impact on the planning area. The geographic extent of the hazard is considered **significant**. The probability of future occurrences is considered **occasional** and the magnitude/severity for the event of record is **critical** or even **catastrophic**. The HMPC considers the hazard to have a **medium** overall impact rating on the County. This corresponds to the available data drawn from known occurrences, however the potential record of event equates to an overall impact rating of **high**.

The planning team recognizes that an event which would cause all dams in the planning area to fail is extremely unlikely. However, events which may impact the structural integrity of dams, such as earthquakes, may also be region-wide and therefore it is important to assess the planning-area wide impact of all dams, not just incident-specific occurrences. Furthermore, the failure of any high-hazard dam in the planning area is considered an event of critical magnitude and severity, and therefore, despite having a more limited geographic extent, is still a significant planning consideration.

4.2.4 Drought

Description

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends.

Drought is a complex issue involving many factors—it occurs when a normal amount of moisture is not available to satisfy an area’s usual water-consuming activities. Drought can often be defined regionally based on its effects:

- **Meteorological** drought is usually defined by a period of below average water supply.
- **Agricultural** drought occurs when there is an inadequate water supply to meet the needs of the state’s crops and other agricultural operations such as livestock.
- **Hydrological** drought is defined as deficiencies in surface and subsurface water supplies. It is generally measured as stream flow, snowpack, and as lake, reservoir, and groundwater levels.
- **Socioeconomic** drought occurs when a drought impacts health, well-being, and quality of life, or when a drought starts to have an adverse economic impact on a region.

With its semiarid conditions, drought is a natural part of the Colorado climate cycle. Due to natural variations in climate and precipitation sources, it is rare for all of Colorado to be deficient in moisture at the same time. However, single season droughts over some portion of the state are quite common. Defining when a drought begins is a function of drought impacts to water users. Hydrologic conditions constituting a drought for water users in one location may not constitute a drought for water users elsewhere, or for water users that have a different water supply. Individual water suppliers may use criteria, such as rainfall/runoff, amount of water in storage, or expected supply from a water wholesaler, to define their water supply conditions. The drought issue is further compounded by water rights specific to a state or region. Water is a commodity possessed under a variety of legal doctrines.

Drought impacts are wide-reaching and may be economic, environmental, and/or societal. The most significant impacts associated with drought in Colorado are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flash flooding and erosion. A drought may also increase the speed at which dead and fallen trees dry out and become particularly dangerous as fuel sources in wildfires. Drought may also weaken trees in areas already affected by mountain pine beetle infestations, causing more extensive damage to trees and increasing wildfire risks. An ongoing drought which severely inhibits natural plant growth cycles may increase the susceptibility of the area to wildfire for a period of time. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

Geographic Extent

Droughts are regional events, sometimes impacting multiple states simultaneously. Therefore, as the climate of the planning region is fairly continuous, it is reasonable to assume that a drought will impact the entire planning region simultaneously. Based on this information, the geographic extent rating for drought is **extensive**.

Previous Occurrences

The planning area has experienced 7 multi-year droughts since 1893, with the most pronounced being in the 1930s and 1950s. Table 4.6 is from the *Colorado Drought Mitigation & Response Plan (2013)*.

Table 4.6 Historical Dry and Wet Periods in Colorado

Date	Dry	Wet	Duration (years)
1893-1905	X		12
1905-1931		X	26
1931-1941	X		10
1941-1951		X	10
1951-1957	X		6
1957-1959		X	2
1963-1965	X		2
1965-1975		X	10
1975-1978	X		3
1979-1999		X	20
2000-2006	X		6
2007-2010		X	3
2010-2012	X		2

Source: 2013 Colorado Drought Mitigation and Response Plan

The *Colorado Drought Mitigation and Response Plan* was last updated in August 2013. The update provided the following additional information to the table above, drawn from the 2004 *Drought & Water Supply Assessment (DWSA)*:

“The period 2000 through 2003 was a ‘significant multi-year statewide drought, with many areas experiencing [the] most severe conditions in Colorado instrumented history.’”⁹ The 2007 *DWSA Update* notes that the “effects of Colorado’s recent drought (1999-2003) still linger among municipal providers.”

2012 Drought

Even though 2011 was very wet across northern Colorado, the extreme drought during this time in Texas, New Mexico and Oklahoma was also felt in the Rio Grande and Arkansas Basins in Colorado. This trend continued in those basins as 2012 began, but also increased in breadth across the rest of Colorado. Based on the U.S. Drought Monitor, approximately 50% of Colorado was already under drought conditions at the beginning of 2012. Drought conditions and a period of

⁹ Colorado Water Conservation Board, *Updated Information Provided in Support of the 2002 Colorado Drought Mitigation and Response Plan*, June 2007. Available online at <http://cwcb.state.co.us/NR/rdonlyres/1F537E1C-A4FC-4B8D-A553-7C5D381BA250/0/FinalReportJune2007.pdf> last accessed July 13, 2009.

extremely hot temperatures in June 2012 contributed to very dry forests, contributing to the conditions that led to the High Park fire in northern Colorado and the Waldo Canyon fire near Colorado Springs, two of Colorado's most destructive wildfires. Drought conditions also exacerbated the Lower North Fork fire in Jefferson County in March of 2012. Reservoir levels in many portions of the State helped abate some of the drought impacts seen in 2011-2013. Had the reservoir levels not been at levels sufficient for carryover storage into 2012 (due to record breaking high snowpack in 2011) in many river basins, many of the impacts discussed above may have been worse.

As of September 2015, the Climate Prediction Center Seasonal Outlook indicated that no part of Colorado is in a drought cycle, which was expected to remain true through December 2015. The following figure shows drought conditions at the height of the 2012 drought, versus drought conditions in November of 2015.

Probability of Future Occurrences

According to the *2013 Colorado Drought Mitigation and Response Plan*, there have been 7 recorded drought incidents totaling 41 'dry' years which impacted Jefferson County between 1893 and 2012. The methodology for calculating the probability of future occurrences is described in Section 4.2.1. This formula evaluates that the probability of a drought occurring in any given year is 36%. Both of these data sets correspond to a probability of future occurrences rating for drought of **likely**.

Magnitude and Severity

Droughts are often underrated in terms of the magnitude and severity drought impacts have on urbanized society. Droughts cause obvious and severe impacts on agricultural areas by destroying existing crops and prolonging unsuitable growing conditions which hinders efforts to recover agricultural losses. This causes secondary financial impacts first on the farmers, who have no crops to sell, and then on the consumers, who must pay premium prices for scarce produce. Increased demand for a decreased water supply raises water costs, which also drives up the overall costs to both farm producers and consumers.

Urban settings house the consumers which must pay higher prices for produce and foodstuffs impacted by the drought conditions. Urban areas are also impacted by rising water costs, which may impact personal property and personal water usage bills. Recreational uses which are water-dependent may increase significantly in price or decrease in availability, particularly those which are based in reservoirs or lakes, as the water levels may be too low to sustain safe recreation. Finally, the increased risk of wildfires impacts the planning region. While the hazard of fire itself is profiled separately, drought conditions increase the likelihood that wildfires will occur, either naturally or due to human causes.

In order to calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event

of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it is a reflection of common occurrence. The event of record for Jefferson County occurred between 1999 and 2003. The event impacted the entire planning area, although the exact percent of directly-impacted property in the County is not available. Any damages inflicted on critical facilities and services (critical infrastructure) resulted in no loss or disruption of services. There were no directly attributable documented illnesses or injuries and the medical response capability of the County was not impacted. However, the drought seriously impacted water supply levels and water quality, and several severe wildfires, augmented by drought conditions, occurred in the planning area during this time. The impact on the costs of water resulted in significantly higher water billing rates, and some jurisdictions implemented water regulation measures which also extended beyond the drought period.

The U.S. Drought Monitor classifies droughts into different categories, from D0 (Abnormally Dry) to D4 (Exceptional Drought). Periods of dryness are classified in one of these categories as the drought’s life cycle is tracked. The following table explains each of these categories.

Figure 4.3. U.S. Drought Monitor Drought Severity Classifications

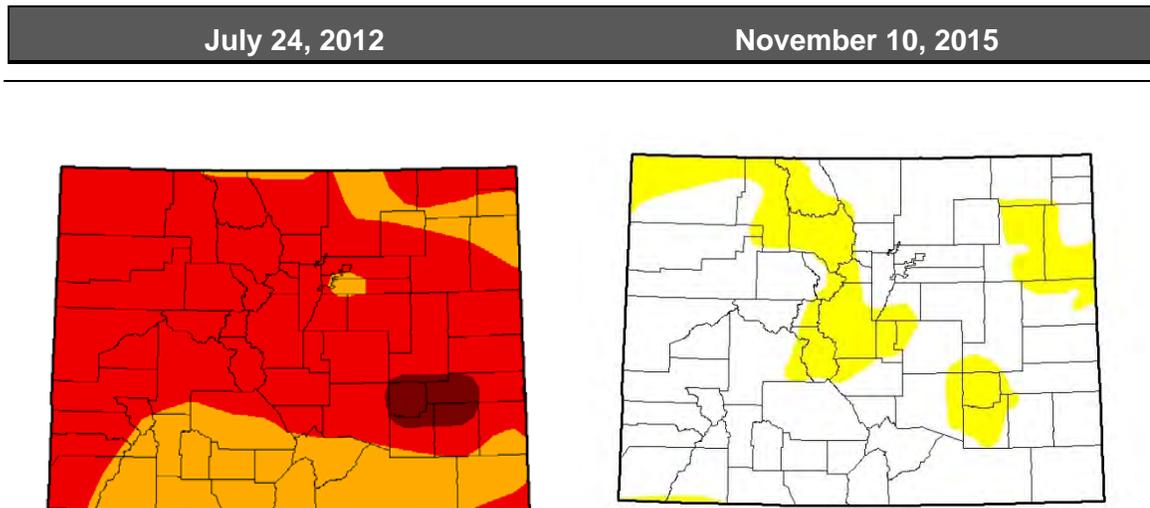
Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)	Standardized Precipitation Index (SPI)
D0	Abnormally Dry	Going into drought: <ul style="list-style-type: none"> - Short-term dryness slowing planting, growth of crops or pastures Coming out of drought: <ul style="list-style-type: none"> - Some lingering water deficits - Pastures or crops not fully recovered 	-1.0 to -1.9	-0.5 to -0.7
D1	Moderate Drought	<ul style="list-style-type: none"> - Some damage to crops, pastures - Streams, reservoirs or wells low, some water shortages developing or imminent - Voluntary water-use restrictions requested 	-2.0 to -2.9	-0.8 to -1.2
D2	Severe Drought	<ul style="list-style-type: none"> - Crop or pasture losses likely - Water shortages common - Water restrictions imposed 	-3.0 to -3.9	-1.3 to -1.5
D3	Extreme Drought	<ul style="list-style-type: none"> - Major crop/pasture losses - Widespread water shortages or restrictions 	-4.0 to -4.9	-1.6 to -1.9
D4	Exceptional Drought	<ul style="list-style-type: none"> - Exceptional and widespread crop/pasture losses - Shortages of water in reservoirs, streams and wells creating water emergencies 	-5.0 or less	-2.0 or less

Source: United States Drought Monitor

Drought extent maps are available from the archive of the U.S. Drought Monitor. They consistently change as conditions lessen or worsen, and show both the severity and magnitude of the drought conditions across the State. The following figure shows drought conditions from two different time periods – the height of Colorado’s last large-scale drought in 2012, and from

November 2015. Note the extent of the drought conditions in Jefferson County and across the state in 2012 when the majority of the state and the County were in D3 Extreme Drought conditions. In November 2015, the majority of the state was experiencing normal precipitation conditions.

Figure 4.4. Colorado: Drought Conditions, 2012 and 2015



Source: United States Drought Monitor

The 2013 State of Colorado Drought Mitigation and Response Plan assessed the risks to drought to each of Colorado's counties, including Jefferson County. According to the plan, impacts of future drought will vary by region. Although the agricultural industry in the County is limited, it is expected to experience crop losses and livestock feeding expenses and deaths. Jefferson County will see an increase in dry fuels, beetle kill, associated wildfires, and some loss of tourism/recreation revenue. Water supply issues for municipal, industrial, and domestic needs will be a concern for the entire County. Lawn and tree impacts in suburban areas could result from water restrictions. Vulnerability increases with consecutive winters of below-average snow pack.

Based on these factors, the magnitude severity ratings for droughts are considered **critical**.

Overall Hazard Significance

Droughts in Jefferson County do have an impact on the planning area. While the impacts of the drought may be less severe than those inflicted on primarily agricultural counties, it is nevertheless a significant hazard to examine. As discussed earlier, the most profound impacts of drought on urbanized planning areas such as this are in the increased costs of water for general and recreational use and the heightened wildfire conditions. In fact, all of the drought periods recorded here culminated in a wildfire event, which is of particular concern for Jefferson County. The geographic extent of the hazard is considered **extensive**. The probability of future occurrences is

considered **likely** and the magnitude/severity for the event of record is **critical**. This equates to an overall impact rating of **medium**.

4.2.5 Earthquake

Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth’s outer layer push the sides of the fault together. Stress builds up and the rocks slip suddenly, releasing energy in waves that travel through the earth’s crust and cause the shaking that is felt during an earthquake. The amount of energy released during an earthquake is usually expressed as a Richter magnitude and is measured directly from the earthquake as recorded on seismographs. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface as felt by humans or resulting damage to structures and defined in the Modified Mercalli scale (see Table 4.7). Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

Table 4.7 Modified Mercalli Intensity (MMI) Scale

MMI	Felt Intensity
I	Not felt except by a very few people under special conditions. Detected mostly by instruments.
II	Felt by a few people, especially those on upper floors of buildings. Suspended objects may swing.
III	Felt noticeably indoors. Standing automobiles may rock slightly.
IV	Felt by many people indoors, by a few outdoors. At night, some people are awakened. Dishes, windows, and doors rattle.
V	Felt by nearly everyone. Many people are awakened. Some dishes and windows are broken. Unstable objects are overturned.
VI	Felt by everyone. Many people become frightened and run outdoors. Some heavy furniture is moved. Some plaster falls.
VII	Most people are alarmed and run outside. Damage is negligible in buildings of good construction, considerable in buildings of poor construction.
VIII	Damage is slight in specially designed structures, considerable in ordinary buildings, great in poorly built structures. Heavy furniture is overturned.
IX	Damage is considerable in specially designed buildings. Buildings shift from their foundations and partly collapse. Underground pipes are broken.
X	Some well-built wooden structures are destroyed. Most masonry structures are destroyed. The ground is badly cracked. Considerable landslides occur on steep slopes.
XI	Few, if any, masonry structures remain standing. Rails are bent. Broad fissures appear in the ground.
XII	Virtually total destruction. Waves are seen on the ground surface. Objects are thrown in the air.

Source: USGS. <http://earthquake.usgs.gov/learn/topics/mercalli.php>

Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, communication, and transportation lines. Other damaging effects of earthquakes include surface rupture, fissuring, ground settlement, and

permanent horizontal and vertical shifting of the ground. Secondary impacts can include landslides, seiches, liquefaction, fires, and dam failure. The combination of widespread primary and secondary affects from large earthquakes make this hazard potentially devastating.

Colorado's earthquake hazard is similar to other states in the intermountain west region. It is less than in states like California, Nevada, Washington, and Oregon, but greater than many states in the central and eastern United States. There are many unknowns about the earthquake hazard in Colorado, but the potential does exist for damaging earthquakes.

Geographic Extent

Geological research indicates there are about 100 potentially active faults in Colorado with documented movement within the last 2 million years (Quaternary). The map in Figure 4.8 indicates that potentially active faults exist in the vicinity of Jefferson County that are capable of producing damaging earthquakes. There could be other faults in the state that may have potential for producing future earthquakes that are not known to be hazardous or do not rupture the ground surface.

Previous Occurrences

According to the U.S. Geological Survey (USGS), eastern Colorado is nearly aseismic, with just a few epicenters in the Arkansas and Platte river valleys. Most shocks in the history of Colorado have been centered west of the Rocky Mountain Front Range. The first seismographs in Colorado of sufficient quality to monitor earthquake activity were installed in 1962. Newspaper accounts are the primary source of published data for earthquake events before that time. Figure 4.6 illustrates historic earthquakes and Quaternary faults in Colorado.

More than 400 earthquake tremors of magnitude 2.5 or higher have been recorded in Colorado since 1867. More earthquakes of magnitude 2.5 to 3 probably occurred during that time, but were not recorded because of the sparse distribution of population and limited instrumental coverage in much of the state. For comparison, more than 20,500 similar-sized events have been recorded in California during the same time period. The largest known earthquake in Colorado occurred on November 7, 1882 and had an estimated magnitude of 6.6. The location of this earthquake, which has been the subject of much debate and controversy over the years, is thought to have originated in the northern Front Range west of Fort Collins and north of Estes Park.

Although many of Colorado's earthquakes occurred in mountainous regions of the state, some have been located east of the mountains. The best known Colorado earthquakes were a series of events in the 1960s that were later shown to be triggered by the injection of liquid waste into a deep borehole at the Rocky Mountain Arsenal northeast of Denver. Twelve of the "Rocky Mountain Arsenal" earthquakes caused damage, including a magnitude 5.3 earthquake on August 9, 1967 that resulted in more than a million dollars in damage in Denver and the northern suburbs. This series of earthquakes continued for about ten years and was followed by about six years of

inactivity that coincided with the cessation of fluid waste injections. Earthquake activity resumed in the northeast Denver area in 1978, including a magnitude 4.3 event on April 2, 1981.

These and other notable earthquakes affecting Jefferson County include:

November 7, 1882 - the first ever to cause damage at Denver, probably centered in the northern Front Range near Rocky Mountain National Park, and is the largest historical earthquake in the state. The magnitude is estimated to be about 6.6 on the Richter scale. The quake was felt as far away as Salina, Kansas and Salt Lake City, Utah.

September 29, 1965 – A magnitude 4.7 earthquake epicentered near Arvada shook the northern metro area and cracked plaster and windows.¹⁰

February 16, 1965 – A magnitude 4.6 located in northeastern Jefferson County – no further information.¹¹

November 14, 1966 – A strong shock rumbled through the Denver area, causing some damage at Commerce City and Eastlake. The magnitude of this event was between 4.1 and 4.4.

April 10, 1967 – This was one of the largest earthquake in a series of earthquakes that began in 1962; 118 windowpanes were broken in buildings at the Rocky Mountain Arsenal, a crack in an asphalt parking lot was noted in the Derby area, and schools were dismissed in Boulder, where walls sustained cracks. Legislators quickly moved from beneath chandeliers in the Denver Capitol Building, fearing they might fall. The Colorado School of Mines rated this shock a magnitude 5.0.

August 9, 1967 - The strongest and most widely felt shock in Denver's history struck at 6:25 in the morning. The magnitude 5.3 tremor caused the most serious damage at Northglenn, where a church's concrete pillar roof supports were weakened, and 20 windows were broken. An acoustical ceiling and light fixtures fell at one school. Many homeowners reported wall, ceiling, floor, patio, sidewalk, and foundation cracks. Several reported basement floors separated from walls. Extremely loud, explosive-like earth noises were heard. Damage on a lesser scale occurred throughout the area.

November 1967 - the Denver region was shaken by five moderate earthquakes. Two early morning shocks occurred November 14th. They awakened many residents, but were not widely felt. A similar shock, magnitude 4.1, centered in the Denver area November 15th. Residents were generally shaken, but no damage was sustained. A local shock awakened a few persons in Commerce City November 25th. Houses creaked and objects rattled during this magnitude 2.1 earthquake.

¹⁰ Colorado Geologic Survey (CGS) Colorado Late Cenozoic Fault, Fold and Earthquake database

¹¹ Ibid.

November 26, 1967 - The magnitude 5.2 event caused widespread minor damage in the suburban areas of northeast Denver. Many residents reported it was the strongest earthquake they had ever experienced. It was felt at Laramie, Wyoming, to the northwest, east to Goodland, Kansas, and south to Pueblo, Colorado. At Commerce City merchandise fell in several supermarkets and walls cracked in larger buildings. Several persons scurried into the streets when buildings started shaking back and forth.

May 23, 1970 – A magnitude 4.1 earthquake struck northeastern Jefferson County on County line – no further information. ¹²

January 5, 1979 at 6:59 p.m. MST - A small but rare earthquake occurred in the central part of the State. The magnitude 2.9 tremor was centered about 30 miles northwest of Colorado Springs near Florissant and Lake George. Some minor damage (MM VI) was reported at Cripple Creek and Royal Gorge.

March, April, and November 1981 – On April 2nd a sharp earthquake, magnitude 4.1, occurred that was centered approximately 12 miles north of downtown Denver in the Thornton area. Some slight damage (MM VI) was observed at Commerce City and Thornton. The quake was felt in other parts of Adams County and in parts of Arapahoe, Boulder, Clear Creek, Denver, Douglas, Jefferson, Gilpin, and Weld Counties. This earthquake was preceded by a small tremor located in the same area on March 24 at 6:04 a.m. MST with magnitude 2.8. It was felt in the Commerce City and Northglenn-Thornton area. The north-central part of Colorado experienced a small earthquake on September 16, 1981 at 1:59 p.m. MDT. The magnitude 2.1 tremor was located in the Commerce City-Thornton area and was felt by a few people in that area.

November 1, 1981 - A minor but alarming earthquake occurred in Jefferson County on November 1, 1981, at 8:03 p.m. MST. The magnitude 3.1 tremor was centered in the Evergreen area about 22 miles southwest of Denver. The effects registered MM V, and were experienced in the Conifer, Evergreen, and Pine Junction areas. It was also felt in other parts of Jefferson County and in parts of Clear Creek and Park Counties.

March and September 1982 – On March 11, 1982 at 4:55 p.m. MST a very minor 2.8 magnitude earthquake occurred. It was located about 12 miles north of downtown Denver in the Thornton area. It was felt in the Commerce City, Northglenn, and Thornton areas. MM III effects were experienced in the Thornton area. On September 18 at 10:12 a.m. MDT, a small part of the north-central part of Colorado was shaken by a very minor earthquake. The magnitude 2.8 tremor was located about 12 miles north of downtown Denver in the Thornton area. MM III effects were noted at Thornton; it was also felt at Commerce City and Northglenn.

¹² CGS Colorado Late Cenozoic Fault, Fold and Earthquake database

February 25, 1984 at 2:18 a.m. MDT - a very minor earthquake occurred in the Denver metropolitan area. This magnitude 2.5 tremor was located about 13 miles north of downtown Denver in the Thornton area where it was felt lightly.

Figure 4.5. Colorado Major Fault Map



Source: State of Colorado Natural Hazard Mitigation Plan, 2007

Faults have been classified based on the geologic time frame of their latest suspected movement (in order of activity occurrence, most recent is listed first):

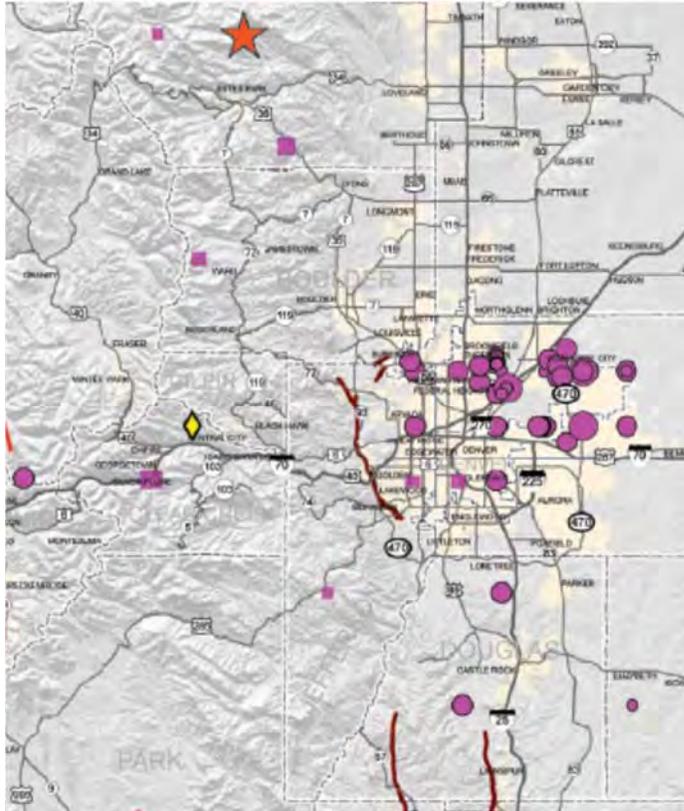
- H—Holocene (within past 15,000 years)
- LQ—Late Quaternary (15,000-130,000 years)
- MLQ—Middle to Late Quaternary (130,000 - 750,000 years)
- Q—Quaternary (approximately past 2 million years)

Faults with evidence of movement in the past 130,000 years (Late Quaternary) are considered active faults. Faults that last moved between 130,000 and 2 million years ago may be considered potentially active (Source: Colorado Earthquake Hazards 2008). The only known potentially active fault in Jefferson County is the Golden Fault, which is a Quaternary fault. This fault runs along the base of the foothills west of Golden, roughly paralleling Highway 93 from Highway 72 to the north down to Highway 285 near Morrison, and is shown on the map in Figure 4.6, which

is taken from a statewide map of Colorado earthquake hazards developed by the Colorado Geological Survey. The fault runs through sparsely developed sections of western Arvada, Golden, western Lakewood, and just east of Morrison. According to the Colorado Earthquake Evaluation Report associated with the Colorado Hazard Mitigation Plan the fault is thought to be capable of producing a M6.5 earthquake. The Colorado Late Cenozoic Fault, Fold, and Earthquake Database considers this a “suspect feature” that has not shown evidence of movement in the past 500,000 years, and that definitive evidence of Quaternary movement is lacking.

In addition to the Golden Fault there are potentially active faults to the north (Walnut Creek (Q) and Valmont (MLQ), Rock Creek (Q) in Boulder County), east (Rocky Mountain Arsenal Fault (H) in Adams County), and south (Ute Pass (MLQ) in Douglas County) of the County. The Golden, Ute Pass, and Walnut Creek faults, all which could affect Jefferson County, are three of the state’s five potentially most damaging faults, according to the Earthquake Evaluation Report. The Walnut Creek Fault is in unincorporated Jefferson and Boulder Counties near Rocky Flats. In addition to these faults there is a fault suspected to be located beneath the Rocky Mountain Arsenal, has been the source of damaging earthquakes in the Denver metro area and is considered by the Colorado Geological Survey to have the potential of producing a magnitude 6.25 earthquake. This fault is not shown on the map because it is not evident on the earth’s surface.

Figure 4.6. Colorado Earthquake Fault Map- Jefferson County Excerpt



EARTHQUAKE EPICENTERS

Instrumentally located epicenters (~1962 to 2007)
Size of dot indicates magnitude.

- 5-5.5
- 4-4.9
- 3-3.9

Approximate location of pre-instrumental earthquake epicenters (~1867 to 1961). Square size indicates the maximum Modified Mercalli intensity for the earthquake (see back of map for intensity scale).

- | | |
|---|---|
| VII | IV |
| VI | I-III |
| V | |

1882 Earthquake; magnitude estimated at 6.6 +/- 0.6 (Spence and others, 1996)

QUATERNARY FAULTS

Geologically young faults that displace sediments or rocks deposited during the Quaternary Period (approximately past 2 million years).

- Known or suspected fault with displacement of late Quaternary deposits (approximately past 130,000 years)
- Known or suspected fault with displacement of middle to early Quaternary deposits (approximately past 130,000 to 2 million years old)

Permanent Seismic Stations— Includes four seismographs currently operated by the U.S. Geological Survey as part of the Advanced National Seismic System.

Source: Colorado's Earthquake and Fault Map, Colorado Geological Survey 2008

Based on this information, the geographic extent rating for earthquake is **significant**.

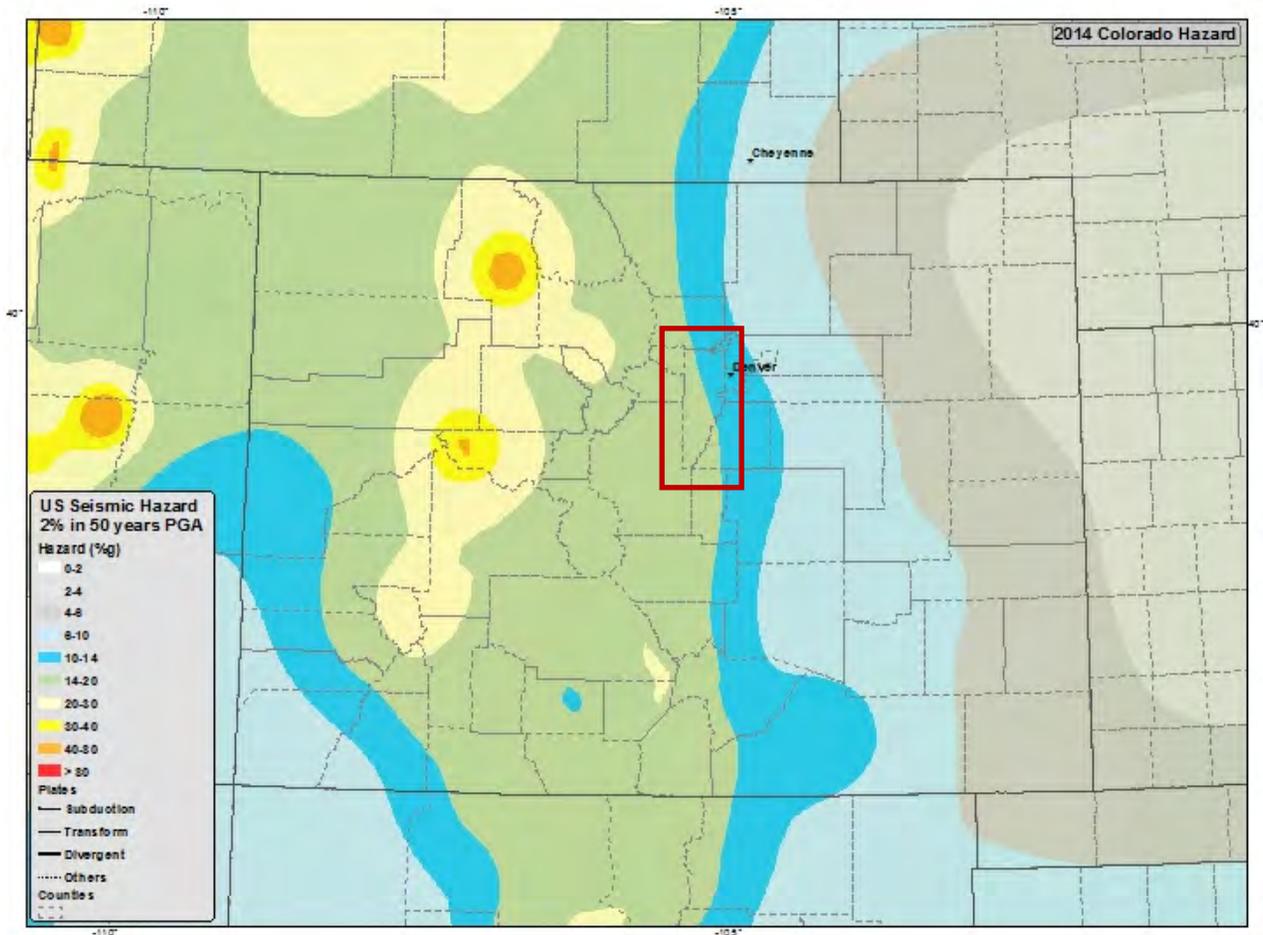
Probability of Future Occurrences

According to the Colorado Geological Survey, it is not possible to accurately estimate the timing or location of future dangerous earthquakes in Colorado because the occurrence of earthquakes is relatively infrequent in the state, and the historical earthquake record is relatively short (only about 145 years). It is prudent to expect future earthquakes as large as magnitude 6.6, the largest historical event in Colorado. Studies indicate earthquakes as large as 7.25 could occur within the state, but scientists are unable to accurately predict when and where it will occur (Source: Colorado Earthquake Hazards – Colorado Earthquake Mitigation Council 2008.)

National seismic hazard zone maps indicate the probability of earthquakes in the United States, based on analyses of faults, soils, topography, and past events. Figure 4.7 is probabilistic seismic hazard maps of Colorado from the USGS that depict the probability that ground motion will reach a certain level during an earthquake. The data show peak horizontal ground acceleration (the fastest measured change in speed for a particle at ground level that is moving horizontally because of an earthquake). Figure 4.7 represents the 2,500 year probability ground motion, which is more of a worst-case scenario, and depicts the shaking level that has a 2 percent chance of being exceeded over a period of 50 years. In this scenario, Jefferson County lies in the range of 10-14 and 14-20 percent peak acceleration. Ground motions become structurally damaging when average peak accelerations reach 10 to 15 percent of gravity, average peak velocities reach 8 to 12 centimeters per second, and when the Modified Mercalli Intensity Scale is about VII (18-34 percent peak ground acceleration), which is considered to be very strong (general alarm; walls crack; plaster falls).

Thus, probability for an earthquake producing minor shaking is considered **occasional** and an earthquake causing significant damage is **unlikely**, with less than a 1 percent chance of occurrence over the next 100 year period.

Figure 4.7. Colorado Seismic Hazard Map—2% Probability of Exceedance in 50 Years



Source: USGS Earthquake Hazards Program <http://earthquake.usgs.gov/regional/states/colorado/hazards.php>

Magnitude and Severity

Earthquakes in or near Jefferson County are low probability but potentially high consequence events. The primary earthquake hazard in Jefferson County includes strong ground shaking, which could affect the entire County. While structural damage could result to buildings, damage to non-structural building elements and contents will account for the majority of damages. A 6.5 earthquake has the potential to cause multiple fatalities and injuries. The general perception is that earthquakes don't happen in Colorado, thus the populace is ill-prepared for what to do when one occurs. There is also potential for rupture of the ground surface, which could happen along a fault trace. Though a remote possibility, the potential for fault rupture would be most likely along the Golden Fault, in the vicinity of Golden along the base of the foothills. Fault rupture could impact homes and highways in west Golden. Secondary earthquake hazards that could occur in the western Jefferson County and near Golden include landslides and rockfall, which could potentially damage transportation infrastructure, property, and cause death or injury. There is also the potential for damaging large waves called seiches that can form in lakes during earthquakes. This

could impact reservoirs such as Chatfield, Strontia Springs, and Cheeseman, potentially causing damage to the marina and property at Chatfield.

During the development of this mitigation plan, HAZUS-MH was used to model the consequences of a large earthquake in Jefferson County. The results of this analysis are presented in Section 4.3 Vulnerability Assessment. This analysis complements HAZUS-MH studies performed by the Colorado Geological Survey on various faults statewide. According to those studies Jefferson County ranks 2nd in the state, behind El Paso County, as having the highest earthquake risk while comparing potential for economic loss and casualties. Considering a worst case scenario, the potential magnitude/severity rating of earthquakes is **catastrophic**, with widespread property damage, shutdown of facilities for more than two weeks and/or multiple fatalities.

Overall Hazard Significance

Earthquakes in Jefferson County can impact the entire planning area. Within Colorado's relatively short historic record, earthquakes have been limited mainly and generally low in magnitude and/or intensity. The geographic extent of the hazard is considered **significant**. The probability of future large magnitude occurrences is considered **unlikely** (less than 1 percent probability of occurrence), though the magnitude/severity for a worst case scenario is **catastrophic**. In addition, the HMPC considers the hazard to have a **high** overall impact on the County. While this lends itself to an overall ranking of high, the likelihood of an earthquake event that causes damages and significant impacts on the planning area is extremely low. Furthermore, mitigation activities for the planning area are very expensive and, according to stakeholder input, prohibitive in both timeframe for implementation and overall expense. As such the hazard is rated as **medium**.

4.2.6 Erosion and Deposition

Description

Erosion is the removal of solids (sediment, soil, rock and other particles) in the natural environment. It usually occurs due to transport by wind, water, or ice; by down-slope creep of soil and other material under the force of gravity; or by living organisms, such as burrowing animals, in the case of bioerosion. Erosion is distinct from weathering, which is the process of chemical or physical breakdown of the minerals in the rocks, although the two processes may occur concurrently.

The rate of erosion depends on many factors. Climatic factors include the amount and intensity of precipitation, freeze-thaw cycles, seasonality, the wind speed, and storm frequency. The geologic factors include the sediment or rock type, its porosity and permeability, the slope of the land, and whether the rocks are tilted, faulted, folded, or weathered. The biological factors include ground cover from vegetation or lack thereof, the type of organisms inhabiting the area, and the land use. Areas with high-intensity precipitation, more frequent rainfall, more wind, freeze-thaw cycles, or more storms are expected to have more erosion. Sediment with high sand or silt contents and areas with steep slopes erode more easily, as do areas with highly fractured or weathered rock. The

porosity and permeability of the sediment or rock also affect how fast water can percolate into the ground. If the water moves underground, less runoff is generated, reducing the amount of surface erosion. Sediments containing more clay tend to erode less than those with sand or silt.

Grus soils form as a result of weathering of granites with abundant feldspar, such as the Pikes Peak Granite present in southwestern foothills of Jefferson County. The result is similar to ‘kitty litter’, which can easily be eroded and transported by wind and rain. Problems result from both erosion and deposition of these soils, particularly in areas burned by recent wildfires. Generally, land underlain by grus is gently rolling.

Changes in the kind of vegetation in an area can also affect erosion rates. Different kinds of vegetation lead to different infiltration rates of rain into the soil, and different surface runoff flow speeds. For example, forested areas have higher infiltration rates, so precipitation will result in less surface runoff, thus less erosion. If the trees are removed, for example by fire or logging, infiltration rates become high, but erosion can remain low to the degree that the forest floor remains intact. It is the removal of, or compromise to, the forest floor, not the removal of the canopy, which leads to increased erosion.

Poor land use practices can also lead to increased erosion. Some of those practices include deforestation, overgrazing, unmanaged construction activity and road-building. Land that is used for the production of agricultural crops generally experiences a significantly greater rate of erosion than that of land under natural vegetation. In the case of construction or road building, when the litter layer is removed or compacted, the susceptibility of the soil to erosion is greatly increased and the process, without proper engineering, can significantly change drainage patterns. There has been a marked increase in recreational land use that has left erosive remnants. Large numbers of hikers use trails leaving furrowed foot traffic, or extensive use of off-road vehicles leave paths of beaten down vegetation and gouged terrain. There is a potential for the impacts of “beetle kill” to negatively affect soil stability and lead to erosion and watershed degradation as well. As discussed in Section 4.2.16 Wildfire, these predictions are difficult to quantify the impacts have not yet occurred, though the precedence is set. Future evaluation on the impacts of beetle kill on erosion may be merited in future planning efforts. While a certain amount of erosion is natural and, in fact, healthy for the ecosystem, wise land use practices are also necessary to keep it balanced.

Geographic Extent

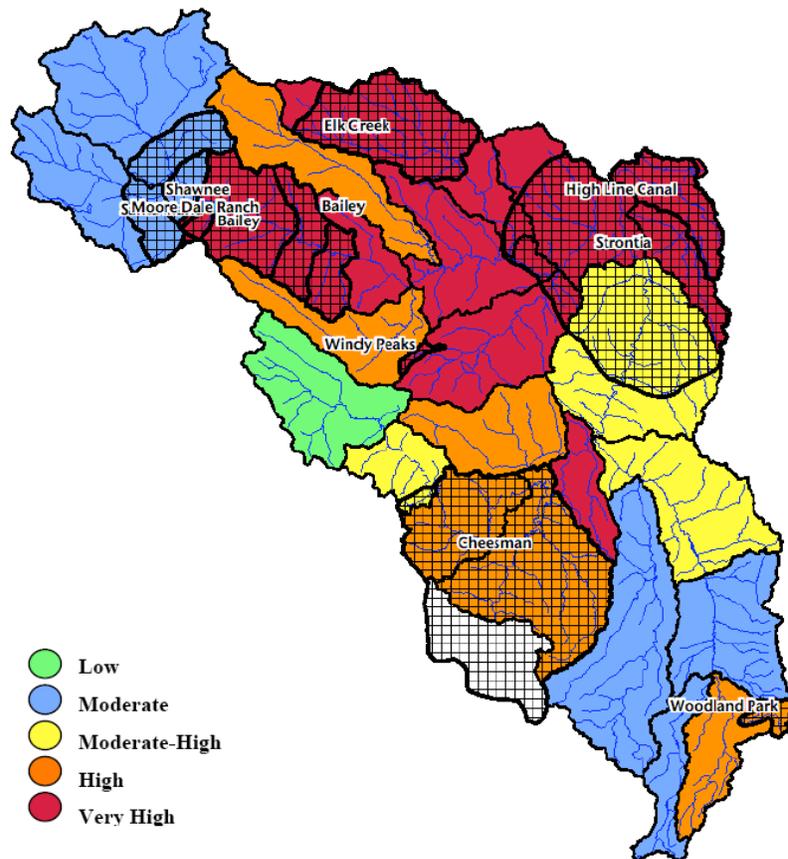
Determining erosion vulnerability for the planning area is difficult at best. Theoretically, areas of potential erosion due to man-exacerbated conditions, such as construction sites, are temporary and move around frequently as the County undergoes normal ebbs and flows in development.

Forested areas in the foothills of Jefferson County, which account for over 50% of the planning area, are potentially vulnerable to erosion problems after severe wildfires.

The Front Range Watershed Protection Data Refinement Work Group has developed a technical approach to protecting watersheds from post wildfire erosion. The purpose of this group is to

identify and prioritize those watersheds that provided or convey water used by communities and municipalities. The data analysis is designed to identify and prioritize watersheds for hazard reduction treatments or other watershed protection measures. Through GIS analysis of soil erodibility, water uses, wildfire hazard, and flood or debris flow risk hazardous watersheds have been identified. Many of these are within Jefferson County are displayed on the following map. The source water area upstream from important surface water intakes, upstream diversion points, and classified drinking water supply reservoirs that have a higher potential for contributing significant sediment or debris is referred to as the Zone of Concern.¹³

Figure 4.8. Upper South Platte Zones of Concern and Watershed Prioritization Map



Source: Front Range Watershed Protection Data Refinement Workgroup Executive Summary

Finally, the natural geologic formations found in the planning area, and specifically the sides of North and South Table Mountain, Green Mountain, and the hogback formations, may be vulnerable to erosion from natural causes. In general, however, the overall extent of erosion susceptibility is fairly small.

¹³ Front Range Watershed Protection Data Refinement Workgroup Executive Summary, 2009. Last accessed October 09, 2009

Based on this information, the geographic extent rating for erosion is **significant**.

Previous Occurrences

Erosion occurs frequently in Jefferson County and is, in fact, a natural part of the ecosystem. Concerns about erosion arise when large amounts of sedimentation are deposited into the water supply as a result of erosion (generally driven by human factors) or when significant erosion occurs in wildfire burn areas, which both impacts watershed quality and recovery efforts in the burn area.

Specific incidents of development-driven erosion, or the erosion that occurs when sites undergoing development and construction are not adequately protected against erosion, are too numerous to specifically quantify. Under state, local and federal regulation, however, construction sites are required to mitigate or minimize erosion and sedimentation as far as possible, which would reduce future occurrences.

The Buffalo Creek Fire in Jefferson County in May of 1996 was followed by substantial flooding and erosion two months later. The burned area is within the Pike National Forest, in the South Platte Watershed and foothills of Jefferson County. The flooding transported approximately 331,000 m³ of coarse sediment into Strontia Springs Reservoir in three months after the fire. This reservoir supplies over 75% of the drinking water to the City of Denver. Studies indicate the sedimentation rate was nearly 30 times the annual rate of sediment input used in designing the reservoir. The reservoir also experienced a significant degradation in water quality as a result of the input of burned material and sediment. Denver Water, the agency responsible for distributing drinking water from the reservoir, estimates that it spent over \$1 million in immediate clean-up efforts after the fire. Denver Water is in the process of dredging excess sediment from the reservoir, at an estimated cost of \$23 million.¹⁴

The 2002 wildfire season, detailed in the wildfire hazard profile, was unusually severe in terms of both the number and extent of wildfires the state experienced, and the severity of the lasting impacts of those fires. Unlike the 1996 Buffalo Creek post-fire recovery time, localized extreme flooding and substantial erosion and deposition that pose significant hazards to the public have continued to 2009; the potential for more flooding and erosion and will likely continue for several more years, particularly in and near the community of West Creek and on Six Mile Creek near Deckers. In 2009, seven years after the fire, Vail Resorts, the U.S. Forest Service, and the National Forest Foundation announced plans to raise \$4 million to undo damages caused by the Hayman fire, including watershed cleanup, restoration of burned lands, and rebuilding of recreational trails. This project was successfully completed over three years between 2011 and 2013. Based on the lessons learned from the Buffalo Creek Fire, Denver Water installed sediment traps on Turkey Creek to protect Cheesman reservoir from siltation, at a cost of \$2 million. These sediment traps

¹⁴ Studies of Post-Fire Erosion in the Colorado Front Range Benefit the Upper South Platte Watershed Protection and Restoration Project – Deborah Martin USGS 2000, http://watershed.org/news/win_00/5_postfire.htm).

require periodic mucking out, which costs about \$350,000 each time, but should mitigate more expensive dredging operations at the reservoir in addition to water quality impacts.

The Coal Creek Watershed suffered a heavy rainfall event on September 12, 2013 that caused large amounts of channel migration that resulted in erosion and deposition. Per the Upper Coal Creek Watershed Restoration Master Plan: The rainfall event on September 12, 2013, was unprecedented in the Coal Creek watershed. Damage throughout the corridor was widespread. In particular, downstream of Twin Spruce Gap Road, nearly every access culvert failed, was washed out, or was significantly damaged. The channel eroded significantly, leading to visible scour through the La Duwaik Estates and other central residential corridors. Highway culverts also plugged with debris, further exasperating flooding effects on the highway and downstream infrastructure. The culvert crossing at the Union Pacific Railroad (UPRR) did manage to pass the peak flows; however, a sedimentation zone was formed in the valley upstream of the culvert, where much of the eroded material was deposited. With the exception of the old Real Estate building at Twin Spruce Gap Road, no homes or buildings were destroyed in this area, although some were badly damaged. This building has since been demolished, and the land acquired by the Colorado Department of Transportation (CDOT).

The Coal Creek Canyon community center is located upstream of Twin Spruce Gap Road. Significant damage was also evident in this area, including structure inundation and culvert failures. Runoff from the Crescent Park Tributary eroded drainages and moved sediment through this corridor. Flood damage was widespread at both commercial and residential locations. A new channel was excavated at the intersection of Crescent Park Drive and Highway 72 to help direct discharges from the Crescent Park Tributary to Coal Creek.

Similar observations were made in the upper portions of Coal Creek and its tributaries, with damages along Twin Spruce Gap Road (Beaver Creek), Crescent Park Drive, and Ranch Elsie Road. Again, failure was noted at many driveway and access culverts, as well as damage to homes and other structures.

As with other historic flood events, highway and roadway access was limited during and after the flood event. Highway 72 reopened permanently approximately two months following the flood event. Access for residents to and from the Front Range was very limited over this time period and required extensive detouring to otherwise nearby areas.

Following the flood event significant efforts were made (and are still ongoing) to repair the destruction. Much of the repair work, such as private culvert replacement, has been completed by individual land owners. The National Resources Conservation Services (NRCS) has also provided assistance to qualified land owners in need of immediate assistance through their Emergency Watershed Protection (EWP) program. Repair work to public infrastructure has been led by groups including Jefferson and Boulder Counties.

Along Highway 72, CDOT has been active in repairing and reopening the highway. This work has included debris removal, roadway reconstruction/resurfacing, and bank reinforcement in areas adjacent to the highway with high erosive susceptibility. Much of this initial work was an

immediate response to the flood event and CDOT is currently in the planning stages to provide more infrastructure improvements along Highway 72.

Probability of Future Occurrences

Erosion occurs daily as a natural process in both developed and undeveloped lands, and natural erosion is not considered a hazard.

Future incidents of erosion associated with wildfires are likely particularly in a mountainous area where the ground is sloping. As such, for this erosion and deposition, the probability of future occurrence mimics that of the wildfire hazard. Since 1980, there have been 20 fire incidents in Jefferson County that have burned 10 or more acres. The methodology for calculating the probability of future occurrences is described in Section 4.2.1. This formula evaluates that the probability of erosion occurring as a result of severe wildfire in any given year is 57.1%. This corresponds to a probability of future occurrences rating of **likely**.

Magnitude and Severity

According to the *Small Site Erosion and Sediment Control Manual* published by the Jefferson County Planning and Zoning Division, stormwater runoff polluted with sediment is the main cause of surface water pollution in the United States. Furthermore, construction activities may generate 400 times the amount of erosion compared to undisturbed land, or 400 years' worth of erosion over a period of one year of construction. Erosion issues with new development should be minimal if erosion control practices are utilized.

Post-fire erosion in the foothills of Jefferson County has and will continue to cause watershed health problems. Erosion rates due to wildfires varies based on the terrain, slope, severity of the burn, subsequent rainfall until groundcover can be re-established, and the overall erodibility of the soil in question.¹⁵ While a methodology is still under development, the impacts of erosion into watersheds is well documented. Erosion carries sediment, organic debris, and chemicals into the water supplies, which may damage aquatic habitats and impact the water quality utilized by populations.¹⁶ As water is a critical resource to Jefferson County's large population, the impacts may be widespread. Erosion, therefore, could pose significant indirect impacts on the planning area, even if it does not directly impact life quality and other critical services.

In order to calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it is a reflection of common occurrence. The event of record for this hazard is the resulting erosion caused by the Buffalo Creek Fire in 1996, but the impacts have been long-range.

¹⁵ Brian Drake, *Estimating Increased Erosion and Sediment Delivery Caused by Wildfires*. Student paper, published online at http://www.crrwr.utexas.edu/gis/gishydro06/Introduction/TermProjects/FinalReport_Drake.htm last accessed October 1, 2009.

¹⁶ Deborah A. Martin and Moody, John, "Hydrologic and Erosion Responses of Burned Watersheds." April 4, 2007, available online at http://www.brr.cr.usgs.gov/projects/Burned_Watersheds/ last accessed October 1, 2009.

Response and recovery costs to address erosion problems have cost Denver Water alone over \$24 million. Erosion may occur and damage the entire burn area, with damages inflicted on critical facilities from the loss or disruption of services, particularly if reservoirs, water treatment plants, roads, or communication lines are impacted or damaged. Erosion may cause illnesses to the watershed populations who are exposed to diminished water quality but the burden on the medical community is anticipated to be minimal. Knowledge of these impacts is well addressed in local planning and mitigation efforts, however, which decreases the likely occurrence of these impacts.

Based on these factors, the magnitude severity rating for erosion is considered **critical**, mainly for watershed health and critical facility impacts.

Overall Hazard Significance

Erosion events in Jefferson County have a potentially significant impact on the planning area, but the County has recognized and addressed these threats. As such, the geographic extent of the hazard is considered **significant**, the probability of future occurrences is considered **likely** and the magnitude/severity for the event of record is **critical**. In addition, the HMPC considers the hazard to have a low overall impact on the planning area. This equates to an overall impact rating of **medium**.

4.2.7 Expansive Soils

Description

Swelling soils and swelling bedrock contain clay which causes the material to increase in volume when exposed to moisture and shrink as it dries. They are also commonly known as expansive, shrinking and swelling, bentonitic, heaving, or unstable soils and bedrock. In general, the term refers to both soil and bedrock contents although the occurrence of the two materials may occur concurrently or separately. The difference between the materials is that swelling soil contains clay, while swelling bedrock contains claystone.¹⁷ In this profile, the term is used to refer to both materials, as they are both relevant to the planning area.

The clay materials in swelling soils are capable of absorbing large quantities of water and expanding 10 percent or more as the clay becomes wet. The force of expansion is capable of exerting pressures of 15,000 pounds per square foot or greater on foundations, slabs, and other confining structures.¹⁸ The amount of swelling (or potential volume of expansion) is linked to five main factors: the type of mineral content, the concentration of swelling clay, the density of the materials, moisture changes in the environment, and the restraining pressure exerted by materials

¹⁷ Colorado Geological Survey Department of Natural Resources, *A Guide to Swelling Soils for Colorado Homebuyers and Homeowners*. (Denver, Colorado.) 1997. p 15-16.

¹⁸ *Ibid.*, p 17.

on top of the swelling soil. Each of these factors impact how much swelling a particular area will experience, but may be modified, for better or worse, by development actions in the area.

In Colorado, swelling soils expand and contract naturally during seasonal wetting (winter and spring) and drying (summer and fall) conditions and in their natural, undeveloped state they cause little damage. However, exposure to additional water sources, such as lawn and garden irrigation or precipitation drainage from houses, and reduced evaporation properties caused by the development of roads, sidewalks, buildings and parking lots, may cause the swelling soils to expand more than they would if they remained undeveloped. In addition, the re-grading of development areas may expose more swelling soil to moisture than the natural state, causing a more widespread swelling event.

In Jefferson County, there are also areas of steeply dipping bedrock or heaving bedrock along the foothills. In these areas, sedimentary bedrock layers are steeply upturned and tilted to form the distinctive hogback features. This causes bedrock to swell unevenly in a linear pattern, instead of the uniform pattern more common to flatter areas of swelling soils, and subjects structures to extreme amounts of both vertical and lateral stress. In Jefferson County, areas of potential dipping and heaving bedrock are identified as a geologic hazard and construction in those areas is heavily restricted.

Swelling soils are one of the nation's most prevalent causes of damage to buildings. According to the 2013 State Hazard Mitigation Plan, annual losses nationwide are estimated in the range of \$2 billion. In Colorado, the cost is estimated at \$16 million annually. Potential damages include severe structural damage; cracked driveways, sidewalks, and basement floors; heaving of roads and highway structures; condemnation of buildings; and disruption of pipelines and other utilities. Destructive forces may be upward, horizontal, or both. Buildings designed with lightly loaded foundations and floor systems often incur the greatest damage and costly repairs from expansive soils. Building in and on swelling soils can be done successfully, although more expensively, as long as appropriate construction design and mitigation measures are followed. In some cases avoidance may be the best mitigation policy.

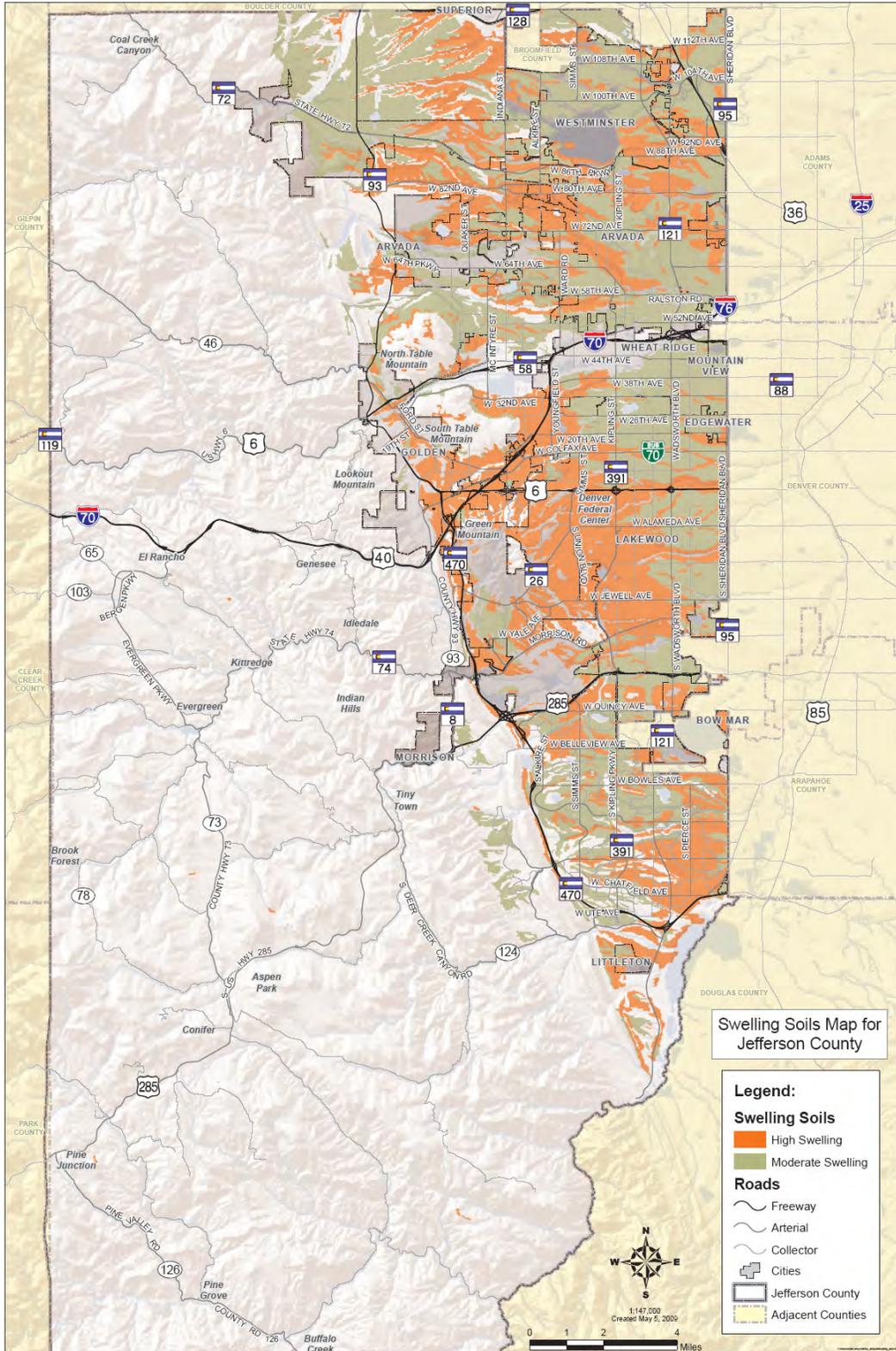
Geographic Extent

The extent of swelling soils across Jefferson County is primarily contained in the developed portion of the County at the base of the foothills in the northeast portion of the planning area and, in fact, neatly follows the rise of the Rocky Mountains along the western and southern portions of the County. The extent of dipping bedrock in the planning area neatly abuts the extent of the mostly horizontal plains of swelling soil on the east, and the fall of the hogback formations on the west. The figures below demonstrate the mapped geologic hazard layers utilized by the planning area for development.

Previous Occurrences

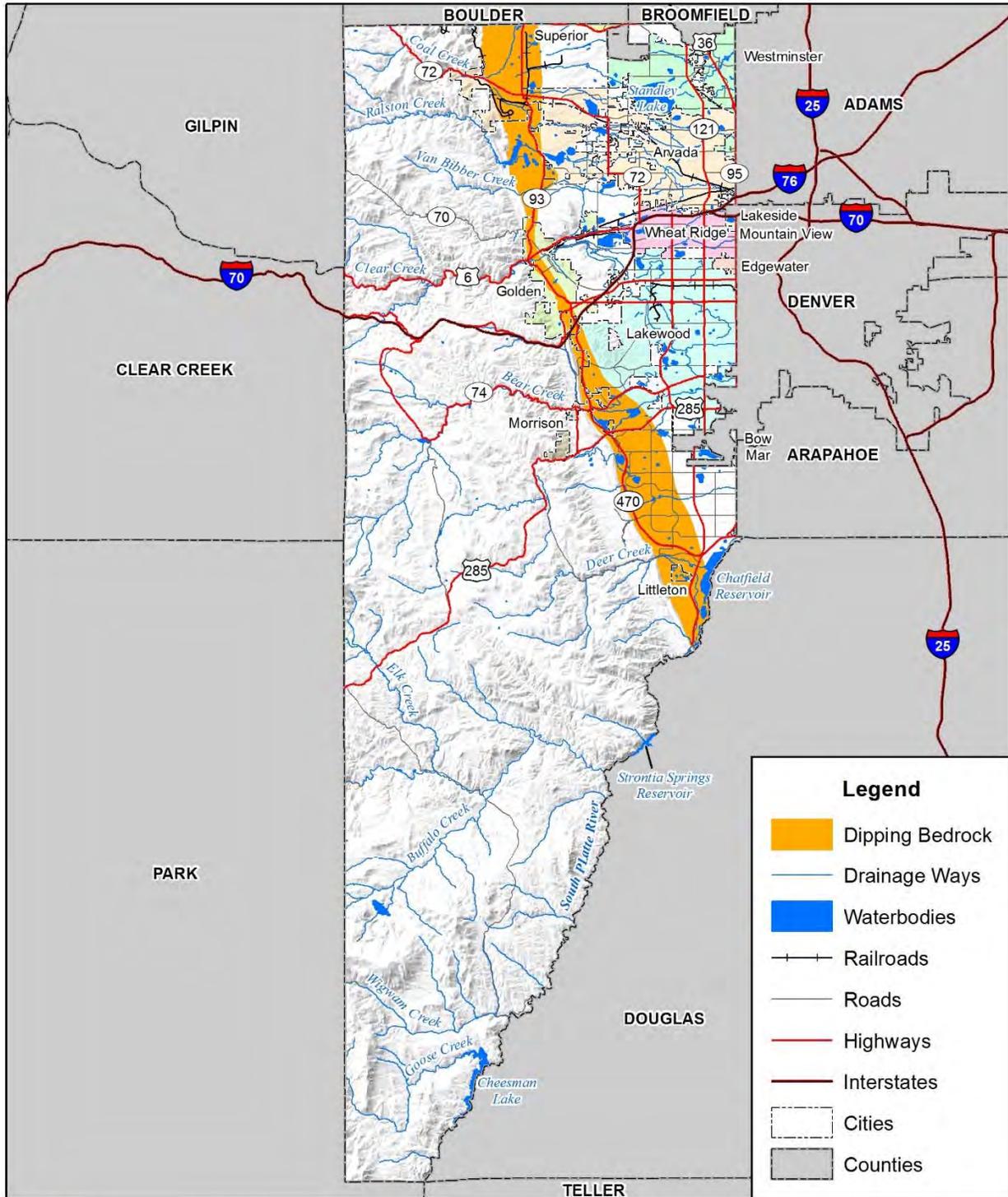
Damage of varying degrees of severity occurs on an ongoing and seasonal basis. The frequency of damage from expansive soils is associated with the cycles of drought and heavy rainfall and also reflects changes in moisture content based on typical seasonal patterns. Building codes and structure ages also contribute to overall damages, as newer structures are usually built with more resistant techniques or as development restrictions in vulnerable areas minimize expansion and exposure. Published data summarizing damages specific to Jefferson County is not available, but it is acknowledged that a certain degree of damage to property and infrastructure occurs annually, as noted above.

Figure 4.9. Jefferson County Swelling Soils



Source: Jefferson County Land Use Plan

Figure 4.10. Jefferson County Dipping Bedrock




 Map compiled 10/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD

Since the last plan update, the most significant areas that intersect Golden and Morrison remain largely undeveloped; however, growth in western Arvada, unincorporated areas along Highway 93, and in Lakewood since the last update exposes new development to this hazard. It is important to note that recent development east of Highway 93 in West Arvada and north of Golden was not reflected in the 2015 parcel and associated databases; once added, it is estimated that considerable exposure will be identified for these areas.

The mapped extent of the hazards clearly impacts approximately 50% of the planning area. However, when considering the geographic impact on the planning area, it is important to note that the entire southern portion of the County is occupied by Pike National Forest, and therefore has a minimal impact on this hazard mitigation plan as development in the area is highly regulated outside of County authority. Of the actively developed and monitored lands in the County, more than 75% is subject to swelling soils or dipping bedrock hazards.¹⁹

Based on this information, the geographic extent rating for swelling soils is **extensive**.

Probability of Future Occurrences

The planning area has extensive development regulations to minimize the damages incurred by dipping bedrock and other geologic hazards in the County. As such, while previous occurrences are certainly commonly known, it is reasonable to assume that damages and future occurrences should be decreasing.

Since records of specific occurrences are not available to the planning process, it is difficult to estimate the probability of future occurrences. The hazards occur seasonally and annually, which should theoretically equate to a highly **likely** rating. However, mitigation efforts in place in the County since 1995 should prevent the likelihood of the hazard having damaging impacts. Due to the extensiveness of swelling soils in the County the probability rating for this hazard is considered as **likely**.

Magnitude and Severity

In order to calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it is a reflection of common occurrence. For this hazard, there is no specific event of record, and the extensive mitigation efforts taken since the initial identification of the hazard nearly thirty years ago are taken into account with the magnitude and severity ratings. Therefore, this hazard will be evaluated for potential worst-case scenarios possible under current regulatory standards. Such an event could potentially damage entire neighborhoods, including roads,

¹⁹ This is not to imply that the Pike National Forest has a significant expansive soils hazard rating. Indeed, the area has a minimal overlapping of the hazard area (identified in the maps above) and the forested land. The point is to emphasize that the hazard impacts most of the planning area that is currently or may be developed, even if that rating does not correspond to the strictest definition of 'geographic extent'.

sidewalks, properties, and utility pipes. Even minor damages on such a scale would quickly incur enormous costs. While critical infrastructure services are not directly vulnerable to the hazard, structures experience the same risks identified for private and commercial properties: if they are built on swelling soil without adequate or appropriate building mitigation, they are vulnerable to damage. In worst case scenarios, this could include loss of communication lines or severe damages to structures rendering them uninhabitable. If this occurred to a hospital or jail, for instance, it could have significant social repercussions, in addition to the incurred costs. Injuries, illnesses and deaths associated with the hazard would be unique and minimal, and probably incurred as secondary hazards resulting from damages to infrastructure. Overall, though the fiscal damage may be extensive, the overall severity and impacts of the hazard are readily mitigated, reducing the overall impacts.

Based on these factors, the magnitude and severity rating for swelling soils is considered **limited**.

Overall Hazard Significance

Swelling soil in Jefferson County has, historically, exerted significant impacts on the County, particularly during the large growth expansion experienced between 1970 and 1995. In response to the growing hazard, Jefferson County formed and convened an Expansive Soils Task Force in the spring of 1994, and implemented development regulations by 1995.²⁰ As a result, the impacts of the hazards in the planning area have been extensively mitigated, either by restricting where development is permitted or by heavily regulating the type of construction permitted in certain areas to adequately address the hazard. The geographic extent of the hazard is considered extensive. The probability of future occurrences is considered **likely** and the magnitude/severity for the event of record is limited. In addition, the HMPC considers the hazard to have a low overall impact on the jurisdiction. This equates to an overall impact rating of **medium**. In many ways, the swelling soils hazard is an excellent example for demonstrating the effectiveness of how mitigation efforts may reduce the vulnerabilities and risks of a previously high-concern hazard. Sound planning and engineering practices should keep the impact to future development low, however the potential for damages exist in older residential areas.

4.2.8 Extreme Temperatures

Description

Extreme Heat

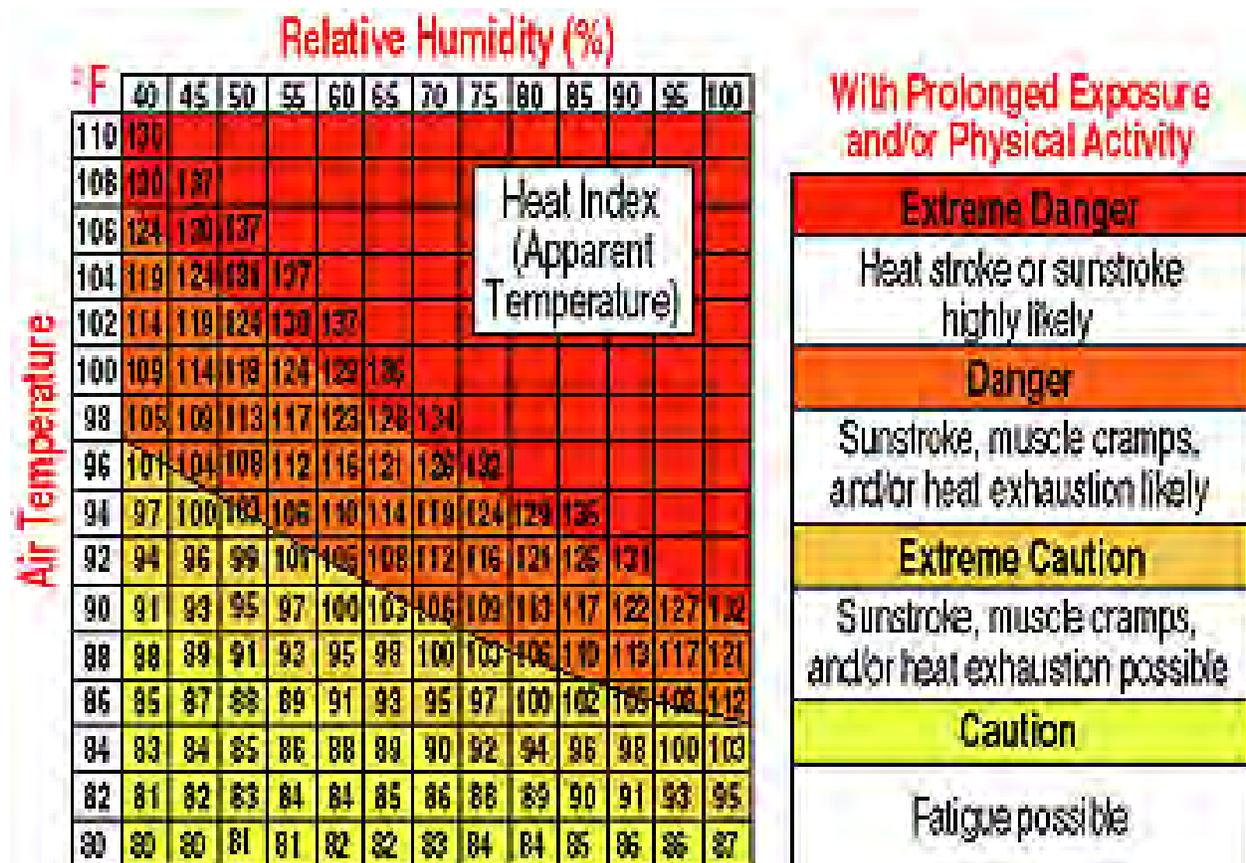
According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of summer heat. According to the National Weather Service (NWS),

²⁰ David C. Noe, *Heaving –Bedrock Hazards, Mitigation, and Land-Use Policy: Front Range Piedmont, Colorado*. Published 1997, available online at http://www.surevoid.com/surevoid_web/soils/pub45.html Last accessed September 30, 2009.

among natural hazards, only the cold of winter—not lightning, hurricanes, tornadoes, floods, or earthquakes—takes a greater toll. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the heat wave of 1980, more than 1,250 people died.

Heat disorders generally have to do with a reduction or collapse of the body’s ability to shed heat by circulatory changes and sweating or a chemical (salt) imbalance caused by too much sweating. When heat gain exceeds the level the body can remove, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body’s inner core begins to rise and heat-related illness may develop. Elderly persons, small children, those with chronic illnesses, those on certain medications or drugs, and persons with weight and alcohol problems are particularly susceptible to heat reactions, especially during heat waves in areas where moderate climate usually prevails. The chart below illustrates the relationship of temperature and humidity to heat disorders.

Figure 4.11. National Weather Service Heat Index



Source: National Weather Service

Note: Heat Index (HI) values were devised for shady, light wind conditions. Exposure to full sunshine can increase HI values by up to 15°F. Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

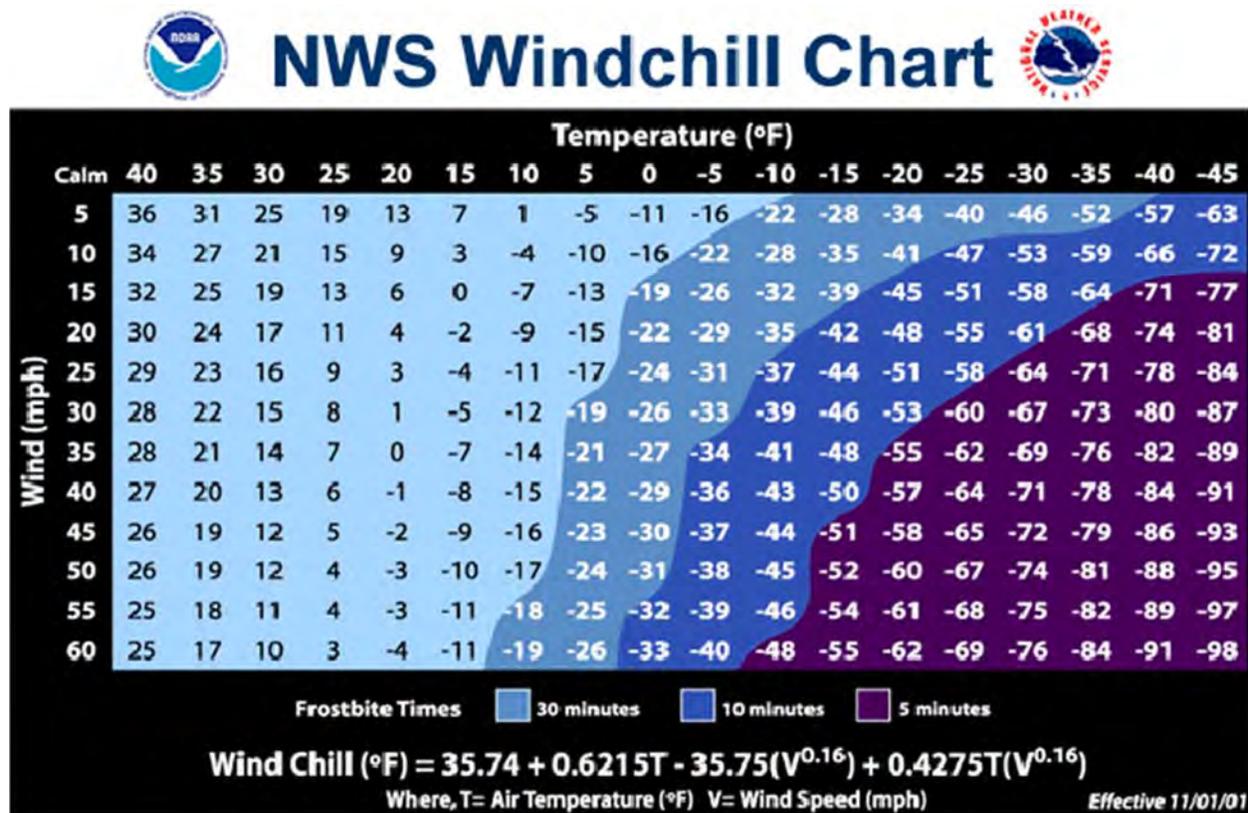
The NWS has in place a system to initiate alert procedures (advisories or warnings) when the Heat Index is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. A common guideline for the issuance of excessive heat alerts is when the maximum daytime high is expected to equal or exceed 105°F and a nighttime minimum high of 80°F or above is expected for two or more consecutive days.

Extreme Cold

Extreme cold often accompanies a winter storm, or is left in its wake. It is most likely to occur in the winter months of December, January, and February. Prolonged exposure to the cold can cause frostbite or hypothermia, and can become life-threatening. Infants and the elderly are most susceptible. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Extreme cold can disrupt or impair communications facilities.

In 2001, the NWS implemented an updated Wind Chill Temperature index (see Figure 4.12). This index was developed to describe the relative discomfort/danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 4.12. National Weather Service Wind Chill Chart



Source: National Weather Service

Jefferson County is located along the foothills of the Rocky Mountains and encompasses the West Denver Metro area municipalities of Arvada, Golden, Lakewood, Lakeside, Morrison, Mountain View, Westminster and Wheat Ridge. It experiences similar temperate climate to the remaining Denver Metropolitan Area, although areas of higher elevations like Kittredge, Evergreen, Idledale, and the unincorporated rural mountain areas are more susceptible to extreme variations, which can pose a danger to those citizens that may be more vulnerable and certainly so if those extremes temperatures are extended.

Geographic Extent

As discussed earlier, the inherent nature of temperature hazards makes them a regional threat, impacting most or all of the planning area simultaneously as well as extending the effects into the surrounding jurisdictions. This is reflected in the previous occurrence record, which consistently discusses the Denver Metro Area, rather than singling out particular counties or communities.

Based on this information, the geographic extent rating for extreme temperatures is **extensive**.

Previous Occurrences

According to the 2013 State Hazard Mitigation Plan, the Denver Metro Area averages 33 days a year with temperatures above 90°F. During 2008, Denver's 87 year-old record for the number of consecutive days above 90 degrees F was broken. The new record of 24 consecutive days surpassed the previous record by almost a week. On August 1st, it reached 104 degrees, breaking a record set in 1938 and on August 2nd, it reached 103 degrees, breaking a record set in 1878.

By contrast, the Denver Metro area averages 156 days a year with a minimum temperature of 32°F or less. The highest recorded temperature for Jefferson County is 103°F, and the lowest is -41°F.

Since temperature variations are a regional hazard, many of the previous occurrences are documented at a regional level as well. For example, between 1996 and 2014 the NCDC database reflects 1 incident of extreme temperatures for Jefferson County (extreme cold/wind chill in 2011), but documents 8 incidents in neighboring Denver County. Therefore, the incidents below impact more than just the planning region.

1983 - A cold spell impacted the entire Metro area with readings dipping to -21°F, marking the coldest recorded temperature in 20 years.

1989 - Periods of extreme cold and high winds combined with snow created a severe storm scenario. Stapleton Airport was closed and a 46-car pileup occurred on Interstate 25. More details on this storm are captured in Section 4.2.13.

April 11, 1995 - Extreme cold was reported across the region with temperatures recorded at 13°F. Damages to wheat crops in Arapahoe County were estimated at \$1 million (\$1.4 million in 2008 dollars).

December 16-18, 1996 - Extreme wind chills impacted the entire Front Range and plains regions. Lows in the Denver area were reported at -9°F. A homeless man found in his car, with a body temperature of only 85°F at the time, died a few hours later.

October 24-25, 1997 - A blizzard left snow up to 4' deep in the foothills and wind gusts were documented at 70 mph. With wind chill, temperatures dropped to between -25°F and -40°F. A State of Emergency was declared, with five recorded deaths and 15 injuries.

December 18-24, 1998 - An arctic air mass settled in over northeastern Colorado dropping overnight temperatures well below zero for 6 consecutive days. Overnight temperatures bottomed out at -19°F on the morning of the 22nd. At least 15 people, mostly homeless, were treated for hypothermia at area hospitals. The bitter cold weather was responsible, either directly or indirectly, for at least 5 fatalities. Three of the victims died directly from exposure. The cold weather also caused intermittent power outages. Following the cold snap, thawing water pipes cracked and burst in several homes and businesses causing extensive damage. Damage estimates were unavailable.

June and July 2000 - June 29th marked the beginning of a near record hot streak for the Denver area. The maximum high temperature at Denver International Airport equaled or exceeded the 90°F mark for 17 consecutive days, from June 29th-July 15th; one day short of tying the all-time record. The record of 18 consecutive days was set in two different years, July 1st-18th, 1874 and July 6th-23rd, 1901.

February 1-4, 2011 - A frigid Arctic air mass settled into the Front Range Urban Corridor to start out the month. At Denver International Airport, overnight low temperatures on the 1st through the 3rd were 13 and 17 below zero and zero respectively. The icy temperatures caused pipes to crack and burst following the freeze. At the county courts administration building in Jefferson County a steady stream of water from a crack on the 5th floor went unnoticed and flooded all floors of the administration wing overnight. As a result, much of the office equipment, furniture and carpet sustained water damage. The icy temperatures also forced the closure of several school districts.

According to the National Weather Service Forecast Office for Denver/Boulder, there have been 82 streaks with temperatures of 90 degrees or greater since 1895, which accounts for more than 150 days of extremely hot temperatures in the metro area.²¹ In addition, as of August 2008, the area documented 68 days with temperatures above 100°F and 29 days with temperatures below -20°F between February 2008 and 1872.²²

²¹ National Weather Service Weather Forecast Office for Denver/Boulder CO: <http://www.crh.noaa.gov/bou/?n=consec90>

²² National Weather Service Weather Forecast Office for Denver/Boulder CO: <http://www.crh.noaa.gov/bou/?n=tempxtrm>

Probability of Future Occurrences

Temperature extremes occur on a regular basis, with an average of 33 days a year exceeding 90°F and more than 150 where temperatures dip below freezing (32°F). Severe incidents or prolonged exposures to a temperature extreme are a higher threat to the community than isolated, seasonal occurrences. The information used in calculating the probability of future occurrences is drawn from the 2013 State Hazard Mitigation Plan and combines extreme heat and extreme cold incidents together. The data begins in 1934 but only extends through 2000. This data does not include incidents of severe winter storms or droughts which could include extreme temperature deviations. Therefore, this rating may actually be a low percentage of occurrences.

There have been 21 incidents of extreme temperatures in Jefferson County since 1934. The methodology for calculating the probability of future occurrences is described in Section 4.2.1. This formula evaluates that the probability of a severe temperature extreme occurring in any given year is 26%. This corresponds to a probability of future occurrences rating of **likely**.

Magnitude and Severity

In order to calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it is a reflection of common occurrence. Since temperature extremes refer to both extreme heat and extreme cold, there is not a single event of record. The event of record for extreme heat in Jefferson County occurred in the summer of 2000. While specific property damages are not available, the event coincided with a severe drought period, which caused extensive damages to crops and personal property, impacted overall water supplies, and caused economic damages due to both conditions. The event of record for extended periods of severe cold in Jefferson County occurred during December 18-24 in 1998. Damages caused by ruptured water pipes were considered extensive in both the private and public sectors. Power outages increased damages to property and impacted human lives. Hospitals documented a small surge in casualties either directly or indirectly attributed to the cold, and at least 15 injuries were reported. Five deaths were attributed to the cold weather as well, with three of them due directly to exposure. Nationwide, extreme temperatures remain the leading cause of weather-related deaths.

The Jefferson County Emergency Preparedness Guide addresses both of these temperature extremes, and notes that people living in urban areas may experience a greater risk from the effects of a prolonged heat wave than those living in rural areas, due to the impacts of heat on the atmosphere, air quality and temperature. In some cases, extreme heat incidents may lead to emergency water shortages, which are shorter in duration than a drought, but exhibit similar impacts and secondary hazardous situations.

A search of the Colorado Health Information Dataset further confirms these findings. The data is limited, as it only tracks hospitalizations due to extreme cold, and therefore does not represent extreme heat or non-hospitalized injuries. In addition, the data only ranges from 1995 to 2006 and

it tracks patients, not number of extreme temperature events. Still, according to the dataset, 68 individuals were hospitalized over an 11-year period, which averages to 6 hospitalizations a year. Of those 68 cases, 3 resulted in death and 8 in traumatic brain injuries and Jefferson County is not considered to have an anomalous number of reported incidents. This indicates that the impact of temperature extremes on exposed populations is critical.

Based on these factors, the magnitude and severity rating for temperature extremes is considered **limited**.

Overall Hazard Significance

Extreme temperatures in Jefferson County have a particular impact on the planning area. The risk to the population is the greatest, with exposure posing a significant threat to life and safety of residents. In addition, potential damages to property as an indirect impact of the temperature, particularly during cold weather, are costly. Temperature extremes are often companions for other, more obvious hazards such as droughts and blizzards or other winter storms, and may have undocumented impacts in the community as well. The geographic extent of the hazard is considered **extensive**. The probability of future occurrences is considered **likely** and the magnitude/severity for the events of record is **limited**. The HMPC considers the hazard to have an overall impact rating of **low** on the County. Collectively, the data indicates that the overall impact rating for extreme temperatures is **low**.

The impacts of extreme temperatures on a population are still undergoing analysis within the scientific community. In past risk assessments, the hazards have often been classified under the associated disaster conditions that they are often present during, such as blizzards and droughts. In doing so, the overall significance of these hazards may still be underestimated. In the examination of the few documented impacts of the hazards on the County indicates that they are, indeed, stand-alone hazards that require attention and mitigation, where possible.

4.2.9 Flood

Description

A flood is an overflow or accumulation of an expanse of water that submerges land. Flooding may result from the volume of water within a river or lake which escapes its normal boundaries. While the size of a lake or river will vary with seasonal changes in precipitation and snow melt, it is not a significant flood unless such escapes of water endanger lives and property of inhabited areas along the waterway, which is referred to as the floodplain.

River (or stream) flooding is normally due to excessive high flows and the strength of the water-force that pushes it out of the river channel, particularly at bends or meanders. Businesses and homes along such rivers usually sustain significant damages. While flood damage can be virtually eliminated by moving away from rivers and other bodies of water, people continue to inhabit areas that are threatened by the flood hazard. Communities are strengthening their floodplain building

regulations, acquiring property along floodplains to turn into open space recreational areas, and designing flood control projects that better protect large populations.

Floods can be among the most frequent and costly natural disaster in terms of human hardship and economic loss. They are caused by a number of different weather events. Floods can cause injuries and deaths and substantial damage to structures, landscapes, and critical infrastructure and services. Certain health hazards are also common to flood events. Standing water and wet materials in structures can become a breeding ground for microorganisms such as bacteria, mold, and viruses. This can cause disease, trigger allergic reactions, and damage materials long after the flooding event is over.

Direct impacts such as drowning can be limited with adequate warning and public education about what to do during floods. Where flooding occurs in populated areas, warning and evacuation will be critical to reduce life and safety impacts.

Although heavy rainfall, especially in the form of cloudbursts, is alone capable of causing flash flooding, snowmelt combined with heavy rainfall can certainly increase the chance of flash flooding. Floods caused by rainstorms can peak within a few hours of the onset, and in less than an hour on smaller streams, leaving little time for evacuation.

Communities in Jefferson County are susceptible to various types of flood events as described below.

Riverine or Overbank Flooding

Riverine or overbank flooding is defined as *a watercourse that exceeds its “bank-full” capacity* and is usually the most common type of flood event. Riverine flooding generally occurs as a result of prolonged rainfall, or rainfall that occurs when soils are already saturated or drainage systems overloaded from previous rain events. The duration of riverine floods may vary from a few hours to several days and may exhibit a seasonal pattern over a course of years.

Factors that directly affect the amount of flood runoff include: 1) precipitation amount, precipitation intensity, frequency of precipitation, and its spatial and temporal distribution; 2) the saturation levels of the soils, variation in vegetation, erosion and/or bank stability, and the amount of impervious surfaces due to urbanization; and 3) snow-pack depth at higher elevations, rate of snow melt versus snow evaporation and transpiration, and the ratio or pattern of sunny hot days to cooler cloudy days. The weather pattern during peak runoff can be a major factor in whether a watercourse exceeds its capacity or not. Another critical consideration, though secondary to the flood event, is the presence of debris blocking a waterway, channel, bridge, or culverts. The debris can be recent build-up from current runoff or an accumulation long overdue for removal. In any case, debris can further aggravate a flood event.

Development can alter the natural environment, changing and interrupting natural drainage-ways. As a result, drainage systems can become overloaded more frequently intensifying the effects of flooding.

Figure 4.13 and Figure 4.14 show examples of recent riverine flooding in the County. In Figure 4.13 the Cottonwood trees in Bear Lake Park dramatically show the high water line from the September 2013 flooding. The leaves below the high water line were destroyed, leaving the tops of the trees untouched and still able to display their fall colors. During the height of the fall floods, the park's water level rose roughly 55 feet above normal. The park, more than 2,500 acres in size, suffered substantial damage due to the high water level, but functioned as it was designed and protected many people and properties downstream.

Figure 4.13. High Water Mark from September 2013 Flooding in Bear Lake Park



Source: CASFM and Lakewood resident Carole Kaune

Figure 4.14. South Platte River at Trumbull Bridge Hwy 67 June 17, 2015



Source: Jefferson County Emergency Management

The most serious overbank flooding occurs during flash floods. They result from intense rainstorms, or following a dam or levee failure. The term “flash flood” describes localized flooding as an incident of *sizable peak flow and magnitude, in conjunction with quick onset and short duration*. Flash floods usually results from a heavy rainfall on a relatively small drainage areas can occur very quickly with little or no warning; locally, these are known as “cloudburst” storms. In contrast, frontal-type rainstorms or snowmelt runoff are more regional in nature, result from moderate rainfall or snowmelt over large areas. Though rain-on-snow flooding can occur, it is fairly infrequent in the Colorado Front Range (and Colorado in general), and does not produce maximum flooding. Flash flooding usually results from a heavy rainfall on a relatively small drainage area occurring very quickly with little or no warning. With residential and businesses development along these small drainages combined with the quickness of an overbank-type flash flooding, evacuation can be difficult. Early warning systems that include automated detection of heavy rainfall and stream level changes are imperative for the public’s safety in these types of developed drainage-ways.

Gulches/Irrigation Ditch/Canal Flooding

Jefferson County has numerous valleys, gulches and creeks, canyons and draws, irrigation ditches, and canals used to convey water collected in the mountain reservoirs to downstream users. Ditches

convey irrigation water along hillsides, following contours and, as a result, cut across the natural drainage pattern of stormwater runoff flowing down hillsides. Although efforts are made to separate stormwater runoff and irrigation water, excessive runoff can flow into an irrigation ditch causing overbank flooding or a collapse of the ditch itself. Similar to flash floods, there is often little warning for these types of events.²³

Urban or Street Flood Events

Urban or street flood events occur due to the conversion of land from undeveloped areas to surfaces appropriate for roads, parking lots, and other types of site development needs. This is called *urbanization*, which is the reason that a soil's ability to absorb water is reduced. When soil is subjected to an excessive amount of water in an accelerated timeframe, it cannot balance the rate of absorption. Urbanization increases runoff two to six times over what would occur on natural terrain. Underpasses, street flooding and yard ponding usually do not exceed more than a foot or two and are often viewed more as a nuisance than a major hazard. However, in some localized urban areas, larger flood velocities and depths, which can develop as rapidly as flash floods, can produce extremely hazardous conditions to the public and block vehicular traffic. Stormwater drainage systems may or may not be adequate enough to handle the incoming flow. Impervious surface studies can be conducted to assess runoff levels, which can identify areas of increased risk or threat as well as the need for improved capture of stormwater runoff.

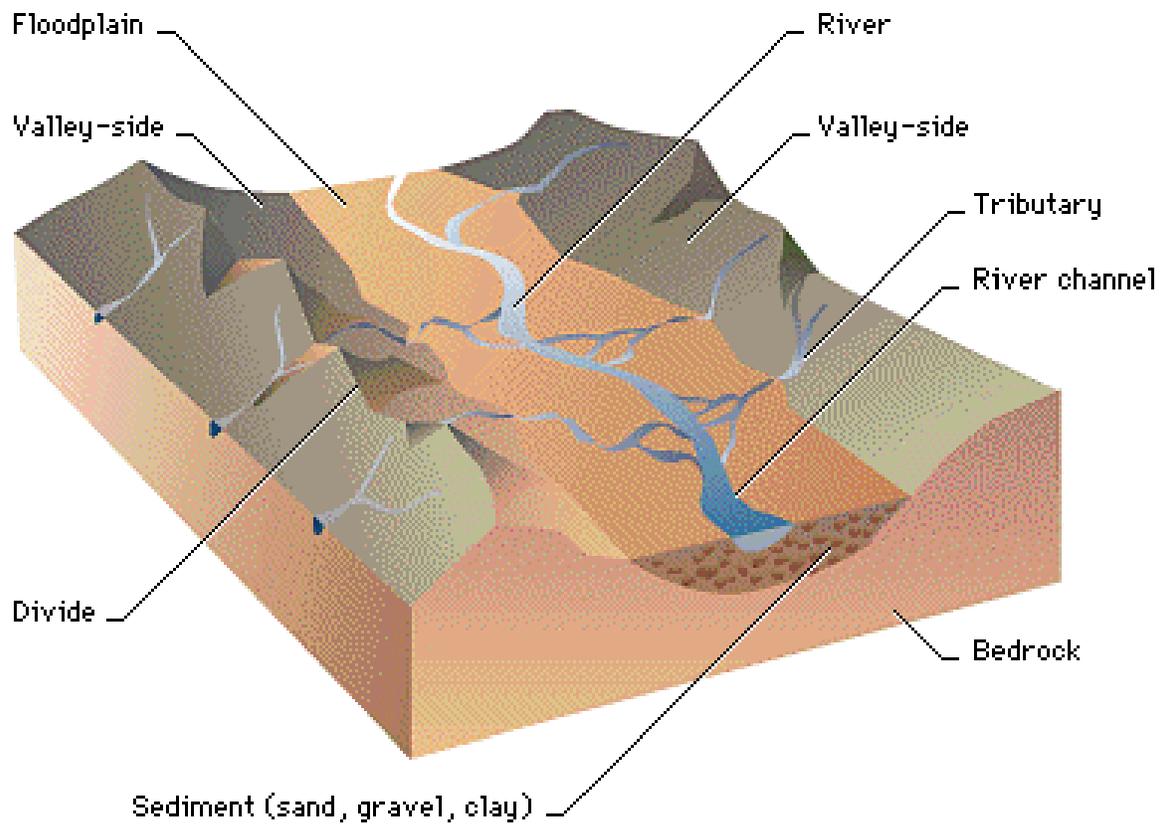
Floodplain

A floodplain is flat or nearly flat land adjacent to a stream or river that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which are areas covered by the flood, but which do not experience a strong current.

Floodplains are made when floodwaters exceed the capacity of the main channel or escape the channel by eroding its banks. When this occurs sediments (including rocks and debris) are deposited that gradually build up over time to create the floor of the floodplain. Floodplains generally contain unconsolidated sediments, often extending below the bed of the stream.

²³Topographic Map Valley Features in Jefferson County, Colorado.

Figure 4.15. Floodplain Topography



Regulated floodplains are illustrated on inundation maps called Flood Insurance Rate Maps (FIRM). FIRM maps are currently being replaced with Digital Flood Insurance Rate Maps (DFIRM) as part of FEMA’s map modernization project. The Jefferson County DFIRM is current as February 5, 2014. It is the official map of a community on which the Federal Emergency Management Agency (FEMA) has delineated both the special flood hazard areas and the risk premium zones applicable to the community. Private citizens and insurance agents use FIRM’s to determine whether or not specific properties are located within the FEMA defined flood hazard zones.

Each of the flood zones that begins with the letter ‘A’ depict the Special Flood Hazard Area, or the 1% annual chance flood event (commonly referred to as the 100-year flood). Table 4.8 explains the difference between mapped flood zones.

Table 4.8 Flood Hazard Zones

Flood Zone	Description
1% Annual Chance	100-year Flood: Also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year.
Zone A	100-year Flood: No base flood elevations provided
Zone AE	100-year Flood: Base flood elevations provided
Zone AO	100-year Flood: Sheet flow areas, base flood depths provided
0.2% Annual Chance or Shaded Zone X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depth of less than 1 foot or with drainage areas less than 1 square mile; and areas protect by levees from 1% annual chance flood
Zone D	Areas in which flood hazards are undetermined, but possible
Zone X	Areas determined to be outside the 0.2% annual chance floodplain

Source: FEMA

Community officials use DFIRM’s to administer floodplain management regulations and to mitigate flood damage. Lending institutions and federal agencies use FIRM’s to locate properties and buildings in relation to mapped flood hazards, and to determine whether flood insurance is required when making loans or providing grants following a disaster for the purchase or construction of a building.

The floodplain most often refers to that area that is inundated by the *100-year flood*. The term “100-year flood” is misleading. It is not the flood that will occur once every 100 years. Rather, it is the flood elevation (or depth) that has a 1- percent chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. The 100-year flood, which is the minimum standard used by most Federal and state agencies, is used by the National Flood Insurance Program (NFIP) as the standard for floodplain management and to determine the need for flood insurance. Over a 30-year period (the term of a typical home mortgage), a structure located within a special flood hazard area has a one-in-four chance of experiencing the flood depicted on the NFIP map. The chance is even more likely that a damaging flood of lesser magnitude will occur, while the possibility of a much larger flood is also quite real. Extreme events have been measured at many locations that exceed the magnitude of the 100-year flood by three times or more. Figure 4.16 illustrates a 100-year floodplain. Figure 4.17 shows the 100-year floodplains in Jefferson County. Only major streams are highlighted; however, flooding can occur in any channel or drainage in the County.

Figure 4.16. 100-year Floodplain

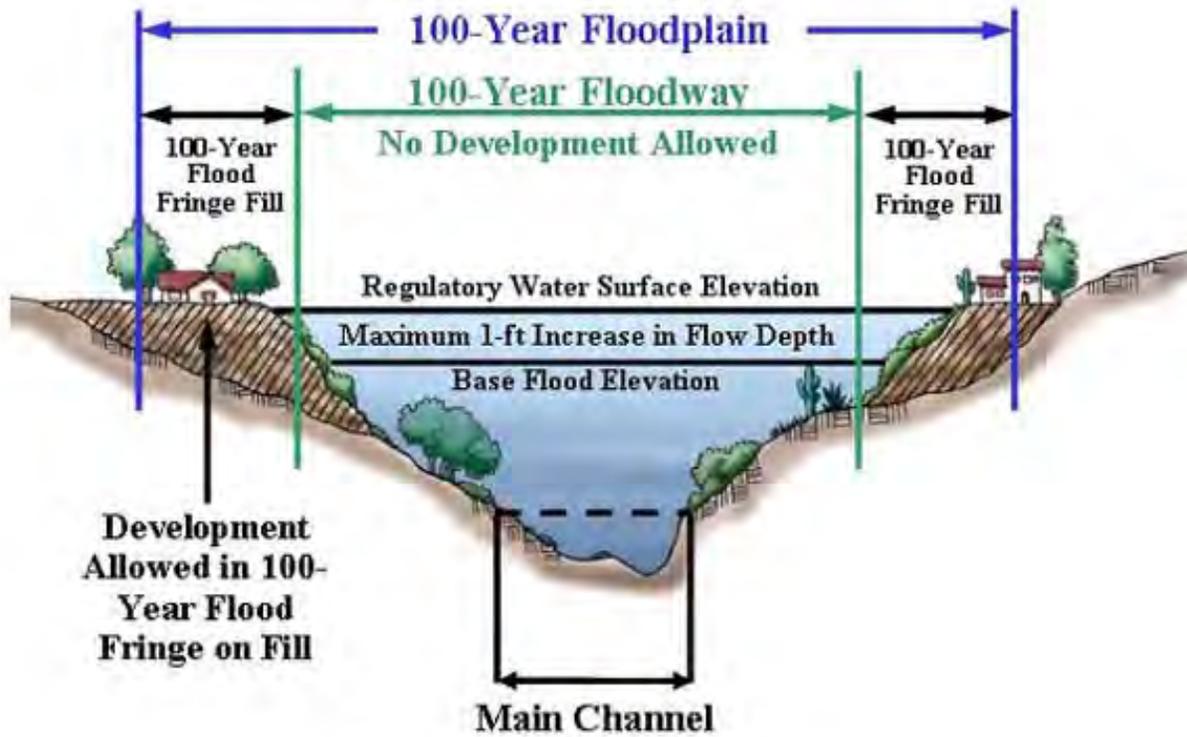
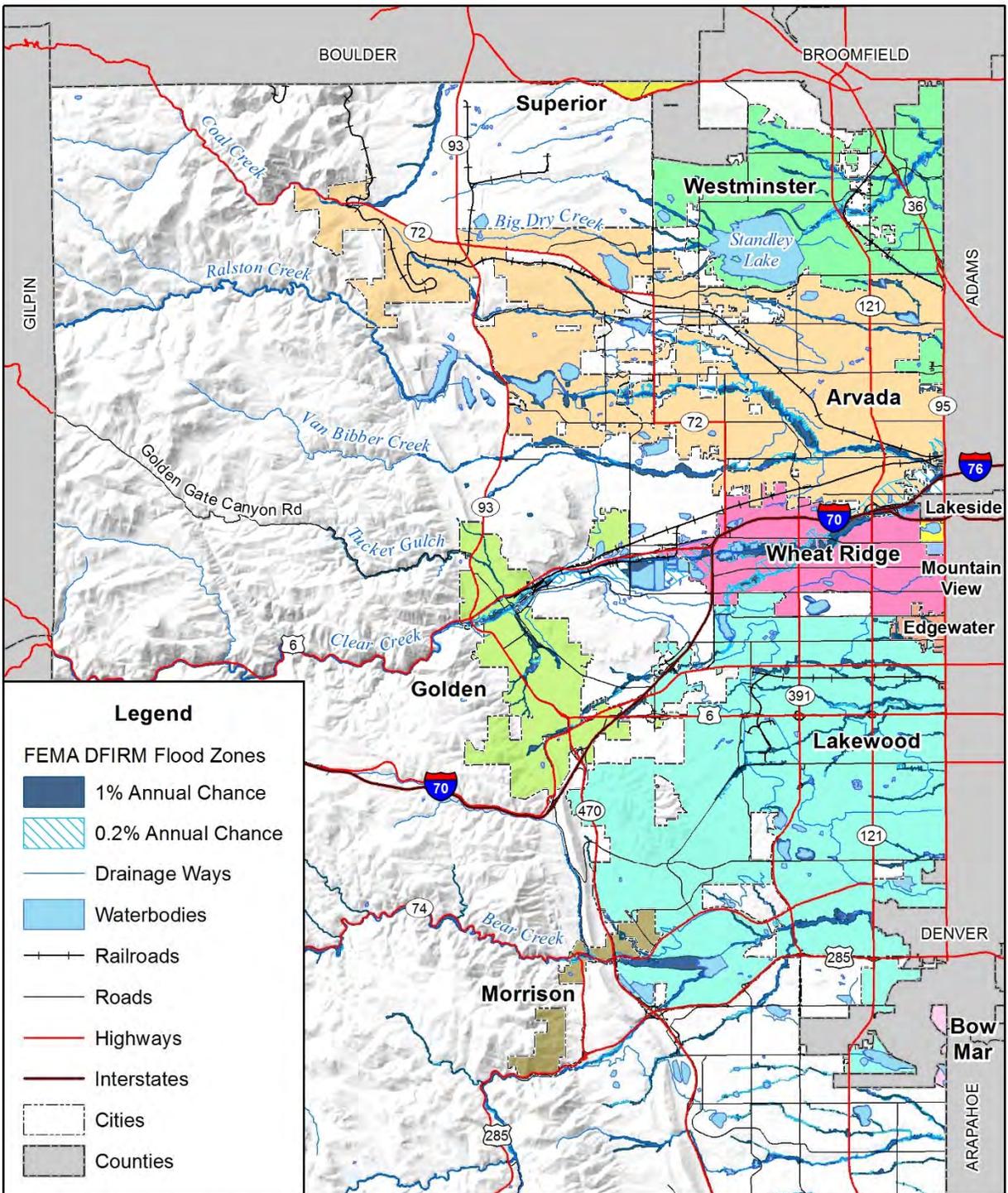
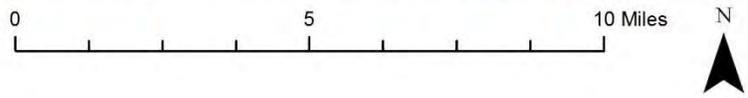


Figure 4.17. Jefferson County Flood Hazard Map (North Half)




 Map compiled 10/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD, FEMA DFIRM 02/05/2014



Geographic Extent

Jefferson County has multiple creeks, tributaries, and associated floodplains that comprise the geographic extent of flooding throughout the planning area. It is a region heavily influenced by snow and rain patterns in the mountains that flow downstream to a heavily urbanized area in the foothills and plains. Abbreviated snow melts can cause flooding along these creeks and tributaries and they can swell to many times their size after large amounts of rainfall in a short period of time. This overwhelms the smaller channels quickly, which in turn impacts downstream populated areas with little or no warning. As mentioned above, the Buffalo Creek and Hayman burn areas were stripped of vital vegetation ground cover, which is imperative for natural flood mitigation. With soils scorched and stripped of their nutrients and cohesiveness, the areas became more susceptible to flash flooding immediately after the wildfire devastation. It has continued to be a secondary impact issue ten years after the initial incident. In fact, two deaths occurred in the North Fork fire district (Pine Junction area) from secondary flash flooding within weeks after the fire, which caused massive debris flows where innocent people were caught in their paths. Debris flows of this magnitude are attributed to the inability of depleted soils and lack of ground vegetation to hold back the runoff, and thereby normal rainfall precipitation can become a wall of moving earthen debris. See more description of debris flows in the landslide, debris flow and rockfall hazard profile.

The geographic extent rating for flooding is **limited** as it is within 10% to 25% of the County's area. The following section details the extent and history of flood hazards by the major watersheds in the County including Bear Creek, Clear Creek, South Platte River, Turkey Creek, and Ralston Creek.

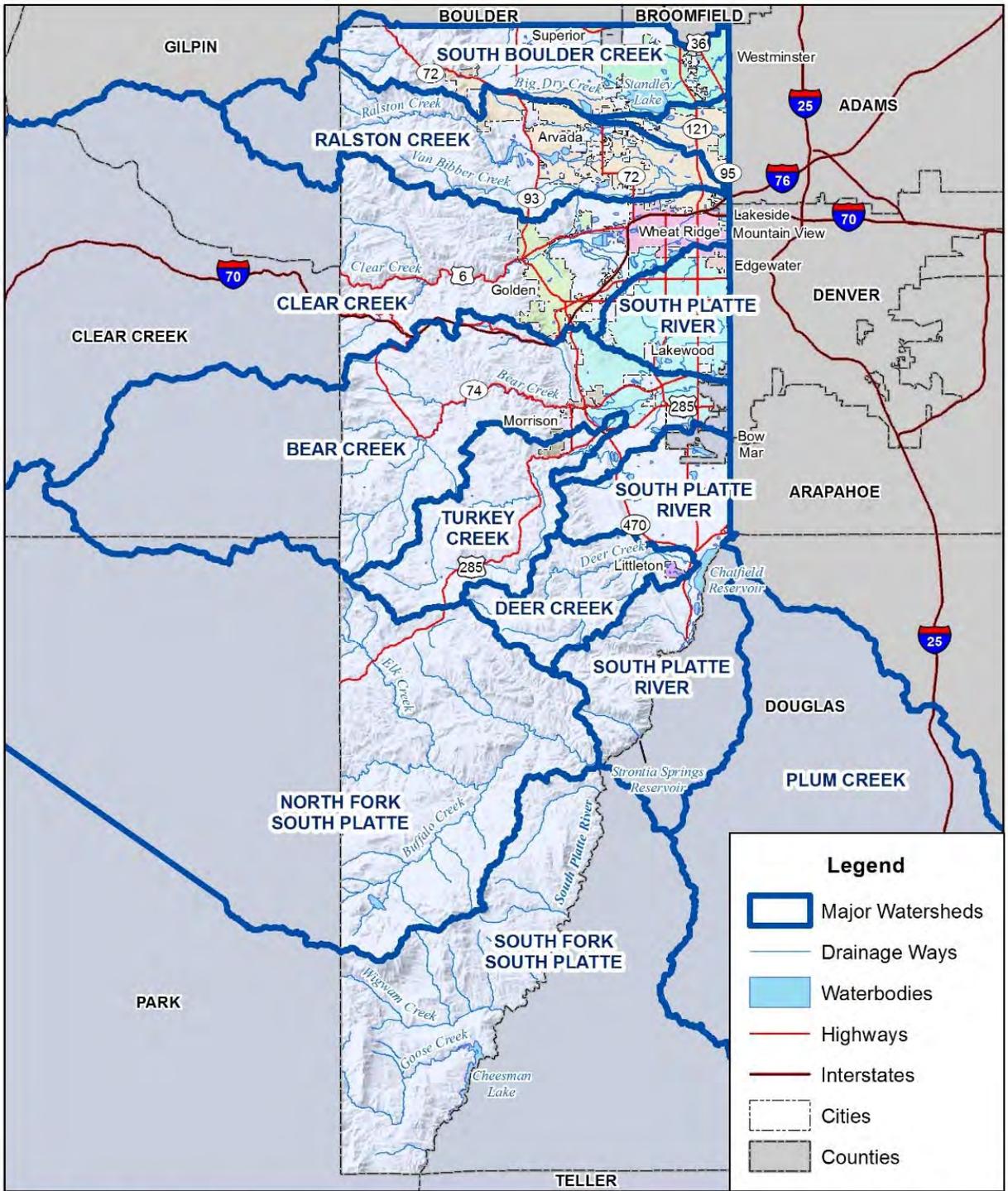
Watershed Drainage Systems

A watershed is an area of land that gets drained by a river and its tributaries. While there are many definitions, scientist and geographer John Wesley Powell put it succinctly when he said that a watershed is: *"...that area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course and where, as humans settled, simple logic demanded that they become part of a community."*

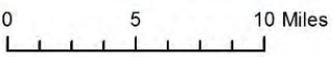
A watershed's boundaries are defined by areas of higher elevation, such as a ridge or mountain range, from which rain and snow melt runoff flows toward a common low point. In this hazard profile, since the planning area includes unincorporated Jefferson County and its municipalities, the flood history or occurrences are identified by watershed or areas impacted to indicate locations with a higher flood hazard risk. The association between wildfire impacted areas and floods as secondary impacts are also discussed.

Figure 4.18 illustrates the watersheds in Jefferson County.

Figure 4.18. Watershed Map



amec foster wheeler
 Map compiled 11/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD



South Platte River Watershed

The South Platte River Watershed begins high up in the Rocky Mountains at the origin of the South Platte River, and encompasses 28,068 square miles in Colorado, of which the Denver metro area sits squarely in the middle. Jefferson County is located west of Denver and makes up the west metro area Denver suburbs of Lakewood, Golden, Wheat Ridge, Edgewater, Mountain View, Lakeside, Arvada, Westminster, parts of Littleton, and Bow Mar. The foothills communities include the town of Morrison, unincorporated Evergreen, and various urban interface communities along I-70.

The Denver region covers about 535 square miles, all of which are in the South Platte River Watershed. The South Platte River is the main artery of the watershed, and is fed by the many creeks, lakes and minor tributaries that come down from the mountains and hills that surround Denver. Some of these tributaries include South Fork, Middle Fork, North Fork, Clear Creek, Bear Creek, Cherry Creek, and Sand Creek. Clear Creek and Bear Creek run through Jefferson County as they descend from the mountains to the plains. The water that fills Denver’s lakes also eventually makes its way into the streams. In addition, drainage ditches, intermittent streams and, most critically, storm sewers, empty into the watershed. Figure 4.19 illustrates the South Platte River Basin Watershed.

Figure 4.19. South Platte River Basin Watersheds



Source: United States Geological Survey

South Platte River

Description

The South Platte River is one of the two principal tributaries of the Platte River and itself a major river of the American West located in Colorado and Nebraska. It drains much of the eastern flank of the Rocky Mountains in Colorado, as well as much of the populated region known as the Colorado Front Range and Eastern Plains. The South Platte forms the Platte at its confluence with the North Platte River in western Nebraska. The river serves as the principal source of water for eastern Colorado. Its valley along the foothills in Colorado has provided for agriculture in an area of the Colorado Piedmont and Great Plains that is otherwise arid. Its drainage basin also includes a portion of southeastern Wyoming in the vicinity of the city of Cheyenne.

The river is formed in Park County, Colorado southwest of Denver in the South Park grassland basin by the confluence of the South Fork and Middle Fork, approximately 15 miles southeast of Fairplay. Both forks rise along the eastern flank of the Mosquito Range, on the western side of South Park, which is drained by the tributaries at the headwaters of the river. From South Park, it passes through Platte Canyon, which is a deep narrow scenic gorge. The canyon is southwest of Denver on the border between Jefferson and Douglas counties. The canyon, approximately 50 miles in length, also receives the North Fork through the Rampart Range before it emerges on the Eastern Plains where it is impounded to form Chatfield Reservoir, a source of drinking water for the Denver Metropolitan Area.

The river flows north through central Denver, which was founded along its banks at its confluence with Cherry Creek. The valley through Denver is highly industrialized, serving generally as the route for both the railroad lines, as well as Interstate 25. On the north side of Denver it is joined somewhat inconspicuously by Clear Creek, which descends from the Continental Divide through Clear Creek County following Interstate 70 and Hwy 6 through Clear Creek Canyon entering Jefferson County west of the City of Golden flowing past the Coors Brewing Company. North of Denver the South Platte River flows through the agricultural heartland of the Eastern Plains or Piedmont region (rock formations of sandstone, shale, and limestone that was formed by ocean deposited sediments through erosion of the ancestral Rockies). It flows directly past the communities of Brighton and Fort Lupton, and is joined in succession by Saint Vrain Creek, the Little Thompson River, the Big Thompson River, and the Cache la Poudre River, which it receives just east of Greeley.

East of Greeley it turns eastward, flowing across the Colorado Eastern Plains, past the towns of Fort Morgan and Brush, where it turns northeastward, flowing past the town of Sterling and into Nebraska near the town of Julesburg. In Nebraska, it passes south of the town of Ogallala and joins the North Platte near the town of North Platte, Nebraska.

In an urban area where millions of people live and work, the cumulative actions of a watershed's residents can have a powerful impact on the health of the watershed. On the other hand, in sparsely populated areas of wildland urban interface, careless human-caused wildfires can devastate a

watershed leaving it vulnerable to the ravaging effects of post-wildfire flooding. The following flood history is a more recent schedule of events that have occurred post Buffalo Creek, Hi Meadow, and Hayman wildfire burns.

South Platte Watershed Flood History

June 16, 1965 – In mid-June of 1965, heavy spring storms stalled over the Front Range, overwhelming the basins of the Arkansas and South Platte rivers. The magnitude of the rain, floodwaters and subsequent damage defied belief to those who did not witness the storms firsthand. Over three hours, 14 inches of rain fell at Castle Rock. The water was too much for the creeks and arroyos, picking up debris and scraping gouges in the western flank of Dawson Butte that are still visible today. At the juncture of Plum Creek and the South Platte, it was estimated that the river was 200 feet wide and 20 feet deep, moving at ten miles per hour and carrying 40 times its normal flow. In the *Report to the Colorado General Assembly*, total damages from the 1965 floods were estimated at \$397 million with 11 lives lost. Jefferson County emerged relatively unscathed with no officially reported monetary damage or lives lost. This was due to the limited length of the flooded river along the southern county border. Only about one mile of the South Platte River between Plum Creek and Wolhurst was flooded. At the time, this area was rural and sparsely populated.²⁴

July 12, 1996 – On May 18, 1996, a human induced wildfire burned nearly 12,000 acres of the Pike National Forest and surrounding private lands, destroying 10 dwellings and costing millions in suppression costs and property damage. Less than two months later, on July 12, 1996, a high intensity thunderstorm dumped approximately 2.5 inches of rain on the fire ravaged terrain causing severe flooding, which resulted in the washout of Jefferson County Highway 126 and the destruction of the Buffalo Creek community’s potable water system and telephone facilities. Major flood flows occurred along Sand Draw, Buffalo Creek, the North Fork of the South Platte River (North Fork) below its confluence with Buffalo Creek, Spring Creek (a tributary to the South Platte River just upstream from the North Fork South Platte River), and several other tributary streams in the area. The storm also resulted in the deposition of hundreds of thousands of tons of sediment into Strontia Springs Reservoir (15-year sediment load), the loss of miles of pristine riparian habitat along Buffalo Creek and Spring Creek drainages. Two lives were lost as a direct result of the flooding. Although the geographic area affected was smaller than in some other floods, the Buffalo Creek flash flood event was truly a disaster. Given the magnitude and quick onslaught of the flood flows, it is nothing short of a miracle that more people weren’t killed or injured. The flooding hazards and increased sediment loading potential associated with barren watersheds was dramatically evident at Buffalo Creek after July 12, 1996. Total damages were more than \$4.6 million.

²⁴ Adapted from Historically Jeffco 2014, “The Flood of 1965: Chatfield, Strontia, and Two Forks.” <http://jeffco.us/planning-and-zoning/historical-commission/publications/>

September 14, 1996 - Thunderstorms over southern Jefferson County brought more heavy rain to the Buffalo Creek area. Some minor roads were washed out by flash flooding but no other damage was reported.

July 28, 1997 - Some culverts in the Pine and Conifer areas were washed out due to heavy rainfall.

July 31, 1998 - Heavy rain, up to 3 inches in an hour, caused a flash flood along Buffalo Creek. Portions of County Road 126, just south of the town of Buffalo Creek, were washed out. The floodwaters nearly washed away the bridge as mud and debris slammed into the structure. It was 2 years earlier that a deadly flash flood rushed through the small town killing 2 residents. There was no loss of life or structures, however, large debris accumulations, and disrupting electric, phone and water service for the night. Debris flows were a problem for a number of other mountain towns that evening.

August 4, 1999 - Flooding and flash flooding problems developed over portions of the Urban Corridor as slow moving thunderstorms dumped anywhere from 2 to 3.5 inches of rainfall in approximately 3 hours. Numerous outages were reported with widespread blackouts in Thornton and Littleton. Along Massey Draw in Jefferson County, near Carr Street and Chatfield Reservoir, four homes were flood damaged and portions of their backyards washed out.

July 12, 2000 - Heavy rain fell across a portion of the Hi Meadow burn area near Buffalo Creek, causing localized flash flooding. Approximately three quarters of an inch (0.75) of rain fell in 30 minutes across Miller Gulch. Some culverts became plugged by debris from the fire. As a result, small sections of a forest service road along Miller Gulch were washed out.

July 17, 2000 - An estimated 2 inches of rain reportedly fell in less than an hour in Pine. As a result, two secondary roads in Buck and Miller gulches, in the Hi Meadows burn area, washed out. Water also covered County Road 68 which connects to Bailey. Homeowners in Pine Valley Estates attempted to divert some of the runoff by piling stacks of hay above their homes.

June 19, 2002 - July 21, 2002 – Six flash floods were reported over this 33 day period in the southern portion of the County. Locally heavy rainfall in the Hayman burn area washed out a secondary road. Debris associated with the runoff, blocked a culvert, forcing the water to wash out the road. Gulch Road, which connects to Forest Service Road 211 was washed out. Runoff from heavy rainfall in the Hayman burn area flooded Lost Creek Ranch with up to 18 inches of water, just off of State Highway 126. Floodwaters ruined a very expensive rug in the lodge. Also, a driveway to another local residence was washed out.

May 30, 2003 - Flash flooding was reported in the Hayman burn area in Jefferson County and in southwestern sections of Douglas County, as up to 1 inch of rain reportedly fell in 30 minutes. In Jefferson County, several access roads were washed out.

June 8, 2004 - Locally heavy rain caused flash flooding in the Hayman burn area. Up to a foot of water damaged sections of Trumbull Road and a maintenance road near Lazy Gulch.

August 29, 2007 - Heavy rain caused localized flash flooding in the Hayman burn area, in Southern Jefferson County. The flash flooding forced the closure of County Road 126 and Wigwam Road. Brush and Wigwam Creeks jumped their banks, leaving debris atop the roadway.

July 21, 2009 - Heavy rain produced mudslides in the Hayman burn area. Trees, stumps, sticks, debris, and decomposed granite came down with the mudslides. Most of the damage occurred from Six Mile Creek to Forest Service Road 211 above the Wigwam Fishing Club. Road crews had to totally restore shoulders and slopes and cleaned out ditches downstream of draws and ravines. The mudslides washed out a 250-ft stretch of one shoulder of State Highway 126, near the turnoff to Cheesman Reservoir, and a large section of guard rail was washed out.

September 2013 – Between September 11th and 14th, Colorado’s Front Range experienced major flooding and flash flooding. Storms began on September 9, when power was knocked out at the Jefferson County Administration and Courts Facility and in southern Golden, and west Colfax Avenue had to be closed due to torrential rain. Two days later, Highway 72 in Coal Creek Canyon was closed, as was Highway 93 a few days later. Many major roadways were closed by Friday, September 13th; voluntary and involuntary evacuations were in effect in Upper Bear Creek, below Leyden Dam, and from Morrison to Evergreen. Jefferson County’s Fairgrounds accepted more than 100 horses, five goats, and two llamas. Rockslides were a major concern in canyons, and prevention efforts occupied emergency crews throughout the foothills.

Bear Creek stood at 8.8 feet above normal flows by Friday night. All the water pouring down from its 164 sq. mile upper watershed was captured in Bear Creek Lake until Monday, September 16, when the Army Corps of Engineers finally began releasing some of the water into the lower drainage systems. By then, floodwaters had raised water elevations in the lake 53 feet, to a new record high of more than 5,600 feet. The previous record, set in 1995, was six feet lower. On September 17th, the Jefferson County Sheriff’s Office estimated damage to infrastructure countywide at a “preliminary” \$6,000,000, with 14 residences destroyed, 215 damaged, and 5,805 threatened. Two dozen commercial properties were damaged and another 24 threatened; 200 more “minor” structures were also affected or threatened.

Jefferson County, however, escaped the worst effects, which struck with full force in the northern Front Range. Across the 17 counties affected, eight people died, an estimated 1,500 homes were destroyed, thousands more damaged, and more than \$2 billion in costs incurred, largely by homeowners. Within the county, Coal Creek Canyon, Clear Creek, and Bear Creek were the hardest hit, as the effects of the storms dwindled southward. Clear Creek and Bear Creek remained torrential well into October, but service gradually began to be restored across the county. Most

roads and parks hit by flooding reopened within weeks, although repair efforts continued in some places for months after.²⁵

July 7, 2014 – Severe thunderstorms large hail and damaging winds across Arapahoe, Boulder, Elbert and Jefferson County. Heavy rainfall, nearly two inches in one hour, flooded several residences in Evergreen. In addition, several bridges along Forest Estate Road were washed out.

May 9, 2015 - Heavy rain and rising levels of South Turkey Creek washed out many driveways in Indian Hills.

June 14, 2015 - The combination of heavy rain and snowmelt caused minor flooding in southern Jefferson County. Road closures included West Platte River Rd from Buffalo Creek, and sections of South West River Rd and West Pine Creek Rd.

Watershed Health

Watershed health is of utmost importance after a devastating wildfire. There is evidence that a scorched area from wildfire can even attract atmospheric systems, which then dump its moisture on the same soils stripped of its natural defenses. The chances increase for secondary impacts of flooding, erosion, and sedimentation when an area has been burnt from wildfire. There are Federal and State program dollars used to focus on expediting the re-vegetation of wildfire impacted areas to help reduce the devastation of the secondary impacts of flooding.

Bear Creek Drainage Basin

Bear Creek, which rises in the mountains southwest of Denver, is a left bank tributary of the South Platte River. The total drainage area at the mouth is 261 square miles of which 164 square miles are upstream of Morrison. The basin, shown in Figure 4.18 includes parts of Jefferson, Clear Creek and Park Counties, and ranges in elevation from 5,780 feet at Morrison to 14,264 feet at Mt. Evans. Idledale, Kittredge, and Evergreen are towns located in Jefferson County along Bear Creek upstream of Morrison. Major tributaries entering Bear Creek below Evergreen Lake to Morrison include: Cub Creek, Troublesome Creek, Swede Gulch, Cold Spring Gulch, Sawmill Gulch at Idledale and Mount Vernon Creek at Morrison. Bear Creek flows into Bear Creek Lake just east (downstream) of the Dakota Hogback geologic formation at Morrison. This facility is a major flood control reservoir constructed and operated by the U. S. Army Corps of Engineers. East of the hogback, Rooney Gulch enters Bear Creek Lake from the north and Turkey Creek enters the lake from the south. The City of Lakewood Parks Department is responsible for public safety in the park area surrounding Bear Creek Lake. Upstream, the Evergreen Dam is a 380' long, 34' high structure located on the main stem of Bear Creek above Cub Creek at the town of Evergreen,

²⁵ Adapted from Historically Jeffco 2014, "2013 Storms Make History – Again." Richard Gardner and Sally L. White. <http://jeffco.us/planning-and-zoning/historical-commission/publications/>

forming a 40-acre lake known as Evergreen Lake. This reservoir is not a flood control facility, but it does impound 670 acre-feet of water.

Turkey Creek Watershed (Part of the Bear Creek Drainage Basin)

The Turkey Creek Watershed is a main drainage basin located along the southeast border of the Bear Creek Drainage Basin.

Turkey Creek Watershed Study

The USGS Mountain Ground Water Resources Study (MGWRS) on the Turkey Creek Watershed was conducted in 1999-2000. The purpose of the study was to better understand water resources, including surface and ground water quantity and quality, in the 47 square mile Turkey Creek Watershed. This study was considered a first step in developing scientifically sound management strategies and for the development of methods to assess ground water availability within different hydrologic settings, evapotranspiration (a term used to describe the sum of evaporation and plant transpiration from the land surface to the atmosphere) and ground water vulnerability to various land uses. Today there is an aggressive Turkey Creek Watershed monitoring program in force. The Precipitation Runoff Modeling System (PMRS) is used to evaluate the amount of precipitation received that is potentially available for ground water storage. The three most important components of runoff are surface runoff, sub-surface flow, and ground water flow. The PMRS results include the percent of precipitation that is returned to the atmosphere by evapotranspiration, the percent that leaves the watershed through surface runoff and subsurface flow, or becomes part of the long-term ground water storage system.

Bear Creek Drainage Basin Flood History

From 1866 to 1973 there have been 24 known floods in the Bear Creek basin; and from 1974 to 2007 there have been 23, which will be discussed later. Most of the floods from 1866 to 1973 were caused by runoff from intense rainstorms during the summer months. However, early season floods were caused from rainfall runoff in conjunction with snowmelt flows. The UDFCD monitors rainfall and streamflow from the Bear Creek basin as part of their early flood warning program, which runs from mid-April through mid-September. The peak discharge measurement at the stream gage on Bear Creek at Morrison in 1896 was 8,600 cubic feet per second (cfs) and the peak discharge on Bear Creek downstream of the gage below the confluence of Mount Vernon Creek during the 1938 flood was estimated to be considerably more than 10,000 cfs. The peak flow rate for Mount Vernon Creek alone was estimated at 9,230 cfs, which is more than twice the magnitude of the 100-year flood.

Mount Vernon Creek enters Bear Creek downstream of the Morrison Stream gage and has a drainage area of only 9.4 square miles. The headwaters of Mount Vernon Creek are at Genesee where I-70 begins its climb into the mountains along Mount Vernon Canyon. The south side of Lookout Mountain also drains into Mount Vernon Creek. At the Dakota Hogback the creek turns south, passing through Red Rocks Park and continuing to its mouth at Morrison, where a very narrow, confined stream channel exists.

A stream gage located east of Bear Creek Lake at Lowell Blvd and Sheridan has continuously measured Bear Creek flows since 1927. The Morrison gage has partial records dating back to 1888 and continuous records since 1922. When comparing the gage records it can reveal variances in peak discharges for each flood event. This indicates the majority of flood drainage came from two different locations. For example, in the 1933, 1934 and 1938 floods, the storms were concentrated in the foothills and mountains of Bear Creek, and the resulting flood peaks attenuated between Morrison and Sheridan. For the 1957, 1965, 1969, and 1973 floods, the majority of runoff occurred from watershed areas downstream of Morrison or from Turkey Creek.

Bear Creek floods are characterized as rapid concentrations of runoff, sharp peak discharges, and rapid flood recession. Peaking time for floods on Bear Creek at Morrison is about 3 to 5 hours after the causing rainfall, while floods on Mount Vernon Creek peak between 1 and 3 hours.

Turkey Creek was the known principle contributor for the 1957, 1965, 1969 and 1973 flood events.

May 21-23, 1876 - Reported by the Denver Tribune on June 5 of that year; "... informs us that one resident had never seen such destruction in the region... He spent some days in the valleys of Soda and Bear Creeks and their tributaries and found new gullies worn to the depth of 20 feet in the action of the raging torrents."

May 29-June 1, 1894 - In the vicinity of Morrison, a flood that caused the loss of bridges, railroad tracks, houses, and destroyed the highway in the canyon.

July 24, 1896 - Intense rainfall centered on Cub Creek, a tributary of Bear Creek near Evergreen. "Without a moment's warning the largest flood that ever came down Bear Creek struck Morrison about 8 o'clock tonight (July 24), sweeping everything in its path ... although the water came down through the town nearly 3 feet deep in the main street, the buildings in the business section all withstood it." Twenty-seven lives were lost in the flood (available records do not indicate where the deaths occurred) and severe damages were reported from Evergreen to the mouth of Bear Creek. No rainfall records of this flood are available. The peak flow on Bear Creek at the Morrison gauging station was estimated at 8,600 cfs, which is the flood of record for the gage. The most recent hydrologic studies indicate that this flood would have a one in 40 chance of occurring in any year. It is not known to what extent Mount Vernon Creek contributed to the Morrison flooding. The Flood of 1896 was the most catastrophic flash flood to hit Bear Creek Canyon. Farms along Cub Creek were obliterated. "The water descended about Evergreen like a huge, moving wall carrying houses, sheds, barns and livestock with it", according to the news. It was determined after the news account that 29 lives were actually lost.

July 7-8, 1933 - "Five persons known dead ... property damage of un-estimated degree and nearly all the highways between Mt. Morrison and Idledale ruined, is the toll up to date of one of the most devastating floods last Friday afternoon (July 7) ever to visit the Bear Creek Watershed. A cloudburst at about 1 o'clock in the neighborhood of Idledale sent a wall of water down Saw Mill Gulch leading to Bear Creek, and another raging torrent down Vernon Creek. ... The Vernon Creek waters reached a height of 15 feet ... in the narrow passage between the business houses. The

highway up beautiful Bear Creek Canyon between Mt. Morrison and Idledale is practically ruined." The peak discharge at Morrison was 8,000 cfs on Bear Creek and estimated as 1,500 cfs on Mount Vernon Creek.

August 9, 1934 - The flood of August 9, 1934 in the Bear Creek basin was caused by cloudburst-type rainfall near Kittredge and at the head of Mount Vernon Creek. Six lives were lost and much property damage resulted. It was reported that Mount Vernon Creek ran higher than the previous year and much of the canyon roadway was destroyed. Damage to Morrison was reduced because the Bear Creek peak flow passed through the town before the Mount Vernon Creek high water arrived

September 2-3, 1938 - A widespread thunderstorm that began over the eastern slope of the Front Range on 30 August became most intense in the Morrison area on 2 September. An unofficial report stated that 7.9 inches fell just north of Morrison in six hours. The heaviest rainfall centered on the divide between Bear Creek and Mount Vernon Creek. The peak discharge on Bear Creek at Morrison above Mount Vernon Creek was 6,200 cfs. From post flood measurements the Mount Vernon Creek peak discharge was estimated at 9,230 cfs at a point 1/2 mile upstream from Morrison. From statements by local residents it appears that the peak discharge on Mount Vernon Creek reached Morrison at about 7 p.m., preceding that on Bear Creek by 1/2 hour. Six persons drowned when trapped in their automobile between Morrison and Kittredge. Damages in the basin were estimated at \$450,000. If Morrison had not been warned, or if the flood had occurred late at night, the number of deaths would likely have been considerably higher.

August 24, 1946 - A heavy rain near Idledale caused Bear Creek to overflow. A Morrison woman was swept from her stranded car and drowned.

August 21, 1957 - Thunderstorms occurred over the Bear Creek basin with heavy rain and hail beginning about 1 p.m. east of Squaw Pass and northwest of Evergreen. At most locations the rain stopped within an hour. The Mount Vernon Creek peak discharge at Morrison was estimated at 1,000 cfs at 2:30 p.m., and 1,640 cfs on Bear Creek at about 3 p.m. While most damages from Bear Creek occurred downstream of Morrison, which is a drainage from Turkey Creek. Mount Vernon Creek left debris on the grounds of six or seven residences in Morrison, flooded a garage and a used car lot, and broke a water main. State Highway 8 at Morrison was closed upon warning of the flood. Later, portions of the highway were flooded by both streams.

July 25, 1965 - On 23-24 July 1965, heavy rains over the headwaters of Bear Creek caused minor flooding throughout its length. Most damages occurred downstream of Morrison. A peak discharge of 1,030 cfs was measured for Bear Creek at Morrison on July 25, 1965.

May 7, 1969 - Heavy rains from May 4-8, 1969 resulted in flooding in the Bear Creek basin with most damages occurring downstream from Morrison. A weather station at Morrison reported a total storm rainfall of 11.27 inches, with a maximum daily amount of 5.77 inches. Unofficial rainfall amounts in the basin varied from 6.7 inches to 11.8 inches during the five-day storm period. The peak flow for Bear Creek at Morrison was 2,340 cfs on May 7, 1969.

May 6, 1973 - The last significant flood to cause damages in the Bear Creek Basin. According to the National Weather Service, damages from the flood were estimated at around \$120 million.²⁶ The following damage estimates were printed in the Denver Post on May 13, 1973. Damages estimates in Weld County, hardest hit by the flood, were \$20 million. In Adams County, the estimate was \$8 million. In Denver, the estimate had climbed to well over \$6 million and in **Jefferson County, officials were reporting over \$500,000 damage to roads, culverts, and other County property.** Two deaths were attributed to this event.

“The 1973 flood was the last big flood in Denver” (Brian Schat, Denver Public Works, personal communication 8/22/03). Rainfall was widespread along the Front Range with totals ranging from one to five inches. A sustained downpour dropped more than three inches in the Denver metropolitan area on Sunday, May 6. In the foothills, heavy snow fell.

Most of the damage was a result of river flooding. The South Platte was four feet above flood level at its crest when it measured 10.85 feet at the 19th Street Bridge early on the morning of May 7. The flood stage of the South Platte at W. Evans Ave. equaled that during the 1965 disaster. However, this flood was more of “a steady overflowing of water” as opposed to the “one surge” Denver experienced during the flood of 1965.

The South Platte flooding was compounded when normally dry gulches and tributaries from the mountains west of Denver became turbulent flows that emptied into the river. When Bear Creek reached southwest Denver, it had grown to be 150 yards wide in spots. Plum Creek and Indian Creek, other South Platte tributaries, also poured out of their banks, virtually isolating the town of Louviers. In Englewood, the Highline Canal and the normally dry Little Dry Creek both overflowed.

Before evacuations were ordered in Denver, water began rising in Turkey, Bear, and Clear Creek Canyons because of the heavy snow runoff on May 5. By May 6, several Jefferson County roads in those areas had been washed out and residents had to be evacuated. In addition, several rockfalls and debris flows forced road closures.

Flooding in the Bear Creek watershed has killed 45 people and caused extensive property damage since the area was settled. It is idyllic for tourists and recreation seekers, unfortunately, under the right conditions Bear Creek Canyon and its tributaries can become death traps in a short amount of time. It doesn't take much rain to create a devastating flash flood. Retired Captain from the Jefferson County Sheriff's Office and historian, Dennis Potter, has documented 15 major floods that have taken place between 1864 and 1938. Of the 15, two occurred in May, one in June, eight in July, two in August, and two in September.

²⁶ <http://www.crh.noaa.gov/den/floods.html>
http://libraryphoto.cr.usgs.gov/cgi-bin/search.cgi?free_form=hogback&search_mode=noPunct

September 2013 – The damage associated with the widespread Front Range flood event was largely north of the Bear Creek Watershed, but damage

Clear Creek Watershed Drainage Basin

Located west of Denver, the Clear Creek Watershed spans 575-square miles from the 14,000-ft. mountain peaks along its southwestern edge on the basing and part of the Continental Divide, to the urbanized plains at its confluence to the South Platte River just north of Denver. The Clear Creek Watershed is the source of drinking water for more than 300,000 people. Clear Creek also provides water for irrigation, recreation and industry. Four hundred square miles of the watershed are located in the mountains west of Golden, and fully one-third of the Clear Creek Watershed lies within the Arapahoe & Roosevelt National Forests.

Clear Creek's headwaters begin in an area rimmed by four 14-ers (mountains that are 14,000 feet in elevation or higher) – Grays and Torreys Peaks, Mt. Evans, and Mt. Bierstadt. Major tributaries that feed into Clear Creek include the North, South and West Forks; Leavenworth, Lion, Trail, Chicago, Soda and Ralston Creeks; Fall River; Tucker Gulch; Kenneys Run; Lena Gulch; Little Dry Creek (confluence in Adams County); and Beaver Brook. The main-stem flows eastward along the Interstate 70 (I-70) corridor, through several communities, along approximately 12 miles of Highway 6 corridor through the Clear Creek Canyon and then back along the I-70 corridor through several Denver Front Range Communities.²⁷

Clear Creek

Clear Creek is a tributary of the South Platte River, approximately 40 miles long, in north central Colorado in the United States. The creek drains a canyon, called Clear Creek Canyon in the Rocky Mountains directly west of Denver, descending through a long gorge to emerge on the Colorado Eastern Plains where it joins the South Platte. The creek is famous as the location of the most intense early mining activity during the Colorado Gold Rush of 1859. The creek provided the route of the Colorado Central Railroad and later for the United States Highway 6 and Interstate 70 as they ascend to the Continental Divide west of Denver

The creek begins near the continental divide in the Front Range, northwest of Grays Peak in western Clear Creek County. It descends eastward through Clear Creek Canyon past the towns of Silver Plume, Georgetown, and Idaho Springs, all of which were founded as mining camps in the 1859 gold rush. Within the canyon it receives numerous smaller tributary creeks that descend from the rugged mountains on either side.

At the mouth of the canyon, in Jefferson County, the creek passes through the town of Golden, past the Coors brewery. East of the foothills, it flows through the northwest part of the Denver

²⁷For the complete Clear Creek Watershed 2007 report, *Exploring Watershed Sustainability* see <http://www.clearcreekwater.org/pdfs/CCWF-2007-report-optimized.pdf>

Metropolitan Area, passing through Wheat Ridge, southeastern Arvada, then roughly along the route of Interstate 76 (I-76). Along this section it is largely an undeveloped urban stream, with an undeveloped floodplain. Part of the creek path forms a wooded park with bicycle/foot path. It passes under Interstate 25 (I-25) between its junction with Interstate -70 (I-70) and U.S. Highway 36 (Hwy 36 - the Boulder-Denver Turnpike). It joins the South Platte from the west in southeast Thornton, near the junction of Interstate 76 (I-76) and State Highway 224 (Hwy 224).

Clear Creek Watershed Flood History

The Urban Drainage and Flood Control District (UDFCD), under joint sponsorship with the City and County of Denver, City of Wheat Ridge, City of Golden, Adams County, Jefferson County and ICON Engineering, Inc. conducted a study, *Planning and Flood Hazard Delineation Area for Clear Creek Drainageway*, which extends from Sheridan Boulevard at the downstream study limit to the City of Golden in Jefferson County, at the upstream study limit. The drainage area at the location of the Golden gage near the bluff line is approximately 400 square miles. From Golden, Clear Creek flows in a northeasterly direction, through the Denver Metropolitan Area to its confluence with the South Platte River, near Derby. At the Derby gage, located approximately 0.6 miles upstream from the mouth, Clear Creek has a drainage area of approximately 575 square miles. Elevations within the Clear Creek basin range from approximately 5,100 feet above mean sea level at the mouth to over 14,000 feet above mean sea level in the Rocky Mountains. For the full study including extensive mapping see footnote²⁸.

The intent of the report is to evaluate and document the existing floodplain along Clear Creek so that project stakeholders, and other users, can implement floodplain zoning ordinances, floodplain regulations, and other land-use controls, as needed, to reduce potential damages and adverse development in the floodplain. This report provides information on past flooding events and defines the nature and extent of probable future floods along an 11.6 mile reach of Clear Creek, from Sheridan Boulevard to approximately 2,200 feet upstream of Highway 6 in the City of Golden. Discharge information along Clear Creek was originally computed by the U.S. Army Corps of Engineers (COE) and incorporated into previous Flood Hazard Area Delineation (FHAD) and Master Planning documents. Historically, flooding in the Clear Creek basin has been relatively infrequent. Since 1864, twelve floods have been reported on Clear Creek and its tributaries. The following descriptions include the floods of August 1888, July 1890, June 1956, and July 1965 (Gingery 1979).

Flood of August 1888 - This flood resulted from cloudbursts on the eastern slope of the Front Range of the Rocky Mountains. A discharge of 8,700 cubic feet per second (cfs) was reported at the mouth of Clear Creek canyon. This is the largest estimated peak discharge in the history of this gauging station, which is located 1.5 miles upstream from Golden.

²⁸ http://www.udfcd.org/downloads/pdf/publications/fhad_new/Clear%20Creek%20FHAD%20Denver%20and%20Jeffco%202007.pdf

July 19, 1890 - Severe rain storm begins after a long dry spell causing Clear Creek to flood. Flood waters reach Golden at 4:00 p.m. on the 20th. The deaths of two women and an 18-month-old baby were attributed to the flood.

July 26, 1923 – Cloudbursts in the foothills above Golden caused floods in all the gulches that enter Clear Creek from the north within 2 miles of Golden. At the mouth of Magpie Gulch the rainfall was moderate, but half a mile above it was a cloudburst. The rain began about 12:45 p.m. and the flood reached its crest by 1 p.m. and then fell so rapidly that by 1:40 p.m. the flow in the gulch was again normal. This flood deposited a gravel and boulder dam 10 feet high entirely across Clear Creek, a distance of about 70 feet. Some of the boulders moved by the flood weighed as much as 5 tons.

June 6, 1948 - there was a flash flood in Tucker Gulch, a left bank tributary to Clear Creek in Golden. The peak discharge in Golden was 11,600 cfs and there were substantial flood damages. This flood from the 11.2 mi² basin is nearly twice the largest flood in Clear Creek (~400 mi²). This is one of the largest, if not the largest, flood for this size watershed in Colorado.

Flood of June 1956 - Unusually heavy snowmelt runoff resulted in the failure of the Georgetown Dam located about 1 mile downstream from Georgetown. The peak discharge passing the gage above Golden was 5,250 cfs. By the time the crest reached the gauging station near the mouth of Clear Creek, it was reduced to 2,880 cfs.

Flood of July 23-26, 1965 - On July 23 and 24, during severe storms over the headwaters of Clear Creek and Tucker Gulch, 4.5 inches of rain was reported to have fallen in Tucker Gulch in an hour, which caused flash flooding in Golden, however, flooding extended only a short distance downstream. In Golden, flood waters from Tucker Gulch spread over about 17 blocks and caused an estimated \$112,000 damage to 69 residences, three commercial enterprises, three railroad bridges, four street bridges, and utility lines. At Georgetown, debris blocked the channel and diverted the waters down a street, thereby causing extensive washing of the surface and the flooding of several basements.

July 29, 2003 - Heavy rainfall caused flooding and flash flooding problems in north central Jefferson County. Officials were forced to briefly close State Highway 93, north of Golden, which was flooded by runoff and littered with debris. In Golden, flash floods left several backyards and basements full of standing water. At least one car was submerged in a garage. Radar estimated 1 to 1.5 inches of rain had fallen in the area in approximately 30 minutes.

June 8, 2004 - In Golden, heavy rains triggered a small debris flow on U.S. Highway 6, near the intersection of Colorado Highway 119. Automated gages in the area registered 2 to 3 inches of rain in one hour. Near the Colorado Mills Mall in the Lena Gulch drainage basin, numerous intersections were inundated from 1 to 3 feet of water and hail, stranding several vehicles, including a fire engine. Approximately 30 basements were flooded in Golden and Lakewood and many windows, to both cars and homes, were broken by large hail. June 8th was the first of five days in which flash flood warnings were issued for the UDFCD area. Seven other days warranted

flash flood watches, making 2004 one of the most active flood seasons in the 26-year history of the District's flash flood prediction program. Fortunately, no lives were lost and the flooding that did occur was localized with total damages not reaching disaster proportions. An early morning cold front set the stage for 2004's first outbreak of flood producing storms. Around 8 p.m. storms began developing along the urban foothills of Jefferson County. Over the next two hours, Golden, Lakewood, Wheat Ridge, and nearby areas were pounded by heavy rain and hail. The Colorado Mills shopping mall was hit especially hard with over 3 inches of rain in 90 minutes. Homes were flooded and streets were closed in the vicinity of W. 32nd Ave. and I-70 where an unconfirmed precipitation measurement of 5" was reported. A Golden firefighter stated that flood fighting at the intersection of 20th Street and Washington was like working a swift water rescue. Hail depths up to 18 inches were reported in some areas and motorists in Lakewood were rescued from cars.

June 27, 2004 - A deluge of very heavy rain from nearly stationary thunderstorms caused flooding and flash flooding problems over parts of Jefferson County. In Jefferson County, an automated rain gauge north of Golden measure 3.6 inches of rain in one hour. Numerous homes were flooded in Golden, including one that was 146 years old. The home was listed as a complete loss. In addition, State Highway 93 had to be closed from the Pine Ridge subdivision (near 6th Ave and Hwy 93) to Golden Gate Canyon Road. At the height of the storm, about 4 feet of water covered Colorado 93 through Golden, forcing its temporary closure. Rockfall and debris flows were also reported in Golden Gate Canyon. Several intersections were also flooded and impassable. The worst flooding in Golden occurred along a small drainage known as Arapahoe Gulch, which runs along the west side of Washington Street. Affected residents there may have a similar predicament with regard to flood insurance since the hazard area associated with Arapahoe Gulch is not shown on the Flood Insurance Rate Map. The storm that caused this flooding produced between 3.5 and 4 inches of rain over the watershed. Based on surveyed high water marks and debris lines, peak flow rates in Arapahoe Gulch during the June 27 event were approximately 400 cfs. The peak flow estimate was nearly a 200-year event and greatly exceeded the capacity of the Arapahoe Gulch drainage system downstream of 2nd Street.

August 3, 2006 - Heavy rain caused flash flooding along Leyden Creek in unincorporated Jefferson County, northwest of Arvada. An automated rain gauge in upper Leyden Creek, 6 miles northwest of Arvada, measured 2.68 inches of rain in less than two hours. Two to three feet of water covered the roadway at 82nd and Quaker. Leyden Creek is a tributary to Ralston Creek.

September 2013 – See the dam failure section for a description of flooding during 2013.

May 2015 - Sustained rainfall in the month of May caused many creeks and drainages to be bankfull and causing minor overbank flooding including along Leyden Creek in Arvada.

Coal Creek Watershed

The Coal Creek Watershed drains almost 80 square miles in southern Boulder County and northern Jefferson County and is part of the South Boulder Creek Watershed. The watershed is approximately 28 miles long and an average of 3 miles wide, with an elevation drop of about 5,500

feet. The drainage begins in the foothills east of the Rocky Mountains, and flows through Superior, Louisville, Lafayette, Erie, and the City and County of Broomfield until it reaches Boulder Creek. The existing land use within the watershed is about 61 percent open space and parks. Rural residential development makes up approximately 16 percent of the existing land use, while residential, commercial, industrial and roadways comprise another 16 percent of the watershed. Public facilities, such as schools, comprise about 7 percent. Approximately 45 percent of the watershed is considered developed, with the lower end still developing.

The Coal Creek Watershed suffered a heavy rainfall event on September 12, 2013 that caused large amounts of channel migration that resulted in erosion and deposition. More information on this can be found in the Erosion and Deposition section of this document.

Ralston Creek Watershed

Ralston Creek is a tributary of Clear Creek, approximately 15 miles long. It drains a suburban and urban area of the northwestern Denver Metropolitan Area. It rises in the foothills in northeastern Gilpin County, in southern Golden Gate Canyon State Park. It descends through a valley eastward into Jefferson County following Drew Hill Road (County Road 57), emerging from the mountains approximately 3 miles north of Golden, where it is impounded to form Ralston Reservoir west of State Highway 93 and the Arvada/Blunn Reservoir on both sides downstream of State Highway 93. It flows eastward through Arvada and joins Clear Creek from the north in southeast Arvada, near the intersection of Sheridan Avenue and Interstate 76. The U.S. Army Corps of Engineers funded a flood and erosion control stream improvement project to the 100-year floodplain along Ralston Creek at the location of the Garrison Street Bridge in 2005.

Deer Creek Watershed

Deer Creek created Deer Creek Canyon. It is an important riparian corridor between the hogback and Wetlands Conservation Areas. It is a rich butterfly habitat and a large portion of it is protected by the Deer Creek Canyon Park, which encompasses diverse, natural environments. Perhaps most striking is the scrub oak habitat, uncommon in Jefferson County. Although small in stature, the scrub oak provides important food and cover for wildlife including grouse, turkey, mule deer, elk, mountain lion, and black bear. Deer Creek discharges directly into Chatfield Reservoir.

Significant Jefferson County Gulches

As mentioned above there are over 90 gulches, canyons and draws in Jefferson County. Some gulches, where there is a high vulnerability to larger numbers of populations, are discussed in further detail below.

Lena Gulch

Lena Gulch is a tributary of Clear Creek with a confluence near 41st Avenue and Kipling Street. The total drainage area for the basin is 13.3 square miles. Lena Gulch is predominantly in the City of Wheat Ridge, but also through Golden, the Pleasant View area, Lakewood, Wheat Ridge and

parts of unincorporated Jefferson County. The lower reach of Lena Gulch begins at Maple Grove Reservoir, which is a water storage reservoir operated by the Consolidated Mutual Water District Company. The drainage basin entering Maple Grove Reservoir is 10.5 square miles. Typically, low flows from the upper basin pass through the reservoir and are released downstream. The lower basin has a drainage area of 2.8 square miles. Lena Gulch is unusual for a small foothills stream in that it has a constant base flow. This makes for an attractive stream setting with riparian zones and aquatic flora and fauna along the corridor. There are several areas of concern along Lena Gulch. Discussions for flood control projects are currently under way across several jurisdictions. Lena Gulch will be further discussed in the jurisdictional annex for the City of Wheat Ridge. A complete study of the Flood Hazard Area Delineation for Lena Gulch has been created.²⁹

Lena Gulch Flood History

July 27, 1997 - Heavy rain caused Lena Gulch to surge 2 feet over its banks. The fire department had to rescue a man when his van stalled in the high water.

August 10, 1998 - Heavy rain caused flooding and flash flooding problems over southwest portions of Metropolitan Denver. An observer in Lakewood recorded 3.26 inches of rainfall in one hour. Several streets were flooded in central Lakewood. In addition, a trailer park along Lena Gulch in Wheat Ridge was evacuated due to the high waters.

June 8, 2004 - Heavy rain and large hail caused flooding and flash flooding across northeast Jefferson County. Automated gages in the area registered 2 to 3 inches of rain in one hour.

Lakewood Gulch

Lakewood Gulch is a well-defined drainageway. It originates on the northwest slopes of Green Mountain in Lakewood, flows east through Sixth Avenue West Park, and continues east through Lakewood into Denver, where it joins the South Platte River southwest of the intersection of I-25 and Colfax Avenue. A small portion of the studied length of Lakewood Gulch is in unincorporated Jefferson County, while the predominant length lies in Lakewood. Lakewood Gulch will be further discussed in the jurisdiction annex for the City of Lakewood. A complete study of the Flood Hazard Area Delineation for Lakewood Gulch has been created.³⁰

Lakewood Gulch Flood History

August 21, 1998 - While no flash flood warning was issued for the August 10th storm, extensive urban flooding did occur in Lakewood and Denver. Between 4:45 and 5:45 P.M., 3.26 inches of rain was measured in Lakewood near the intersection West 1st Ave. and Balsam Street. Rush-hour traffic was at a crawl while many homes had their basements flooded. Vehicles were floating in the Wal-Mart parking lot where the floodwater was 3 to 4 feet deep. This parking lot is located in

²⁹ http://www.udfcd.org/downloads/pdf/publications/fhad_new/Lena%20Gulch%20Lower%20FHAD%202007.pdf

³⁰ http://www.udfcd.org/downloads/pdf/publications/fhad_new/Lakewood%20Gulch%20FHAD%201979.pdf

the floodplain of South Lakewood Gulch near West 2nd Ave. and Wadsworth Blvd. East of Kipling Street, McIntyre Gulch was out of its banks at a number of locations. Lakewood Gulch in Denver overtopped Wolff Street by at least 3 feet. This event contributed directly to a Lakewood City County action exactly 2 weeks later endorsing a plan to form a stormwater utility and establish a fee of \$0.88 a month for each 1,000 square feet of impervious surface area, costing the average homeowner \$1.98 per month.

May 14, 2007 - a mother and her toddler got trapped in a flash flood on Lakewood Gulch in Denver. They were taking a walk along the gulch trail when it started to hail. They attempted to escape the hail from the storm by going further down into a small box culvert underneath Decatur Street adjoining the creek as it travels under Decatur Street in Denver. The mother lost the grip of her toddler's stroller and the child was swept downstream. He was found dead a few days later a few miles away on the banks of the South Platte River. After the incident, the bike path adjoining the creek was permanently closed.

Probability of Future Occurrences

There have been 50 floods in Jefferson County recorded since 1876; however, 40 of them (37 recorded by the NCDC, 3 recorded by NWS and a number of others by UDFCD) have occurred since 1950, or a span of 64 years. The methodology for calculating the probability of future occurrences using the number of incidents from 1950 is described in Section 4.2.1. This formula evaluates that the probability of a flood occurring in any given year is 78%. This corresponds to a probability of future occurrences rating of **likely**.

If the total number of flood incidents is used (50) over a period of 139 years, the probability of a flood occurring in any given year is 36%. This still corresponds to a probability of future occurrences rating of **likely**. A 100-year flood has an annual probability of 1%. A 500-year flood has a 0.2% chance of occurring in any given year.

Magnitude and Severity

Magnitude and severity can be described or evaluated in terms of a combination of the different levels of impact that a community sustains from a hazard event. Specific examples of negative impacts from flooding on Jefferson County span a comprehensive range and are summarized as follows:

- Floods cause damage to private property that often creates financial hardship for individuals and families;
- Floods cause damage to public infrastructure resulting in increased public expenditures and demand for tax dollars;
- Floods cause loss of personal income for agricultural producers that experience flood damages;
- Floods cause loss of income to businesses relying on recreational uses of County waterways;
- Floods cause emotional distress on individuals and families; and
- Floods can cause injury and death.

Jefferson County is uniquely located covering very populated urban areas as well as wildland urban interface foothills. Areas burned by wildfire tend to have a high runoff, resulting in flash flooding in those areas. Hilly terrain, coupled with brief, heavy summer downpours can result in flash flooding in many areas in the County. Fast-moving water is extremely powerful. The result can be deadly to anyone in the water's path. The force of flash flood waters can be extremely dangerous to motorists who unwittingly or unknowingly drive over water-covered roads - only two feet of running water are needed to sweep away a car. Risks to life and property can be very high during periods of flash flooding.

The magnitude and severity of the flood hazard is usually determined by not only the extent of impact it has on the overall geographic area, but also by identifying the most catastrophic event in the previous flood history. Sometimes it is referred to as the "event of record." There are differences in how the various natural hazard events are recorded and therefore do not apply across the hazards equally. For this reason additional data was taken into consideration to define the term "flood of record." Normally a flood of record relates to official stream-flow information available from the USGS and other sources, which include the National Weather Service and Urban Drainage and Flood Control District. The "flood of record" is almost always correlated to a peak discharge at a gage, but that event may not have caused the worst historic flood impact in terms of property damage, deaths, etc.

The 1938 flood illustrates this point well. It was likely the most devastating flood that Morrison has ever experienced; however, the '38 flood was not the largest historic stream-flow measurement for the Bear Creek at Morrison gage. The 1896 Black Friday Flood peak discharge was 8,600 cfs versus 6,200 cfs for the 1938 flood. In 1933 the Bear Creek gage recorded a peak discharge of 8,110 cfs and deaths occurred, but the 1938 flood caused far more damage to the town.

With this said, it is important to evaluate all the variables when attempting to identify a "flood of record." The 1965 flood received much media attention along Plum Creek in Douglas County and along the South Platte River through Denver, but Jefferson County sustained its share of damages as well. When major floods happen, lesser impact areas from the same event are given less attention by the media. To get a handle on the flood year that caused the most damage, additional research was necessary. NFIP claims statistics for the past 30 years were considered, however, the two worst flood damage years predated the NFIP. Inflation adjustments were also calculated. The accumulated data pointed to the 1896 Black Friday Flood to be the "flood of record." There were 29 lives lost and devastation from Evergreen to the mouth of Bear Creek wiping out everything in its path. Farms were destroyed along with the livelihoods of most of those who lived in the area. The City of Golden was under siege by floodwaters coming in from two directions taking out all bridges and shutting down the electric plant. Miles of railroad tracks were twisted like pretzels up Clear Creek, and the town of Morrison was a mass of wreckage and ruin. Enormous amounts of debris were strewn from the mountains to the plains of Denver. It was considered an economic catastrophe of its time where reconstruction took years. A future event of this magnitude could have similar devastation to Morrison and Golden. Based on these factors, the magnitude severity ratings for flood are considered **critical**.

Overall Hazard Significance

Floods in Jefferson County can have a particular impact on the planning area. Widespread flooding is less frequent, but the 2013 flood demonstrated that these events happen. Flash floods and flooding in small pockets of the County happens with regularity. The geographic extent of the hazard is considered **limited**. The probability of future occurrences is considered **likely** and the magnitude/severity for the event of record is **critical**. In addition, the HMPC considers the hazard to have a **high** overall impact rating on the County. This equates to an overall impact rating of **high**.

4.2.10 Hailstorms

Description

Hailstorms are any storm events where hailstones fall. Hailstones, often abbreviated to ‘hail,’ forms when updrafts carry raindrops into extremely cold areas of the atmosphere where the drops freeze into ice. Hail falls when it becomes heavy enough to overcome the strength of the updraft and is pulled by gravity towards the earth. The process of falling, thawing, moving up into the updraft and refreezing before falling again may repeat many times, increasing the size of the hailstone. Usually hailstones are less than two-inches in diameter, but have been reported much larger and may fall at speeds of up to 120 mph. Hailstorms occur throughout the spring, summer, and fall in the region, but are more frequent in late spring and early summer. These events are often associated with thunderstorms that may also cause high winds and tornadoes. Hail causes nearly \$1 billion in damage to crops and property each year in the United States. Hail is also one of the requirements which the National Weather Service uses to classify thunderstorms as ‘severe.’ If hail more than ¾ of an inch is produced in a thunderstorm, it qualifies as severe.

The National Weather Service classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. The table below indicates the hailstone measurements utilized by the National Weather Service.

Table 4.9 Hailstone Measurements

Average Diameter	Corresponding Household Object
.25 inch	Pea
.5 inch	Marble/Mothball
.75 inch	Dime/Penny
.875 inch	Nickel
1.0 inch	Quarter
1.5 inch	Ping-pong ball
1.75 inch	Golf-Ball
2.0 inch	Hen Egg
2.5 inch	Tennis Ball

Average Diameter	Corresponding Household Object
2.75 inch	Baseball
3.00 inch	Teacup
4.00 inch	Grapefruit
4.5 inch	Softball

Source: National Weather Service

In Colorado, hail is one of the most damaging of natural hazards. In fact, the 1996 July hailstorm set a record for most damaging hailstorm on a national level. According to the 2008 State Hazard Mitigation Plan, the damaging hail season in Colorado ranges from mid-April to mid-August. Colorado’s Front Range, including the entire planning area, is located in the heart of “Hail Alley,” which receives the highest frequency of large hail in North America and most of the world. According to the Rocky Mountain Insurance Information Association (RMIIA), hail accounts for six of the ten most costly storms on record in terms of insured damage. One of those incidents also include damages from tornadoes.

Geographic Extent

Hailstorms occur during severe storms, which are regional in nature. However, just as the amount of precipitation in the form of snow or rain may vary significantly within a single storm, so may the amount, size, and duration of hail within a severe storm. In general, hail can fall anywhere in Colorado. The areas where hail is most frequently reported with damaging effects are in the eastern plains, where hail damages crops and livestock, and in the Denver metro area, where hailstorms damage buildings, cars and trees, and may cause driving conditions to deteriorate. The extent of impact ranges from limited, where a single community within the planning area is affected, to significant, where more than 50% of the County was impacted. There are no known incidents where a single hailstorm impacted more than 75% of the County; however, so while hail is *possible* anywhere in the planning area, it is not likely to affect the entire area simultaneously.

Based on this information, the geographic extent rating for hailstorms is **significant**.

Previous Occurrences

Since hailstorms are so prevalent in Colorado, the most useful previous occurrences to examine are those which caused a particularly high amount of damage or incurred some other unique cost or impact. The NCDC database records 342 hail events in the planning area between January 1, 1950 and December 31, 2014. Twelve of those storms reported hailstones at least two inches in diameter; however, some of these storms reflect the different size hailstones for the same storm event, so the data is somewhat skewed. Several selected incidents, including some not captured in the NCDC database, are profiled below. These selections illustrate the severity of the hail hazard for the jurisdiction and are representative of the range and risk, but are not comprehensive.

July 20, 2009 - In an unusual overnight storm, rain, winds and golf-ball sized hail battered roofs, uprooted trees, damaged homes, and pounded vehicles in Wheat Ridge, Lakewood, Arvada and Englewood. Most of the damage in this storm are attributed to property losses, with 32,900 homeowner claims and 19,500 automobile claims filed as of July 27, 2009, which amounts to \$350 million in insurance claims based on preliminary estimates. While the entire Denver metro area was impacted by the storm, the most significant damages were reported in Jefferson County. This storm is projected to be the second costliest natural disaster in Colorado, in terms of insured losses.

May 24, 2007 - Several fast moving storms dropped substantial amounts of hail in the foothills southwest of Denver. One hailstorm impacted U.S. Highway 285 near Aspen Park, where state patrol reported two inches of pea-sized hail fell on the highway, causing it to become snow packed and slick. Four associated accidents were reported shortly thereafter, including three roll-overs in a 10 minute period of time. No injuries were reported and damages were estimated at \$20,000 (\$20,700 in 2009 dollars (most recent data available)).

June 8, 2004 - A series of hailstorms stretching along the Front Range from Colorado Springs to Larimer County and out to the eastern border of the state dropped hailstones ranging from dime to golf ball sized. The hail in Jefferson County fell mostly between 7:00 and 8:00 pm across Evergreen and Golden. The next afternoon, Morrison, Conifer, and Lakewood were all impacted by large hailstorms as well. Statewide, insurance damages were reported at \$146.5 million (\$166.4 million in 2009 dollars). This storm was classified as the eighth most costly hailstorm event in Colorado history as of July, 2009.

May 22, 1996 - A severe thunderstorm producing large hail ranging in size from 3/4 to two inches in diameter rumbled across the northwest and northern portions of the Denver metropolitan area. The thunderstorm apparently developed from an outflow boundary generated from the supercell thunderstorm that moved across extreme northeastern Colorado earlier in the evening. The storm developed near the foothills and moved east northeast across northern portions of the metro area. The hardest hit areas were cities of Arvada and Westminster, northwest of Denver. The insurance industry estimated \$60 million in damage to homes and personal property and \$62 million in damage to automobiles for a total of \$122 million in insured losses (\$166.8 million in 2009 dollars). This estimate also included the cities of Golden, Thornton, and Wheat Ridge.

October 1, 1994 - An afternoon hailstorm, lasting for nearly three hours as it crossed the Denver metro area, produced hail ranging from pea to golf ball sizes. Damages and incidents reported in the planning area include Arvada, Edgewater, and Wheat Ridge. Other impacted areas included Denver, Boulder, Last Chance, Bennett, Strasburg, Wiggins, Penrose, and the Buckley Air National Guard Base near Aurora. Overall insured estimates, sourced by RMIIA, totaled at \$225 million (\$326 million in 2009 dollars).

June 1, 1991. Intense thunderstorms formed in northern Jefferson County on June 1, 1991. These storms flooded streets and urban streams from Columbine County Club through Lakewood into

Golden with 0.75" to 1.5" diameter hail and 1.5" to 3.5" rainfall in less than 1 hour. I didn't have information on the estimated damage for this event.

July 11, 1990 - A storm with hailstones of up to 2.75" in diameter incurred 13 injuries in the planning area. A companion entry for the same date indicated the hail size was 1.75" but that 47 injuries were reported, which were mostly documented in Elitch Gardens (then located in Denver County). The RMIIA placed the total insured hail damages for the affected area at \$625 million (\$1.03 billion in 2009 dollars). The storm impacted Adams, Arapahoe, Boulder, Denver, Elbert, Jefferson and Larimer counties, with the heaviest damages reported in Jefferson County. Additional accounts indicate that this was the costliest hailstorm in U.S. history, as hail ranged along the entire Front Range. Jefferson County also suffered severe damages to aircraft at the Jefferson County Airport, power and utilities were disrupted to thousands of residents, and storm drains clogged with hail flooded roads three to six feet deep in Arvada.

June 13, 1984 - A mega rain/hailstorm occurred on June 13, 1984. Severe thunderstorms crossed northern Jefferson County and western Adams County dropping 2 to 4" rain and 1" to 3.5" diameter hail. There was serious flooding in Arvada, Westminster, Wheat Ridge and Lakewood. Damage was estimated at \$350-\$400 million (\$723-\$825 million in 2008 dollars) damage in Jefferson County.

Probability of Future Occurrences

The planning area experiences an average of two to three days of significant hail per year. The record of previous occurrences, as discussed earlier, is incomplete as well, but provides a useful reference for hailstorms which produced significant size stones and/or caused damage. Calculating that Jefferson County expects two to three days of hail per year is less useful than determining how frequently the planning area may experience a severe event. According to RMIIA, there have been eight severe hailstorms which caused more than \$100 million in damages that impacted Jefferson County in some way since 1990. The planning team identified an additional severe event in 1984, and since the 2009 update, the NCDC records an event in Columbine that caused over \$350 million in damage to property. This data will be used to determine the probability of a severe hailstorm in Jefferson County.

There have been 10 severe incidents involving Jefferson County since 1990. The methodology for calculating the probability of future occurrences is described in Section 4.2.1. This formula evaluates that the probability of a severe hailstorm occurring in any given year is 40%. If the same methodology is applied to all hailstorms (including those that cause minimal damage), then there have been 342 events since 1950, for a span of 64 years. This indicates that Jefferson County can expect an average of 5.3 hailstorms per year.

This corresponds to a probability of future occurrences rating of **likely**.

Magnitude and Severity

In order to calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it is a reflection of common occurrence. The event of record for Jefferson County occurred on July 20, 2009. According to the RMIAA, the event caused \$767.6 million in damages to property in the jurisdiction; according to NCDC reports, it caused \$350 million in damages specific to Jefferson County.

Also of note is the July 11, 1990 storm. The damages inflicted on critical facilities and services (critical infrastructure) resulted in a loss or disruption of services for a minimal amount of time. Documented illnesses and injuries were considered critical, though the medical response of the jurisdiction was considered minimally impacted.

According to the RMIAA, seven of the top ten hazard events in Colorado by the amount of insured loss were either entirely hail-related, or involved hail as a hazard.

Based on these factors, the magnitude severity rating for hailstorms is considered **critical**.

Overall Hazard Significance

Hailstorms in Jefferson County have a significant impact on the planning area. The costs of hailstorms are higher than any other natural disaster currently documented for the planning area. In addition, Jefferson County reports the highest number of hail-related injuries in the state at 60. The geographic extent of the hazard is considered **significant**. The probability of future occurrences is considered **likely** and the magnitude/severity for the event of record is **critical**. The HMPC considers the hazard to have an overall impact rating of low on the County. The data indicates, however, that an overall impact rating of **high** is most appropriate.

While hailstorms are not as high profile as other natural disasters such as tornadoes, blizzards, or floods, the amount of damage they inflict on the planning area is hugely significant. The hazard is frequent enough in occurrence to pose a significant financial risk to the planning area, and though mitigation measures are limited, the hazard deserves due consideration in the overall profile effort.

4.2.11 Landslides, Debris Flows, and Rockfalls

Description

Landslide

Landslides are a serious geologic hazard common to almost every state in the United States. It is estimated that nationally they cause up to \$2 billion in damages and from 25 to 50 deaths annually. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that

they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement. Factors that allow the force of gravity to overcome the resistance of earth material to landslide include: saturation by water, erosion or construction, alternate freezing or thawing, earthquake shaking, and volcanic eruptions.

Landslides are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompanies these events. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. Generally significant landsliding follows periods of above-average precipitation over an extended period, followed by several days of intense rainfall. It is on these days of intense rainfall that slides are most likely.

Areas that are generally prone to landslide hazards include existing old landslides; the bases of steep slopes; the bases of drainage channels; and developed hillsides where leach-field septic systems are used. The most vulnerable areas are the mountain corridors and the urbanized areas along the Rocky Mountain Front Range. Landslides are often a secondary hazard related to other natural disasters. Landslide triggering rainstorms often produce damaging floods. Earthquakes often induce landslides that can cause additional damage.

Slope failures typically damage or destroy portions of roads and railroads, sewer and water lines, homes and public buildings, and other utility lines. Even small-scale landslides are expensive due to clean up costs that may include debris clearance from streets, drains, streams and reservoirs; new or renewed support for road and rail embankments and slopes; minor vehicle and building damage; personal injury; and livestock, timber, crop and fencing losses and damaged utility systems.

The identification of areas susceptible to landslides is necessary to support grading, building, foundation design, housing density, and other land development regulations in reducing the risk of property damage and personal injury. Some work has been done to prevent development on top of or below slopes subject to sliding. More needs to be done to educate the public and to prevent development in vulnerable areas. Jefferson County has developed a dipping bedrock overlay zone that is designed to mitigate development in these areas that could be damaged by landslides (FEMA, Colorado Geological Survey).

Debris Flow

Debris flows, sometimes referred to as mudslides, mudflows, lahars, or debris avalanches, are common types of fast-moving landslides. They are a combination of fast moving water and a great volume of sediment and debris that surges down slope with tremendous force. These flows generally occur during periods of intense rainfall or rapid snowmelt and may occur with little onset warning, similar to a flash flood. They usually start on steep hillsides as shallow landslides that liquefy and accelerate to speeds that are typically about 10 miles per hour, but can exceed 35 miles per hour. The consistency of debris flow ranges from watery mud to thick, rocky mud that can carry large items such as boulders, trees, and cars. Debris flows from many different sources can combine in channels, and their destructive power may be greatly increased. When the flows reach

flatter ground, the debris spreads over a broad area, sometimes accumulating in thick deposits that can wreak havoc in developed areas. Mudflows are covered under the National Flood Insurance Program; however, landslides are not. Figure 4.20 gives a description of debris flows, characteristics, and provides a picture of the leading edge of a debris flow.

Figure 4.20. Field Evidence of Debris Flow

<p>Deposit Margins/Surfaces</p> <ul style="list-style-type: none">• No dunes or ripples on surface• Lobate margins• Accumulations of coarse clasts at margins (sometimes openwork where matrix washed away); otherwise coarse clast distribution on surface is fairly random• Positive relief (convex surface morphology where flow “freezing” occurs); otherwise surfaces flat, commonly studded with boulders• Flow levees common but not always formed• Consolidated sediments packed into “nooks and crannies” – e.g., between roots in root wads, in cavities in trees, buildings, stream banks, etc.• Commonly dammed locally by small log jams or boulder clusters• Fragile clasts may be present on surface (e.g., soil clasts, glass bottles)• Sandy mud coatings on boulders, logs, banks• No gravel imbrication	
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Source: USGS publication “*Distinguishing between Debris Flows and Floods from Field Evidence in Small Watersheds*”

A drainage may have several debris flows a year, or none for several years or decades. They are common events in the steep terrain of Colorado and vary widely in size and destructiveness. Cloudbursts provide the usual source of water for a debris flow in Colorado.

Debris flows ruin substantial improvements with the force of the flow itself and the burying or erosion of them by mud and debris. The heavy mass pushes in walls, removes buildings from foundations, fills in basements and excavations and sweeps away cars, trucks heavy equipment and other substantial objects. Boulders and trees swept along by the muddy mass demolish buildings, and flatten fences and utility poles. In mountain areas, portions of valleys have been eroded to a depth of several feet by the flow process.

Removal of vegetation on steep slopes, dumping debris and fill in a mud flow path, and improper road building or earth moving can contribute to a debris flow. The failure of a dam, irrigation ditch or other water management structure can initiate debris flows if the escaping water can swiftly accumulate a large volume of soil materials. Similarly, a landslide that temporarily blocks a stream may cause or contribute to a debris flow.

Rockfall

Rockfalls are the fastest type of landslide and occur most frequently in mountains or other steep areas during early spring when there is abundant moisture and repeated freezing and thawing. The rocks may freefall or carom down in an erratic sequence of tumbling, rolling, and sliding. When a large number of rocks plummet downward at high velocity, it is called a rock avalanche.

Rockfall can be a continuous process over a considerable period of time or a single or series of single, intermittent events. Simultaneous activation of a large mass of rock can result in a rockfall avalanche or very rapid down slope and spreading movement of a large quantity of rock material.

Rockfalls are caused by the loss of support from underneath or detachment from a larger rock mass. Ice wedging, root growth, or ground shaking, as well as a loss of support through erosion or chemical weathering may start the fall.

Rockfalls can demolish structures and kill people. Rocks falling on highways may strike vehicles, block traffic, cause accidents, and sometimes damage the road. Minor but costly consequences are the work of clearing highways and borrow ditches in rockfall areas. Any structure in the path of a large rockfall is subject to damage or destruction.

Geographic Extent

This hazard is most prevalent in the foothills of western Jefferson County, particularly in the canyons that dissect the region, most of which have County roads or State highways running through them, and some residential development.

US Highway 6 in Clear Creek Canyon is prone to rockfall hazards. North and South Table Mountain in Golden can also produce rockfalls from the namesake basalt cliffs that formed them. The base of the foothills in Golden on the northwest side of the intersection of highways 6 and 93 has also been prone to landslides. This landslide sits directly on top of the Golden Fault. Homes were developed just to the north of this landslide area shortly after the landslide was mitigated. The north side of Green Mountain in Lakewood has also had landslide problems.

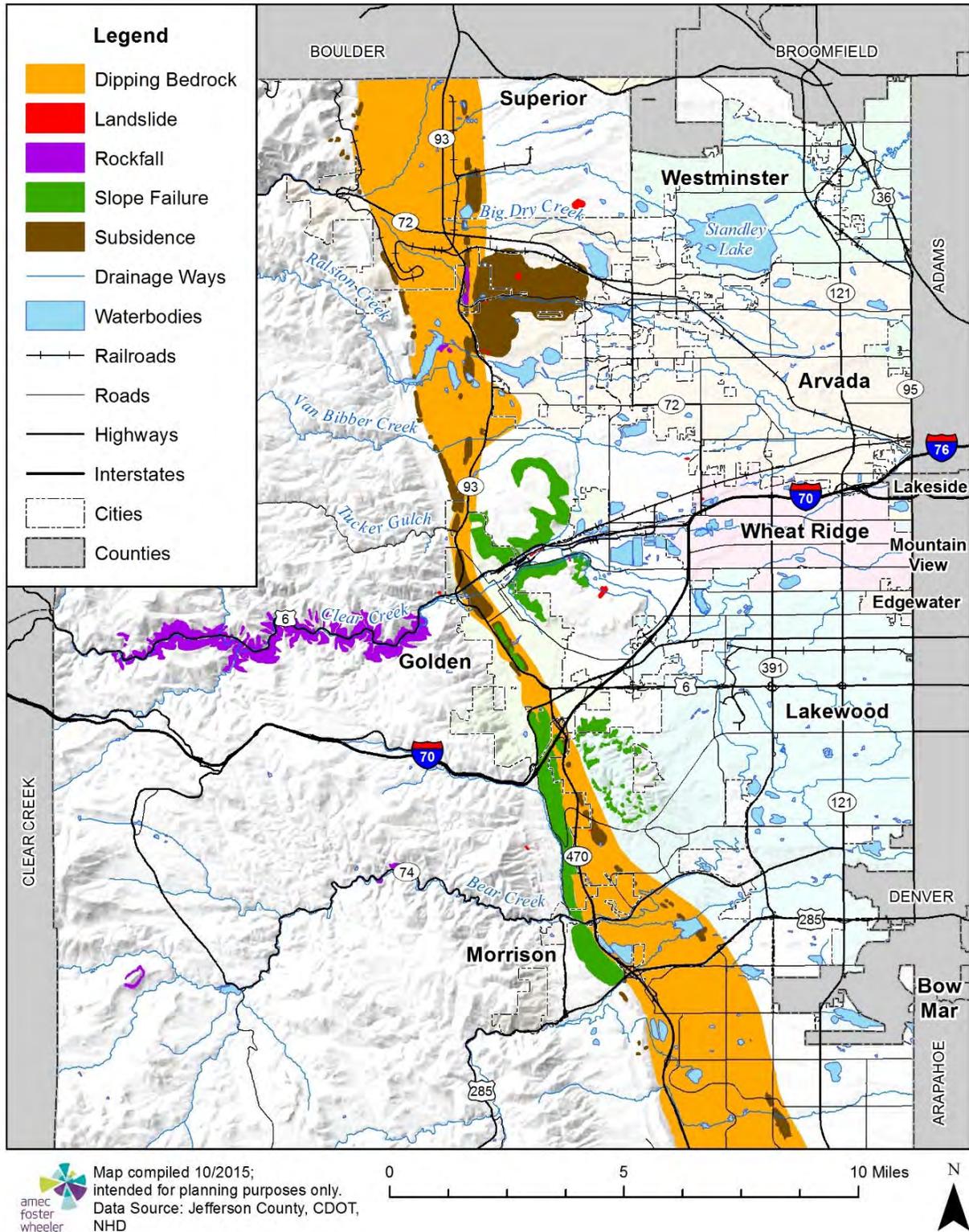
The Colorado Landslide Hazard Mitigation Plan, developed in 1988 and updated in 2002, identified 49 areas in Colorado where landslides could have the “most serious or immediate potential impact on communities, transportation corridors, lifelines, or the economy.” A Year 2002 Review and Priority List was done as part of an update of the 1988 Colorado Landslide Mitigation Plan. The update is a status report on 49 locations believed to pose the most serious landslide risk in Colorado that were identified in the 1988 plan. The hazard areas (landslide/rockfall or debris flow) are categorized into three tiers. Tier One listings are serious cases needing immediate or ongoing action or attention because of the severity of potential impacts. Tier Two listings are very significant but less severe; or where adequate information and/or some mitigation is in place, or where current development pressures are less extreme. Tier Three listings are similar to Tier Two but with less severe consequences or primarily local impact.

Rockfall areas along US HWY 6 in Clear Creek Canyon are considered Tier One rockfall areas. This area is considered a state priority due to the increased traffic and vulnerability of the traveling public to the gambling destinations of Blackhawk and Central City.

Two areas were identified as Tier One debris flow areas including the foothills of Jefferson County burned by the Hi Meadows wildfire in 2000 and the Schoonover wildfire in 2002. In addition, the burn area of the Hayman Fire must be considered a particularly vulnerable area. These wildfires leave the potential for debris flows, rockfalls, and extreme erosion in the area around the fire. Minor landslides will likely continue in susceptible areas as a result of post-fire conditions or when heavy precipitation occurs.

Two Tier Three landslide areas are identified: Golden to Boulder along CO Hwy 93 and the Morrison Town water plant. The report noted that impacts to Hwy 93 have lessened with roadway improvements and sound engineering practices. The Morrison Town water plant landslide has been mitigated but it is recommended that good drainage be maintained and that no construction or expansion of the facility be done without thorough geological evaluation and engineering design.

Figure 4.21. Landslide, Rockfall, and Subsidence Hazards in Jefferson County



As demonstrated in Figure 4.21, a minimal portion of the planning area is prone to occurrences of landslide and rockfall hazards, and of that, only areas with development (such as highways, roads, and subdivisions) are particularly vulnerable to the direct impacts. It should be noted, however, that when this hazard causes road closures, the overall area affected indirectly can be much larger than the slide area itself, with impacts extending into multiple counties on both ends of the incident.

Based on this information, the geographic extent rating for landslide, debris flow, and rockfall is considered **limited**.

Previous Occurrences

Since landslides, debris flows, and rockfalls have a high level of prevalence in Colorado, and a moderate level of prevalence in Jefferson County, the most useful previous occurrences to examine are those which caused a particular high amount of damage or incurred some other cost or impact. Several selected incidents are profiled below. There is no public database or information clearinghouse for this particular hazard. Information regarding these incidents was sourced from multiple sources. This is not an exhaustive list, but it does illustrate the severity of impacts that landslides, debris flows, and rockfalls exert on Jefferson County.

March 1974 – A boulder the size of a small car hurtled down the steep west side of the hogbacks in Jefferson County. It bounced into a new subdivision and stopped after penetrating a wall in the back of an expensive home. No one was injured. Property damage was about \$10,000, including the cost of measures to prevent similar incidents at that site in the immediate future. The incident could have been prevented easily in the subdivision development stage but it was not recognized.

1985 – A landslide directly upslope from the Morrison’s water treatment plan became active in the spring of 1985. The problem was mitigated by removing most of the landslide-prone material, and has not had problems since (CO Landslide Mitigation Plan 2002 update).

1993-1994 – The Highway 93 Golden bypass at the base of the foothills in Golden on the northwest side of the intersection of Highways 6 and 93 was affected by a landslide shortly after its construction. CDOT spent \$3 million in 1994 to mitigate the problem.³¹

August 31, 1997 – Rock and debris were deposited on the southbound lanes of Highway 285 at the base of the south and north flanks of the slide. Two cars on highway 285 were damaged due to the slide; one drove into rocks and debris on the highway and a second then ran into the first. North and south bound lanes of Highway 285, a major commuter route to and from Denver, were closed and traffic was diverted through Tiny Town along Turkey Creek Road. The southbound lane was closed for over one month. Movement was believed to have been triggered by the cumulative effect of above average rainfall in August.

³¹ (GSA Field Guide I Colorado and Adjacent Areas, 1999).

1998 – Renewed movement of an older landslide deposit on the north side of Green Mountain resulted in three homes being damaged beyond repair and two other homes severely damaged. Earth anchors and drainage improvements have been installed to mitigate future movement.³²

2000 – On U.S. 6 in Clear Creek Canyon, a vehicle crashed into a 2-ton rock on the highway. There were no serious injuries reported. In a separate incident, a motorist was injured when a basketball sized rock crashed through the windshield and hit him in leg.

2003 – Heavy rains in June of 2003 resulted in flash floods that moved substantial amounts of sediment, causing road obstructions, flooding, and extreme siltation of the South Platte River near Deckers, Colorado. This was a result of the burned out area caused by the Schoonover fire in 2002.

2005 – On U.S. 6 in Clear Creek Canyon 1,400 tons of rock fell during a rockfall. Two truck drivers and a motorist escaped injury. One boulder was measured to be the size of a minivan.

2006 – On U.S. 6 in Clear Creek Canyon, a car (unoccupied at the time) was flattened under a slab of rock.

2006 – In West Creek and Deckers, there were boulders and debris flows during rainstorms over areas previously affected by a wildfire burn.

2007 – On US 6, a rock crashed through the roof of an SUV. The driver of the SUV sustained minor injuries. The rock was measured and reported to be the size of a beach ball.

July 21, 2009 – Highway 126 north of Deckers near Cheesman Reservoir was washed out due to a severe rainstorm, placing trees and debris on the road. Jefferson County closed the highway down to Deckers. No one was killed or injured. The road was severely undercut and washed away in several places. Jefferson County Road and Bridge performed maintenance on the area periodically for two to three weeks to repair the damage done to the roadway.

September 2013 – Rainfall on September 9-13th triggered at least 1,138 debris flows along the Colorado Front Range. According to the HMPC there were debris flows blocking US 6 in Clear Creek Canyon, Golden Gate Canyon, Coal Creek Canyon, and Upper Bear Creek above Evergreen Dam all at the same time on September 12th.

February 24, 2015 – US 6 was closed in both directions between Golden and Colorado 119 as a number of rocks slid off Clear Creek Canyon approximately 6 miles west of Golden. One car was severely damaged; a passenger in the car was transported to the hospital in good condition.

³² (GSA Field Guide 1 Colorado and Adjacent Areas, 1999).

Probability of Future Occurrences

Based on the history of landslides, debris flow incidents, and rockfalls in Jefferson County (14 incidents over 41 years events) since 1974 a damaging event occurs on average every three years. Rockfalls in the canyons typically occur annually and usually in the winter and spring during freeze-thaw cycles. Since the hazards are profiled together due to common onset and impacts, the probability of future occurrence is established collectively. The methodology for calculating the probability of future occurrences is described in Section 4.2.1. This formula evaluates that the probability of a landslide-type event occurring in any given year is 34%. This corresponds to a probability of future occurrences rating of **likely**.

Magnitude and Severity

The overall magnitude and severity rating is a reflection of the common occurrence of this hazard. Property damages from these hazards has been in the millions of dollars, but generally limited in extent and periodic, typically during wet cycles. The damages inflicted on critical facilities and services (critical infrastructure) are primarily highways in the planning region. This has resulted in a loss or disruption of services periodically in the Clear Creek Canyon HWY 6 corridor. By a combination of mitigation efforts and luck there has not been documented deaths from rockfall in Clear Creek Canyon, but the potential remains. Based on these factors, the magnitude severity ratings for landslide, debris flow, and rockfall are considered **limited**.

Overall Hazard Significance

Landslides, debris flow, and rockfall in Jefferson County periodically impact on the planning area. The geographic extent of the hazard is considered **limited**. The probability of future occurrences is considered **likely** and the magnitude/severity for the event of record is **limited**. This equates to an overall impact rating of **medium**. While landslides, debris flow, and rockfall do occur with some regularity in Jefferson County, the direct effect on the populace is low, but the potential for severe injury or death remains from rockfall. Singular individuals or small groups may be affected by the direct effects of landslides, debris flow, and rockfall. The secondary effect of closed roads is a greater threat to the larger populace, especially if the closed roads cut off emergency personnel from those who need assistance.

4.2.12 Lightning

Description

Lightning is an electrical discharge between positive and negative regions of a thunderstorm. A lightning flash is composed of a series of strokes with an average of about four. The length and duration of each lightning stroke vary, but typically average about 30 microseconds. Typically, thunderstorms include rain, hail, or other forms of precipitation. However, it is possible for a thunderstorm to produce lightning with no delivery of precipitation. These events are called ‘dry thunderstorms.’

Intra-cloud lightning is the most common type of discharge. This occurs between oppositely charged centers within the same cloud. Usually it takes place inside the cloud and looks from the outside of the cloud like a diffuse brightening that flickers. However, the flash may exit the boundary of the cloud, and a bright channel, similar to a cloud-to-ground flash, can be visible for many miles.

Cloud-to-ground lightning is the most damaging and dangerous form of lightning, though it is less common than intra-cloud occurrences. Most flashes originate near the lower-negative charge center and deliver negative charge to earth. However, some flashes carry positive charge to earth. These positive flashes often occur during the dissipating stage of a thunderstorm's life. Positive flashes are also more common as a percentage of total ground strikes during the winter months. This type of lightning is particularly dangerous for several reasons. It frequently strikes away from the rain core, either ahead or behind the thunderstorm, and can strike as far as 5 or 10 miles from the storm, and occur in areas where common observers may not recognize the danger. Positive lightning also has a longer duration, so fires are more easily ignited. Positive lightning strikes usually carry a high peak electrical current, which may potentially result in greater damage.

The ratio of cloud-to-ground and intra-cloud lightning varies significantly between storms. Depending upon cloud height above ground and changes in electric field strength between cloud and earth, the discharge either stays within the cloud or makes direct contact with the earth. If the field strength is highest in the lower regions of the cloud, a downward flash may occur from cloud to earth. Using a network of lightning detection systems, the United States monitors an average of 22 million strokes of lightning from the cloud-to-ground every year.

According to the Colorado Division of Homeland Security and Emergency Management, lightning is the number one life threatening weather hazard. Each year, lightning is responsible for deaths, injuries, and millions of dollars in property damage, including damage to buildings, communications systems, power lines, and electrical systems. Lightning also causes forest and brush fires, and deaths and injuries to livestock and other animals. According to the National Lightning Safety Institute, lightning causes more than 26,000 fires in the United States each year. The institute estimates property damage, increased operating costs, production delays, and lost revenue from lightning and secondary effects to be in excess of \$6 billion per year. Lightning is so significant in Colorado that the Governor declares an annual Lightning and Wildfire Awareness Week each summer. As of 2003, the National Lightning Safety Institute ranks Colorado as third in number of deaths caused by lightning nationwide, though between 1996 and 2005 Colorado ranked 31st overall for flashes per year and flashes per square mile.

Previous Occurrences

Lightning occurs thousands of times a year. Since 1995, 17 lightning strikes with recorded impacts have occurred in Jefferson County. Impacts of these strikes generally can be drawn into two categories:

-
- Strikes that are notable because of human injury or fatality (5 strikes). These primarily occur when the victim is unsheltered during a lightning storm.
 - Strikes that are notable because of property damage (12 strikes). Most damages occurred to single properties.

The selections below demonstrate some events which caused notable injury, death, or property damage, and those events which triggered wildfires. These records, drawn from the NCDC database, illustrate the wide variety of impacts that lightning poses to the planning area.

August 8, 2014 – A man in Evergreen suffered minor injuries when he was struck by lightning, which entered through his finger, traveled down his body, and exited his foot.

July 7, 2014 – A man in Arvada was injured by a nearby lightning strike while he recorded a video of a thunderstorm with his cell phone. He was standing in his garage, when a nearby lightning bolt knocked him out. He suffered overall body aches and had a ringing sensation in one of his ears.

June 6, 2012 – Lightning struck a home in Lakewood, causing extensive electrical damage. Damages were estimated at \$20,000.

May 23, 2011 – Lightning struck a park ranger's office in Evergreen and destroyed a nearby gasoline storage tank. Damages were estimated at \$1,000.

August 16, 2010 – Lightning struck a tree in Morrison; separately, a lightning strike sparked a small grass fire near Quaker Street and Golden Road in Golden. It was quickly extinguished by emergency responders.

August 4, 2008 – Lightning sparked a grassfire that consumed 300 acres on the northern edge of Green Mountain. Gusty winds and very dry conditions allowed the fire to spread quickly and threaten several homes. Only minor damage was reported, caused by smoke and melted siding. Damages were estimated at \$100,000.

July 27, 2007 – A man was struck and killed by lightning while jogging at Matthews Winters Park in Morrison. The thunderstorm produced numerous lightning strikes and caused a power outage at Red Rocks Amphitheatre, which forced the cancellation of a concert later in the evening. Damages were reported at \$5,000.

July 23, 2004 – Lightning caused a power outage in Arvada, leaving approximately 9,800 customers without power for 90 minutes.

May 29, 2004 – A father and son practicing on the driving range at the Meadows Golf Club were struck by lightning. The father was killed and the teenage boy was seriously injured. Three other people standing nearby only received minor injuries.

June 19, 2002 – Lightning damaged the Evergreen Fire Protection District (EFPD) repeater. One microwave transmitter, the main fire channel transmitter and two solar panel controllers were ruined. Damage costs were estimated at \$5,000.

May 27, 2002 – Lightning sparked a wildfire near Deckers. Extremely dry conditions and very strong winds the following day allowed the fire to consume 3,860 acres before it could be contained. Thirteen structures were destroyed, including 4 homes. This incident is discussed further in the wildfire hazard profile.

August 1, 2001 – Lightning coupled with strong thunderstorm winds knocked out power to approximately 10,000 Xcel Energy customers in Golden.

August 13, 2000 – Lightning sparked three separate grassfires near Golden. The fires were quickly contained, however.

July 29, 1997 – A woman received minor injuries when lightning struck her when it passed through the office window. She suffered temporary blindness for approximately 15 minutes.

September 2, 1996 – Lightning sparked a brush fire in the south buffer zone of the Rocky Flats Environmental Test Facility. No structures were damaged but the fire burned approximately 100 acres of grassland before it was contained.

July 3 - 5, 1996 – Lightning from a fast moving thunderstorm blasted a large hole in the side of a house in Lakewood, southwest of Denver. Lightning sparked a small fire near Buffalo Creek. Only one acre was burned before the fire was contained.

September 4, 1995 – Two people were injured when lightning struck their home. The lightning entered in the attic where it sparked a small fire. It then travelled through the walls exploding a mirror that sprayed glass on the residents. Damages were estimated at \$4,500.

May 29, 1995 – Lightning struck a soccer goal post and injured six adults viewing a soccer game. Although no one received a direct hit, one woman was hospitalized.

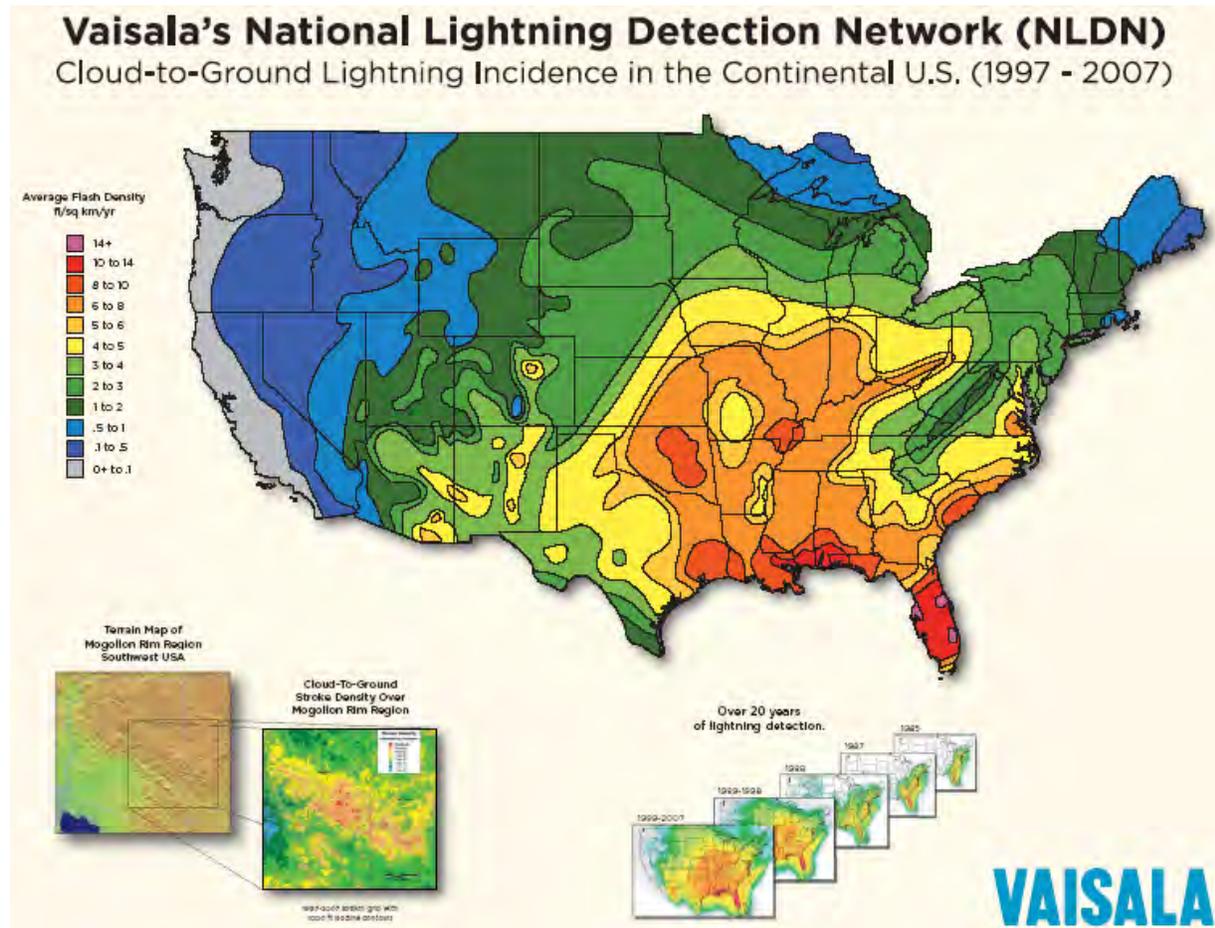
Geographic Extent

The geographic extent for lightning may be examined in two ways. In one regard, ‘lightning’ is a regional hazard measured by the possible places of occurrence. In the other, ‘lightning incidents’ refer to single-point occurrences and are measured according to density. Acknowledging that lightning may occur anywhere in Colorado or in Jefferson County is important, but does not provide particularly insightful information. Examining the density of the lightning flashes may yield more useful information, particularly when the impacts of the hazard are examined. According to the NOAA, Jefferson County averages 7,000 lightning strikes per year. This results in approximately 8.9 lightning strikes per square mile per year (7000/785 mi²). Figure 4.22 indicates that, for the most part, Colorado experiences an average density rating. Therefore, while

100% of the planning area is vulnerable to lightning strikes, the density of these single-point occurrences is fairly limited.

Based on this information, the geographic extent rating for lightning is **limited**.

Figure 4.22. Cloud-to-Ground Lightning Density



Source: <http://www.lightningsafety.noaa.gov/more.htm>

Probability of Future Occurrences

As identified earlier, lightning occurs thousands of times a year in Colorado alone. The average density for lightning strikes in Colorado is 5 per square mile. Assuming all other factors equal, that means the planning area, which is 785 square miles in size, experiences an average of 3,925 cloud-to-ground strikes of lightning a year. Knowing that the probability of any lightning event occurring in the future is highly likely helps underscore the importance of increased public education about the hazard. In order to fairly compare the lightning hazard to other hazards in the planning area, the probability of future occurrences for a lightning event that causes damage should also be computed.

The NCDC database is the only available dataset for county-specific lightning incidents that includes property and fire damages. Although this dataset is probably incomplete, it will be used as the source for the probability of occurrence calculation below. If additional lightning data becomes available for Jefferson County, then this section may need to be revisited. However, as all other data sets available reflect information that is consistent with the NCDC effort, the information calculated below is expected to remain fairly consistent with the application of a more comprehensive dataset. There have been 32 NCDC-recorded lightning strikes which have impacted people or property in Jefferson County since 1996.

According to the NCDC, there were 12 reported damaging incidents in Jefferson County between 1996 and 2014. The methodology for calculating the probability of future occurrences is described in Section 4.2.1. Based on this formula the probability of a damaging lightning strike occurring in any given year is 67%, or every 1.5 years. This corresponds to a probability of future occurrences rating of **highly likely**.

Magnitude and Severity

Impacts for lightning are both direct and indirect. People or objects are directly impacted when struck, or indirectly damaged when the current of the bolt passes through or near the person or object. Other impacts include the ignition of wildfires. The Colorado Division of Homeland Security and Emergency Management estimates that more than half of all forest fires in Colorado are ignited by lightning, in addition to the rangeland and wheat-field fires that lightning causes. Lightning is most likely to cause wildfires during dry conditions or during dry thunderstorms. Records of previous incidents in the NCDC database indicates that most events damage only personal property, and do not significantly impact the availability of critical services or infrastructure, corresponding to negligible severity ratings in both categories. Isolated cases, usually those which trigger large wildfires, have a more significant impact on property damages, but the ratings are still classified as limited.

The National Weather Service Pueblo Lightning Page indicates that between 1980 and 2008, eight people have been killed and 37 people have been injured by lightning strikes in Jefferson County. This equates to 8.6% of all killed and 8.2% of all injured reports for the state. The majority of lightning strikes with casualties for Colorado occurred between the hours of noon and 5:00 pm, peaking between 2:00 and 4:00 pm. This correlates to the times when the population are most exposed, as well: during the temperate summer months, on days where people are most likely to be outside, during peak times of day where outdoor activities are expected to occur. The injury and fatality rates associated with lightning are the greatest indicators of magnitude and severity. It is particularly telling when the flash density of the State is considered. As discussed in the geographic extent section, Colorado experiences an average number of cloud-to-ground strikes when compared to the nation. However, Colorado's injury and fatality ratings are consistently in the top five, or top three when adjusted for population. Therefore, the magnitude and severity of lightning on the population is critical.

In order to calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it is a reflection of common occurrence. For lightning, there is no outstanding event of record, so the overall magnitude and severity rating for the County is determined based on the comprehensive discussion of severity contained above. Lightning events typically damage less than 10% of the property in the County. The damages inflicted on critical facilities and services (critical infrastructure) typically result in a loss or disruption of services for less than 24 hours. Based on these factors, the magnitude severity ratings for lightning strikes are considered **limited**.

Overall Hazard Significance

Lightning strikes in Jefferson County have a range of impacts on the planning area. The most serious impacts are the potential for injuries and deaths, with the most serious indirect impact associated with wildfire caused by lightning. The geographic extent of the hazard is considered **limited**. The probability of future occurrences is considered **highly likely** and the magnitude/severity for the event of record is **limited**. The HMPC considers the hazard to have a **low** overall impact on the County. Together, this equates to an overall impact rating of **medium**. This rating recognizes that other hazards may be a higher priority for the County or may possess more actionable mitigation solutions, while still addressing the significant threat that lightning poses to personal life safety for the jurisdiction's citizens. This is also consistent with the efforts of the Colorado Division of Homeland Security and Emergency Management to increase lightning safety and awareness.

4.2.13 Severe Winter Storms

Description

The National Weather Service defines a storm as “any disturbed state of the atmosphere, especially affecting the Earth’s surface, and strongly implying destructive and otherwise unpleasant weather.” Winter storms, then, are storms that occur during the winter months and produce snow, ice, freezing rain, sleet, etc. Winter storms are a yearly occurrence in climates where precipitation may freeze and are not always considered a disaster or hazard. **For the purposes of this planning element, severe winter storms are those which produce heavy snow, significant ice accumulation, or prolonged blizzard conditions.**³³ Disasters occur when the severe storms impact the operations of the affected community by damaging property, stalling the delivery of critical services, or causing injuries or deaths among the population.

³³ The National Weather Association (NWA) Online Glossary does not define a ‘severe winter storm.’ However, it does define a Severe Local Storm as “A convective storm that usually covers a relatively small geographic area, or moves in a narrow path, and is sufficiently intense to threaten life and/or property.” Therefore, while the term ‘severe winter storm’ is not an official term from the NWA, it is drawn from other official definitions and is intended to reflect these standards as much as possible while still addressing the specific needs of this plan.

Winter storm watches and warnings may be helpful for determining the difference between a seasonal winter storm and a severe winter storm. Warnings are issued if the storm is producing or suspected of producing heavy snow or significant ice accumulations. Watches are usually issued 24 to 36 hours in advance for storms capable of producing those conditions, though criteria may vary between locations. Winter Weather Advisories are issued when a low pressure system produces a combination of winter weather that presents a hazard but does not meet warning criteria.³⁴ A blizzard warning is issued when conditions are expected to prevail for a period of three hours or longer: sustained wind or frequent gusts to 35 miles an hour or greater; and considerable falling and/or blowing snow (i.e., reducing visibility frequently to less than a ¼ mile).

Heavy snow can immobilize a region, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. The cost of snow removal, damage repair, and business losses can have a tremendous impact on cities and towns. Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days until damages are repaired. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

Some winter storms are accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chills. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Blowing snow can reduce visibilities to only a few feet in areas where there are no trees or buildings. Serious vehicle accidents can result with injuries and deaths.

Winter storms in Jefferson County, including strong winds and blizzard conditions, may cause localized power and phone outages, closures of streets, highways, schools, businesses, and non-essential government operations, and increase the likelihood of winter-weather related injury or death. People may be stranded in vehicles or other locations not suited to sheltering operations or isolated from essential services. A winter storm can escalate, creating life threatening situations when emergency response is limited by severe winter conditions. Other issues associated with severe winter storms include the threat of physical overexertion that may lead to heart attacks or strokes. Snow removal costs can pose significant budget impacts, as can repairing the associated damages caused by downed power lines, trees, structural damages, etc. Heavy snowfall during winter can also lead to flooding or landslides during the spring if the area snowpack melts too quickly.

Geographic Extent

Winter storms are a yearly feature of the Colorado climate and may occur anywhere in the state. Generally, severe winter storm events are considered regional, which implies the storms impact

³⁴ This information is drawn from the National Weather Association Online Glossary, which may be accessed at <http://www.weather.gov/glossary/>

multiple counties simultaneously, often for extended time periods. It is possible for the geographic extent of the hazard to vary significantly within a single county- a regional storm may directly impact only a small portion of the planning area while still extending over a large portion of the surrounding area. However, even in these instances, the impacts and effects of a regional hazard are still felt within the planning area. Therefore, while the percent of the planning area directly affected ranges from less than 10% to 100% depending on the specific circumstances, if any portion of the planning area is impacted by the storm, then the entire planning area suffers indirect impacts.

Based on this information, the geographic extent rating for severe winter storms is **extensive**.

Previous Occurrences

The National Climate Data Center database reflects a data-gap in reporting for the planning area, as the available records are minimal and incomplete. Acknowledging that severe winter storms are often regional in nature, it is reasonable to assume that the majority of Jefferson County experienced approximately 121 events since 1996, with the mountainous regions in the south and along the western edge of the County experiencing a higher number of seasonal storms.³⁵ The Colorado Division of Homeland Security and Emergency Management and the Jefferson County Office of Emergency Management provided the following previous occurrences on a regional level, which only cover events in the last 25 years. Information specific to the planning area is noted where possible, though some events remain regional in focus.

May 11-12, 2014 - A strong storm system moved from southwest Colorado and produced heavy snow over the Front Range and adjacent plains. The snow was heaviest over the Front Range foothills where up to 2-1/2 feet of snow was observed. In the mountains and foothills, storm totals included: 12 inches at Arapahoe Ridge and Columbine; 11 inches at Evergreen and Fremont Pass. Along the urban corridor and Palmer Divide, storm totals included: 10 inches at Ken Caryl; 9 inches at Superior; 8 inches near Morrison; 7 inches in Denver, near Franktown, Golden, Lakewood and Highlands Ranch; 6 inches, 5 miles northeast of Westminster, 7 miles south of Lyons, near Parker and Shaw.

March 26, 2009 – At Denver International Airport, hundreds of flights were canceled. In addition, schools throughout the region were shut down and many roads closed due to multiple accidents. Dozens of vehicles slid off Interstate 25 and an accident between Fort Collins and Cheyenne, Wyoming involved up to 75 vehicles. Portions of U.S. Highway 36, between Denver and Boulder, were also closed during the day. The Red Cross opened up six shelters for stranded motorists. Snow totals in and near Jefferson County averaged 11.5 inches.

³⁵ This estimate was derived by taking the average number of reported storms documented on the NCDC website for Jefferson County's neighbors, and the number of incidents for Jefferson itself. When compiling the selected events of past significance, state-wide records were surveyed to assure inclusion of the most relevant materials.

January 12, 2009 – A fast moving storm system brought heavy snow to the foothills of Boulder and Jefferson Counties as well as the western and southern suburbs of the metropolitan Denver. The storm resulted in multiple accidents along the Urban Corridor. In the foothills storm totals ranged from 6 to 8". In the suburbs, Lakewood reported 8", with variances across the area ranging from 4.5 to 11".

April 16, 2008 – Storm totals ranged from 9" to 13". A storm system brought heavy snow to parts of the North-Central Mountains, Front Range Foothills and Palmer Divide. The heaviest snow fell mainly south of the Interstate 70 corridor. Storm totals in the mountains and foothills ranged from 8" to nearly 15".

December 2006 – Back-to-back major storms occurred the third and fourth weeks of the month of December across the Front Range and Eastern Colorado. Heavy snow accumulated over three feet deep in some areas. Strong wind drifted the snow into 12' to 20' drifts and thousands of animals in the eastern plain were stranded from shelter and food by the snow. Travel was hampered for days in the hardest hit areas, including the Denver International Airport. Combined, these events qualified for a Presidential Emergency Declaration to assist communities with costs in the aftermath. Jefferson County was designated for public assistance after the first storm.

March 17 - 20, 2003 – A major snowstorm dumped more than 2' of snow in the Rocky Mountain Region, which closed highways in Colorado and wide sections of Wyoming. Wind gusts of 30 mph reduced visibility across Denver, including the main boulevard leading to Denver International Airport, stranding travelers at the airport and along the roadways. Avalanche warnings were issued for Colorado mountainous areas where up to 29" of snow fell. Upwards of 8' of snow were reported in the Evergreen and Conifer areas of Jefferson County by members of the HMPC. This late season snowstorm stranded hundreds of people and resulted in a Presidential Emergency Declaration to help ease the burden of clean-up costs, which amounted to more than \$8 million. The insurance industry estimates this blizzard to be the most costly winter storm in Colorado history, reporting at least \$93.3 million (\$109 million in 2009 dollars) in claims. Jefferson County was designated for emergency public assistance from this event. Figure 4.25 shows the distribution and snow totals in inches for the storm for the County and surrounding areas.

October 24-25, 1997 – One of the worst blizzards of the 1990s dumped 14 to 31 inches of snow across the Metro Denver Area. The heaviest snow occurred in the foothills west and southwest of Denver, including in Jefferson County, where 2' to 4' of snow were measured. Sustained winds of 40 mph with gusts as high as 60 mph reduced visibilities to zero and produced extremely cold wind chill temperatures of -25°F to -40°F. The strong winds also piled snow into drifts ranging from 4' to 10' deep. Several major roads and highways were closed as travel became impossible and Red Cross shelters were set up for hundreds of stranded travelers forced to abandon their vehicles. Two people were severely injured and five people were killed as a direct result of the event. At Denver International Airport, 4,000 travelers were stranded when the airport was forced

to close and air carriers estimated losses at \$20 million (\$26.7 million 2009 dollars). Snowfall totaled 21.9", setting a new 24-hour snowfall record of 19.1" for the month.

March 8 - 9, 1992 – A springtime blizzard struck the Metro Denver Area with snowfall amounts of up to a foot and a half blown in on north winds at speeds of 30 to 40 mph with gusts as high as 52mph. Many roads were closed including Interstate 70 east of Denver and Interstate 25 north and south of Denver. Many homes and businesses lost power.

March 6, 1990 – Winds gusting up to 58 mph and heavy snow whipped into drifts 3 to 4 feet deep pummeled the Metro Denver Area. Streets and highways became impassable as many stores and schools closed. Police and National Guard rescued hundreds of stranded motorists, including the Governor who was stranded on Highway 36. An airliner with 82 passengers aboard skidded off a runway at Stapleton International Airport. Snowfall totaled 18 to 50" in the foothills and between 9 to 24" west of Interstate 25, including most of urbanized Jefferson County.

Often, total snowfall is one of the major considerations in tallying a ‘severe’ winter storm. The top ten snowfall storms for the Denver Metro region since 1946, according to the National Weather Association, are listed below. It is helpful to remember that the official reckoning for snowfall in Denver is at the airport (Stapleton Airport until February 1995 and currently at Denver International Airport) and that snowfall totals may actually be higher for Jefferson County, particularly in the western communities.

Table 4.10 Top Ten Snowfall Storms in the Denver Metro Area since 1946

Date	Snowfall in Inches
March 18, 2003	31.8
November 3, 1946	30.4
December 24, 1982	23.8
October 25, 1997	21.9
November 27, 1983	21.5
November 19, 1991	21.2
December 20, 2006	20.7
March 5, 1983	18.7
November 19, 1979	17.7

Source: National Weather Service Weather Forecast Office: Denver/Boulder area

Probability of Future Occurrences

Winter storms are a yearly feature in Colorado, often occurring multiple times each winter, and thus are considered a seasonal feature. In that regard, these hazards are considered a highly likely occurrence. When an event is seasonal and an anticipated element in a given climate, it is also important to also examine the probability of future *severe* occurrences of the hazard.

There have been at least 9 incidents of severe winter storms that directly impacted Jefferson County since 1990. The methodology for calculating the probability of future occurrences is described in Section 4.2.1. This formula evaluates that the probability of a severe winter storm occurring in any given year is 36%. This corresponds to a probability of future occurrences rating of **likely**.

Magnitude and Severity

The damages caused by severe winter storms and blizzards vary and are dependent on several factors: the duration of the storm; the geographic extent; the time of year; meteorological factors such as wind, moisture content of the snow, ground and air temperatures; and the advance warning of the storm. Impacts from the storm dictate the magnitude of the event, emphasizing that how much snow may not always directly correlate to how bad the storm is. Damaged power lines and dangerous or impassable roadways may forestall the delivery of critical services such as medical and emergency assistance, the delivery of food supplies and medications, or even the provision of basic utilities such as heat and running water. When events happen with a long warning time, it is possible to pre-mitigate the effects of insufficient supply levels or to pre-test emergency generators, which may prevent some of the previously described impacts from occurring. Unanticipated storms increase the number of people stranded, both in cars and at public locations, which may increase the number of injuries and deaths attributed to the event (often caused by exposure) and place uneven and unanticipated strains on public sheltering capacities. The weight of the snow, driven by the water content of the fall, increases the potential for damages caused to structures and trees. Lighter snow caused by extreme cold increases the damages caused to livestock, agriculture and landscaping due to freezing conditions. Winter storms which go through periods of thaw and freeze prolong dangerous icy conditions, increasing the likelihood of frozen and damaged water pipes, impassable or dangerous roadways, damaged communication lines, or more extensive damages to infrastructure and structures caused by seeping water freezing under roofs, porches, patios, inside sidings, or causing damage to vehicles.

In order to calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it is a reflection of common occurrence. The most damaging event of record for Jefferson County occurred between March 17 and March 20, 2003. This is distinct from the snowstorm with the greatest amount of snowfall, which occurred from December 1-6, 1913, and officially documented 45.7 inches of snow. In order to reflect the significance of each, both events are considered in developing the severity and magnitude ratings.

As noted, the December 1913 storm snow totals in the metro area were officially recorded at 45.7 inches. Snow totals were even deeper in the mountains, where Georgetown reported 86 inches total. The high winds caused significant drifting which completely blocked all transportation as well. The Rocky Mountain News reported that one rescue party and eight miners were lost in the storm and thousands more moved into hotels for shelter. The city opened the auditorium and other

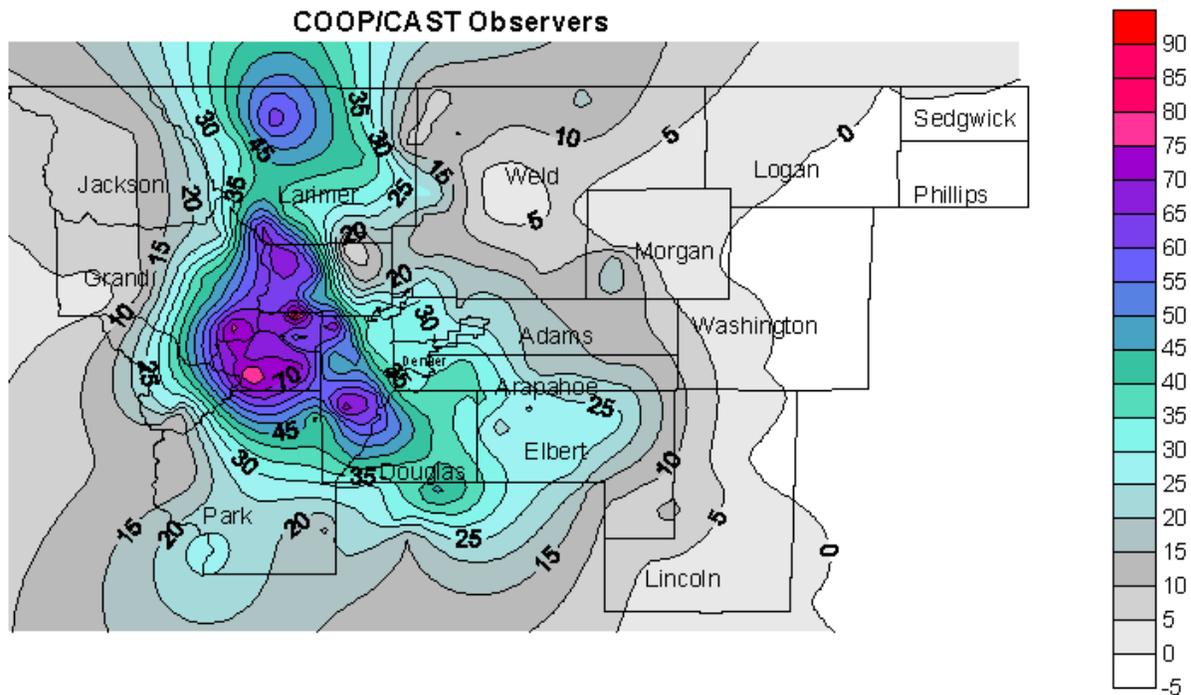
public buildings to shelter the homeless during the event. Of interesting note, the snow removal costs were considered an economic advantage, citing that over 780 men found employment and at least \$700 (\$16,850 in 2015) was spent in snow removal costs. The paper also reported that “(m)illions of dollars [in] additional wealth to Colorado were brought yesterday by the snowfall...it rang up the curtain on the 1914 crop outlook, revealing visions of unprecedented prosperity to every line of industry and bountiful harvest to the farmers.”³⁶

The March 17-20, 2003 snowfall in the metro area was officially tabulated at 31.8 inches, though up to eight feet of snow was reported in the Evergreen and Conifer areas. The event damaged huge amounts of infrastructure and property, with insurance losses alone estimated at more than \$93.3 million (\$122.8 million in 2015 dollars). Insurance losses note that more than 90% of those damages were based on homeowner’s insurance claims, and that of the auto insurance claims, most were a result of the vehicle being crushed by the weight of the snow rather than weather-related accidents.³⁷ The event also resulted in a Presidential Emergency Declaration. The damages inflicted on critical facilities and services (critical infrastructure) resulted in a loss or disruption of services for several days, including power, telephone, and in some cases, heat. Emergency response personnel were hindered from response due to impassible roadways. Documented illnesses and injuries were considered critical, with two serious reported injuries and five directly attributed deaths. The medical response of the region was considered impaired to a limited extent.

³⁶ Reprinted online from the December 5, 1913 issue of the Rocky Mountain News. Available at <http://www.rockymountainnews.com/news/2008/dec/21/the-rocky-150-years-blizzard-of-snow-news/> last accessed October 8, 2009.

³⁷ http://www.rmiia.org/News_room/catastrophe%20news/2003_04_07_blizzard.htm#

Figure 4.23. March 17-20, 2003 Snowfall Totals



Source: National Weather Service Forecast Office: Denver/Boulder CO

Based on these factors, the magnitude severity potential for severe winter storms which may impact Jefferson County are considered **critical**.

Overall Hazard Significance

Severe winter storms in Jefferson County have a significant impact on and presence in the planning area. Damages from winter storms are the second highest cause of insurance-related costs and claims for the County. The planning area is subjected to damaged trees and structures, icy and dangerous roadways, and the large costs associated with snow removal and cleanup after severe events. In addition, the hazard is regional in nature, indicating that if the planning area is impacted, it is likely that the planning area's immediate neighbors will also be impacted, reducing the available resources and aid capacities for response and recovery from the event.

The geographic extent of the hazard is considered **extensive**. The probability of future occurrences is considered **likely** and the magnitude/severity for the event of record is **critical**. In addition, the HMPC considers the hazard to have **high** impact on the County. This equates to an overall impact rating of **high**.

4.2.14 Subsidence

Description

The Colorado Geological Survey defines land subsidence as the sinking of the land over manmade or natural underground voids. Subsidence occurs naturally and also through man-driven or technologically exacerbated circumstances. Natural causes of subsidence occur when water in the ground dissolves minerals and other materials in the earth, creating pockets or voids. When the void can no longer support the weight of the earth above it, it collapses, causing a sinkhole depression in the landscape. Often, natural subsidence is associated with limestone erosion, but may also occur with other water-soluble minerals. Man-driven or technology-exacerbated subsidence conditions are associated with the lowering of water tables, extraction of natural gas, or subsurface mining activities. As the underground voids caused by these activities settle or collapse, subsidence occurs on the surface. In Jefferson County, past coal and clay mining activities have created surface subsidence in some areas and created the potential for subsidence in other areas. Any area where past sub-surface mining was documented has some risk of subsidence; however, tracking these areas is difficult. In some cases, coal was “poached” or more coal was removed from an area than would be noted on the mine map. Also, many mines were incorrectly located relative to surface features due to surveying errors. As such, maps of past mine workings and extents may be incorrect, but rough estimates are available.

Extraction of coal and clay from mines in Jefferson County varied based on the location of the material beds and the available technology.³⁸ Prior to World War II, nearly all mines in the County were worked using the room and pillar mining pattern. In the room and pillar technique, an opening was followed by a shaft that was driven or dug to the layer of coal or clay. Passageways were excavated in the material seam, and rooms were created when the materials were dug out along the original tunnel. The materials were then worked in the direction that correlated to the bed. Between the rooms, pillars of the material were left in place to support the roof of the mine, although sometimes the pillars were replaced with timbers. Subsidence occurs when the stopes collapse, either due to overhead pressure or when the support structures collapse. Other subsidence incidents may occur over air shafts and man shafts. This subsidence forms pits, which may range in diameters of 5' to 20' and range in depth from a few feet to 20', depending on the amount of in-filling which has occurred since the mine was abandoned. Because subsidence incidents are often incomplete, an event may occur multiple times over the same area, increasing the risk and danger of this particular type of subsidence.

Troughs, or long lengths of subsidence, tend to occur over tunnels and slope entries, and may range in length from 10' to 80' and in depth from 5' to 15' or more. Once they collapse, they present a reduced additional risk, as the subsidence is generally complete along the entire length of the tunnel. Another common form on subsidence in Jefferson County occurs when pits and trenches

³⁸ Taken from *Coal and Clay Mine Hazard Study and Estimated Unmined Coal Resources, Jefferson County, Colorado* by Amuedo and Ivey, 1978, and reproduced online at http://inside.mines.edu/fs_home/tboyd/Coal/activity.html

open over stopes that were extended to, or very close to, the surface during the mining process. These features are particularly evident along the east side of the Dakota Hogback from I-70 north to Coal Creek Canyon and range in length from 10' to 100' and in widths of 5' to 40'. This form of subsidence forms a minimal risk in the planning area, as it occurs in areas where development is highly regulated, but additional risks from these features are documented below. Subsidence over reclaimed land occurs when open pit mines are cosmetically back-filled, but the fill is not as compacted as the enclosing bedrock. When construction on the fill material occurs, the weight causes the fill material to compress more than the bedrock, creating a stress or bending movement in the structure, which can result in significant damage to the structures.³⁹

Subsidence may result in serious structural damage to buildings, roads, irrigation ditches, underground utilities, and pipelines. It can disrupt and alter the flow of surface or underground water. Weight, including surface developments such as roads, reservoirs, and buildings and manmade vibrations from such activities as blasting or heavy truck or train traffic can accelerate natural processes of subsidence, or incur subsidence over manmade voids. Fluctuations in the level of underground water caused by pumping or by injecting fluids into the earth can initiate sinking to fill the empty space previously occupied by water or soluble minerals. The consequences of improper use of land subject to ground subsidence can be excessive economic losses, including the high costs of repair and maintenance for buildings, irrigation works, highways, utilities, and other structures. This results in direct economic losses to citizens as well as indirect economic losses through increased taxes and decreased property values.

Geographic Extent

Areas of Jefferson County at risk for subsidence are shown in Figure 4.21 on the map of landslides and rockfall areas. Coal deposits in Jefferson County were located mostly along the northeastern borders shared with Boulder, Adams, Denver and Arapahoe counties. Known coal mines in the County were confined along a narrow strip of land along Highway 93 from Arvada to approximately the junction with C-470, and then along the 470 corridor, without known extent into the northeastern portion of the coal field. As such, the location of inactive coal mines in the County is fairly limited compared to other counties (see Figure 4.24).

Previous Occurrences

Most known areas of potential subsidence in the planning area occur in rural, undeveloped areas and, therefore, have caused no damage. However, there are few records on subsidence. In addition, the planning area exercises specific planning and zoning regulations to minimize the structures permitted on vulnerable lands, as demonstrated in Table 4.10. While actual events of subsidence are visible throughout the County, extensive research on the hazard produced only one reportable incident. A family housing section built on the Colorado School of Mines campus,

³⁹ Taken from *Coal and Clay Mine Hazard Study and Estimated Unmined Coal Resources, Jefferson County, Colorado* by Amuedo and Ivey, 1978, and reproduced online at http://inside.mines.edu/fs_home/tboyd/Coal/activity.html

located in Golden, suffered damage when subsidence occurred over a reclaimed open-pit clay mine. Though the structures were built with mitigation techniques, differential compaction still occurred. Streets and sidewalks suffered damage, as did the structural integrity of several buildings. This report is contained in a County profile issued in 1978 and additional confirmation of the event, along the fate of the structures and associated damage estimates, are not currently available.

Figure 4.24. Locations of Inactive Coal Mines, State of Colorado

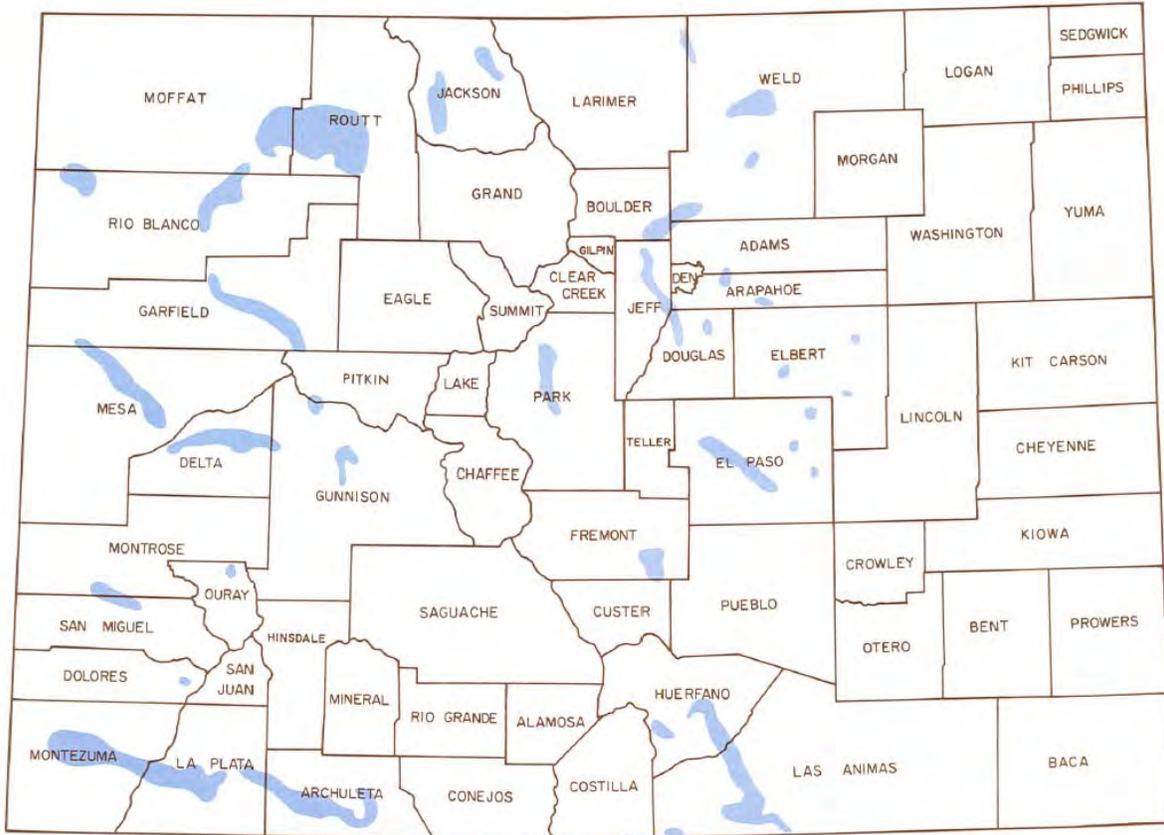


Figure 5. General locations of Inactive Coal Mines in Colorado.

Source: Subsidence above Inactive Coal Mines

According to the 2008 State Hazard Mitigation Plan, Jefferson County hosts 48 abandoned coal mines and 100 other types of abandoned mines. According to the Colorado Division of Minerals and Geology, as of September 2009 there are 104 mine permits in the County and 24 of those permits are active. The majorities of the mines permitted, whether active or not, are for clay, followed by sand and gravel, stone, granite and shale. There are no permitted or active coal mines in the County.

Figure 4.21 illustrates the areas of suspected or known subsidence for Jefferson County, as determined by the County Geological Hazards data layer. The area, marked brown, only

minimally corresponds to the areas of inactive coal mines in the County, and accounts for some subsidence vulnerabilities due to clay mining. Of particular note is the large area of vulnerability in unincorporated Jefferson County and portions of the City of Arvada, which is located south of Rocky Flats Lake and north of Arvada Reservoir, which extends east from Highway 93. While currently only minimally developed along the very edges of the suspected area, future development in the area would be vulnerable to subsidence issues. In Golden, developments along Highway 93 are exposed to the risk as well from the northern edge of the city down until just north of the junction of Highway 93 and Highway 6. In the areas east and north of C-470, subsidence hazard areas are located along several developments along Kipling in Lakewood and the unincorporated County. Other potential subsidence areas are in western Lakewood on the south side of Green Mountain, near the recent Solterra development. This amounts to only a small portion of the total developed landmass in the County- somewhere between 10% and 25%.

Based on this information, the geographic extent rating for subsidence is **limited**.

Probability of Future Occurrences

This assessment was conducted to maintain consistency with other hazards profiled in this planning effort, but represents some significant problems. As the data of previous occurrence is skewed, the accuracy of future probability predictions is heavily impeded. In addition, the existing mitigation efforts in the planning area heavily restrict development in subsidence-prone areas, which reduces the number of occurrences that cause damages, and therefore, reduces the number of occurrences that are reported.

There has only been 1 reported incident in Jefferson County that caused property damage since 1978. The methodology for calculating the probability of future occurrences is described in Section 4.2.1. This formula evaluates that the probability of subsidence occurring in any given year is 3.3%. This corresponds to a probability of future occurrences rating of **occasional**.

Magnitude and Severity

The greatest dangers associated with subsidence are related to property damages incurred by the hazard. There are minimal risks to injury and death from unexpected subsidence or accidental exposure to it, but the risk is possible. No injuries or deaths related to subsidence have been reported in the planning area, but the 2013 State Hazard Mitigation plan documents two injuries related to subsidence in the state.

In order to calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it is a reflection of common occurrence. In this case, there is no event of record for the County related to subsidence. Instead, estimates based on predicted areas of vulnerability are used to complete the assessment for comparison purposes to other hazards profiled in this plan. The developed areas with the greatest vulnerability to known subsidence areas is in the

neighborhoods just north and just south of the C-470 corridor on the western border of the urbanized planning area in Lakewood. Widespread subsidence in the area could damage houses, retail facilities, roads, sidewalks, utilities infrastructure, and critical infrastructure facilities located in the area. Such an event would not be expected to impact overall delivery of essential services and functions to the planning area, though the affected community may be affected for weeks as water, gas, power lines, roads, and houses are repaired. If events are severe enough, structures may be deemed unsafe for continued occupancy, forcing residents to relocate. Injuries or deaths are possible, but not expected, in such an event.

Based on these factors, the magnitude severity ratings for subsidence are considered **limited**, based on the dollar amount of property damage incurred.

Overall Hazard Significance

Subsidence events in Jefferson County have had minimal impacts on the planning area, due in large part to careful land use planning. The geographic extent of the hazard is considered **limited**. The probability of future occurrences is considered **occasional** and the magnitude/severity for the event of record is **limited**. In addition, the HMPC considers the hazard to have a **low** overall impact on the jurisdiction. This equates to an overall impact rating of **medium**.

This rating is based on the current development policies in place in the County, which limit construction in vulnerable areas. If previously unknown areas of subsidence are discovered, particularly in already-developed areas, this assessment may change. In addition, as development continues out and below the areas of mines worked in steep-slope conditions, those properties may experience a higher vulnerability to landslides caused by subsidence in those areas. This information is also addressed in the landslides profile, and can be avoided with continued good mitigation practices.

4.2.15 Tornado

Description

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes are the most powerful storms that exist. They can have the same pressure differential that fuels 300 mile wide hurricanes across a path less than 300 yards wide. Closely associated with tornadoes are funnel clouds, which are rotating columns of air and condensed water droplets that unlike tornadoes, do not make contact with the ground.

Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis, better correlation between damage and wind speed. It is also more precise because it takes into account the materials affected

and the construction of structures damaged by a tornado. Table 4.11 shows the wind speeds associated with the original Fujita scale ratings and the damage that could result at various levels of intensity. Table 4.12 shows the wind speeds associated with the Enhanced Fujita Scale ratings. The Enhanced Fujita Scale's damage indicators and degrees of damage can be found online at www.spc.noaa.gov/efscale/ef-scale.html.

Table 4.11 Original Fujita Scale

Fujita (F) Scale	Fujita Scale Wind Estimate (mph)	Typical Damages
F0	< 73	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-206	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207-260	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	261-318	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena will occur.

Source: National Oceanic and Atmospheric Administration Storm Prediction Center, www.spc.noaa.gov/faq/tornado/f-scale.html

Table 4.12 Enhanced Fujita Scale

Enhanced Fujita (EF) Scale	Enhanced Fujita Scale Wind Estimate (mph)
EF-0	65-85
EF-1	86-110
EF-2	111-135
EF-3	136-165
EF-4	166-200
EF-5	Over 200

Source: National Oceanic and Atmospheric Administration Storm Prediction Center, www.spc.noaa.gov/faq/tornado/ef-scale.html

Tornadoes form when cool, dry air sits on top of warm, moist air. In Colorado, this most often happens in the spring and early summer (i.e., May, June, and July) when cool, dry mountain air rolls east over the warm, moist air of the plains during the late afternoon and early evening hours. However, tornadoes are possible anywhere in the state, at any time of year and at any point during the day.

Tornadoes can cause damage to property and loss of life. While most tornado damage is caused by violent winds, most injuries and deaths result from flying debris. Property damage can include damage to buildings, fallen trees and power lines, broken gas lines, broken sewer and water mains, and the outbreak of fires. Agricultural crops and industries may also be damaged or destroyed. Access roads and streets may be blocked by debris, delaying necessary emergency response. Tornadoes which affect the developed portions of Jefferson County are more likely to cause high dollar damage amounts.

Geographic Extent

Tornadoes are possible anywhere in Colorado, even in mountainous terrain. In 2007, a tornado damaged thousands of trees outside of Woodland Park in Pike National Forest in Teller County. Teller County intersects the southeastern-most corner of Jefferson County. The severe weather conditions that spawn tornadoes are regional events which may impact any extent of the County at a given time, and in this regard, the possible geographic extent for tornadoes is **extensive**. However, tornadoes as a stand-alone event are single-point (or limited point) occurrences similar to lightning. While knowing that the entire planning area is vulnerable to a tornado, the realistic assessment of tornado occurrences indicates that these single point events occur in a **negligible** density. An average of the two extremes may yield the most likely extent rating.

Based on this information, the geographic extent rating for tornadoes is **limited**.

Previous Occurrences

According to the NCDC database, 13 documented tornadoes have occurred in Jefferson County since 1965. The majority of the events were F0 and F1 tornadoes with unknown durations and damages. All of the tornadoes have occurred in June and July, with no reported injuries or deaths. The following are tornadoes that have occurred in or near Jefferson County. **June 3, 1981** – An F2 tornado impacted Jefferson County and caused \$2.5 million in damages. Duration and length of the tornado were not recorded and specifics regarding the damages were unavailable, but no deaths or injuries were reported.

Since this is the only documented event in the County, two events affecting a similarly urbanized portion of nearby counties are also profiled, to provide context and possibility of scope.

June 15, 1988 – An F3 tornado touched down in Denver County. The event was reported at 200 yards wide and traveled for 3 miles, causing \$25 million in damages. While no one was killed, seven people were injured during the storm.

May 22, 2008 – An F3 tornado estimated at a mile wide at times, traveled for 39 miles across Weld County and into Larimer County, beginning just west of Greeley and extending over the community of Windsor before ending just east of Severance. One man was killed, and more than 75 injuries were reported. With damages estimated at more than \$147 million, the storm is one of

the most costly disasters in Colorado history. Of special note, the Jefferson County provided assistance to the affected communities.

Probability of Future Occurrences

There have been 13 documented incidents in Jefferson County since 1965. The methodology for calculating the probability of future occurrences is described in Section 4.2.1. This formula evaluates that the probability of a tornado occurring in any given year is 26.5%. This corresponds to a probability of future occurrences rating of **likely**.

Magnitude and Severity

In order to calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it is a reflection of common occurrence. The event of record for Jefferson County occurred is the June 3, 1981 which was an F2. The damages inflicted on critical facilities and services (critical infrastructure) resulted in no loss or disruption of services. Documented illnesses and injuries were considered minimal (as none were reported) and the medical response of the County was considered non-impacted. However, \$2.5 million dollars of damage (\$6.55 million in 2015 dollars) was reported. Based on these factors, the magnitude severity rating for tornadoes is considered **limited**.

Overall Hazard Significance

Historically, tornadoes in Jefferson County do not have a particularly large or frequent impact on the planning area. The geographic extent of the hazard is considered **limited**. The probability of future occurrences is considered **likely** and the magnitude/severity for the event of record is **limited**. In addition, the HMPC considers the hazard to have a **medium** overall impact rating on the County. This equates to an overall impact rating of **medium**.

4.2.16 Wildfire

Description

Wildfires are an annual concern for Jefferson County, potentially causing casualties and fatalities, causing environmental damage and costing the county millions in fire suppression costs. Wildfires are most likely during the fire season, which extends from mid-spring to late fall, and is most prominent during the driest summer months of July and August; however, the fire season's duration is impacted by local fire conditions. Fire conditions are impacted by hot weather, vegetation growth, and low moisture content in air and fuel. These conditions, especially when combined with high winds and years of drought, increase the potential for wildfire to occur. The wildfire risk is predominantly associated with the wildland-urban interface (WUI). The WUI is made of up of areas where development is interspersed or adjacent to landscapes that support wildland fire. While traditionally associated with forested mountain areas, WUI areas are also

present in grasslands, prairies, valleys, or in any area where a sustained wildfire may occur and impact developed areas. Fires in the WUI may result in major losses of property and structures, threaten greater numbers of human lives, and incur larger financial costs. In addition, WUI fires may be more dangerous than wildfires that do not threaten developed areas, as firefighters may continue to work on more dangerous conditions in order to protect structures such as businesses and homes. As the development of WUI areas increases, the likelihood of a severe wildfire also increases.

Generally, there are three major factors that sustain wildfires and predict a given area's potential to burn. These factors are fuel, topography, and weather.

Fuel - Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse, and include everything from dead tree needles and leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Manmade structures, such as homes and associated combustibles, are also potential fuel sources. The type of prevalent fuel directly influences the behavior of wildfire. Light fuels such as grasses burn quickly and serve as a catalyst for fire spread. "Ladder fuels" are fuels low to the ground that can spread a surface fire upward through brush and into tree tops. These fires, known as crown fires, burn in the upper canopy of forests and are nearly impossible to control. The volume of available fuel is described in terms of fuel loading. Many areas in and surrounding Jefferson County are extremely vulnerable to wildfires as a result of dense vegetation combined with urban interface living.

Another important aspect to know about fuels is the condition of the types of fuels and how that will further fuel or diminish the fire behavior.

Energy Release Component (ERC) is a National Fire Danger Rating System (NFDRS) index related to how hot a fire could burn. It is related to the 24-hour potential worst case total energy (BTUs) released per unit area (square foot) within the flaming front at the head of a fire. Since wind and slope do not enter into the ERC calculation, the daily variations in ERC will be relatively small. Daily variations are due to changes in moisture content of the various fuels present, both live and dead. The ERC is a cumulative or "build-up" type of index. As live fuels cure and dead fuels dry, the ERC values get higher thus providing a good reflection of drought conditions.

1000-Hour Fuel Moisture (1000-hr FM) represents the modeled moisture content in dead fuels in the 3 to 8 inch diameter class and the layer of the forest floor about four inches below the surface. The 1000-hr FM value is based on a running seven-day computed average using length of day, daily temperature, relative humidity extremes (maximum and minimum values), and the 24-hour precipitation duration values.

100-Hour Fuel Moisture (100-hr FM) represents the modeled moisture content of dead fuels in the 1 to 3 inch diameter class. It can also be used as a very rough estimate of the average moisture content of the forest floor from three-fourths inch to four inches below the surface. The 100-hr

FM value is computed using length of day, maximum and minimum temperature, relative humidity, and precipitation duration in the previous 24 hours.

Fuel Model G is used for dense conifer stands where there is a heavy accumulation of litter and downed woody material. Such stands are typically over-mature and may also be suffering insect, disease, wind, or ice damage -- natural events that create a very heavy buildup of dead material on the forest floor. The duff and litter are deep and much of the woody material is more than 3 inches in diameter. The undergrowth is variable, but shrubs are usually restricted to openings.

The presence of fine fuels and needle cast combined with the cumulative effects of previous drought years, vegetation mortality, tree mortality, and forest blowdowns (which are unexplained windfalls that blow down or break numerous trees in an area) are some examples of fuels in Jefferson County. Fuel is the easiest factor for human-driven mitigation of wildfires.

Topography - An area's terrain and land slopes affect its susceptibility to wildfire spread. Both the fire intensity and the rate of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The arrangement and types of vegetation throughout a hillside can also contribute to increased fire activity on slopes. In addition, topography impacts the ability of firefighters to combat the blaze by hampering access for equipment, supplies, materials and personnel.

Weather – Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfires. High temperatures and low relative humidity dry out the fuels that feed the wildfire, increasing the odds that fuel will more readily ignite and burn more intensely. Wind is the most treacherous weather factor. The greater the wind, the faster a fire will spread, and the more intense it will be. In addition to wind speed, wind shifts can occur suddenly due to temperature changes or the interaction of wind with topographical features such as slopes or steep hillsides. Lightning also ignites wildfires, which are often in terrain that is difficult for firefighters to reach. Drought conditions contribute to concerns about wildfire vulnerability. During periods of drought, the threat of wildfire increases. There are no known effective measures for human mitigation of weather conditions. Careful monitoring of weather conditions that drive the activation and enforcement of fire-safety measures and programs, such as bans on open fires, are ongoing weather-related mitigation activities.

Mountain Pine Beetle Infestation

A related threat to forest health with wildfire hazard implications is the Mountain Pine Beetle. According to the Northern Front Range Mountain Pine Beetle Working Group, Mountain Pine Beetles (MPBs or *Dendroctonus ponderosae*) are a native insect to Colorado. The species normally resides at endemic levels in temperate pine forests across western North America, primarily in the Rocky Mountain region. The past decade has brought severe drought to many parts of the state accompanied by relatively warm temperatures in both summer and winter. These climatic conditions probably are the major reason why insect outbreaks have started in many different regions of the state. Once the outbreaks began, the beetles found an abundant food supply

(trees) in most of Colorado’s forests. Many stands are densely stocked with trees because they have not been disturbed for a very long time by fire, insects, or harvest. All of these factors have combined to create a “perfect storm” of bark beetle outbreaks across much of Colorado. As a result, the impact of the beetle epidemic is greater than ever seen before. The resulting weak (stressed) trees and warm temperatures are perfect habitat for beetles, causing their populations to explode.

MPBs, the size of a grain of rice, bore into trees, lay eggs, and introduce spores of blue stain fungi that germinate and grow in the tissues of the tree. Additionally, beetle larvae feed on the phloem of the tree, which weakens the tree. These activities interrupt the flow of water, decrease sap flow, and ultimately kill the trees. Figure 4.25 shows the life cycle of the MPB.

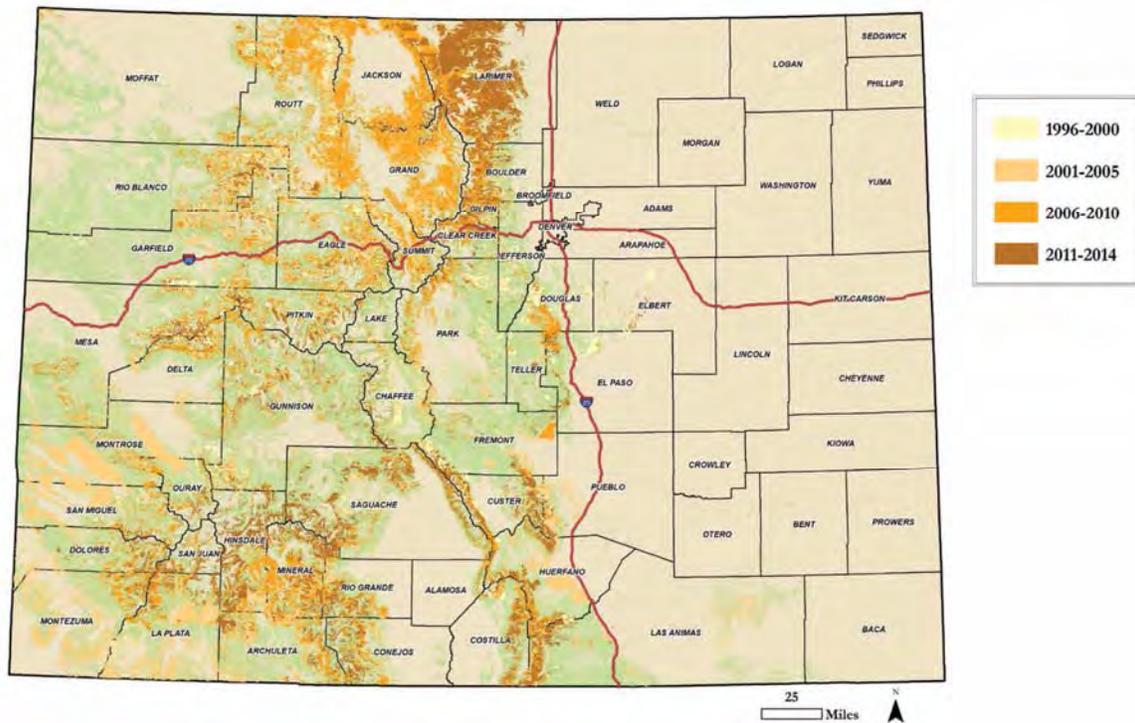
Figure 4.25. Mountain Pine Beetle Life Cycle



Source: Colorado State Forest Service

As shown above in Figure 4.25, once a tree is attacked in the summer/early fall, it will die the following spring or summer. During the spring/summer after infestation, the needles turn red (lodgepole pine trees) or light brown (ponderosa pine trees). The needles will fall off the tree two to three years later, and in many cases, trees start falling to the ground after five to seven years. Since the current epidemic began in the 1990s, nearly 1.5 million acres of Colorado’s lodgepole pine have been infested. Figure 4.26 shows the range of the recent forest insect disease progression from 1996-2014. Jefferson County was largely spared the impacts suffered in nearby Grand and Summit Counties.

Figure 4.26. Colorado Forest Insect and Disease Progression 1996-2014



Source: Colorado State Forest Service 2014 Report on Health of Colorado's Forests

MPB is a significant cause of fuel buildup in lodgepole pine forests, and can result in intense fires. About 3-4 years after an outbreak, the majority of affected trees will be in the “red and dead” stage. At this time fire hazard increases because the red needles are very flammable. Fires burning in red-needled trees can burn more intensely than in live trees. One example is the June 2006 Y Fire in Grand County. Firefighters attribute the unusual intensity of the fire, given the moderate weather and early time of year for that elevation, to beetle-infested trees. Additionally, firefighters have noted the extreme volatility of beetle-killed trees versus live trees when conducting prescribed fires. However, fire hazard decreases substantially once these needles fall off of the trees and leave dead standing trees or “snags.” After 15-20 years, when the majority of trees fall down, creating a jackstraw effect in the forest, the amount of surface or ground fuels increases fire hazard. In general, as trees start falling, the surface fuels contribute more heat to a stand of trees; therefore it is easier to create crown fire conditions as well as a more intense fire.

There is debate in the forest health/fire communities of what the effect will be on ponderosa pine along the Front Range of Colorado (including Jefferson County). Traditionally, as MPB epidemics erupt, the beetle might tend to favor the host species of origin (i.e. if the epidemic is rooted in

ponderosa pines, the transition is limited); however, all epidemics are not equal. For a variety of factors each epidemic has its own characteristics.⁴⁰

Per the 2014 Report on the Health of Colorado's Forests published by the Colorado State Forest Service, in 2014, the area affected by mountain pine beetle declined to its lowest level since the current outbreak began in 1996. A total of 15,000 acres with some level of active infestation were mapped during the annual aerial forest health survey, with most of the active infestation occurring away from Jefferson County.

Geographic Extent

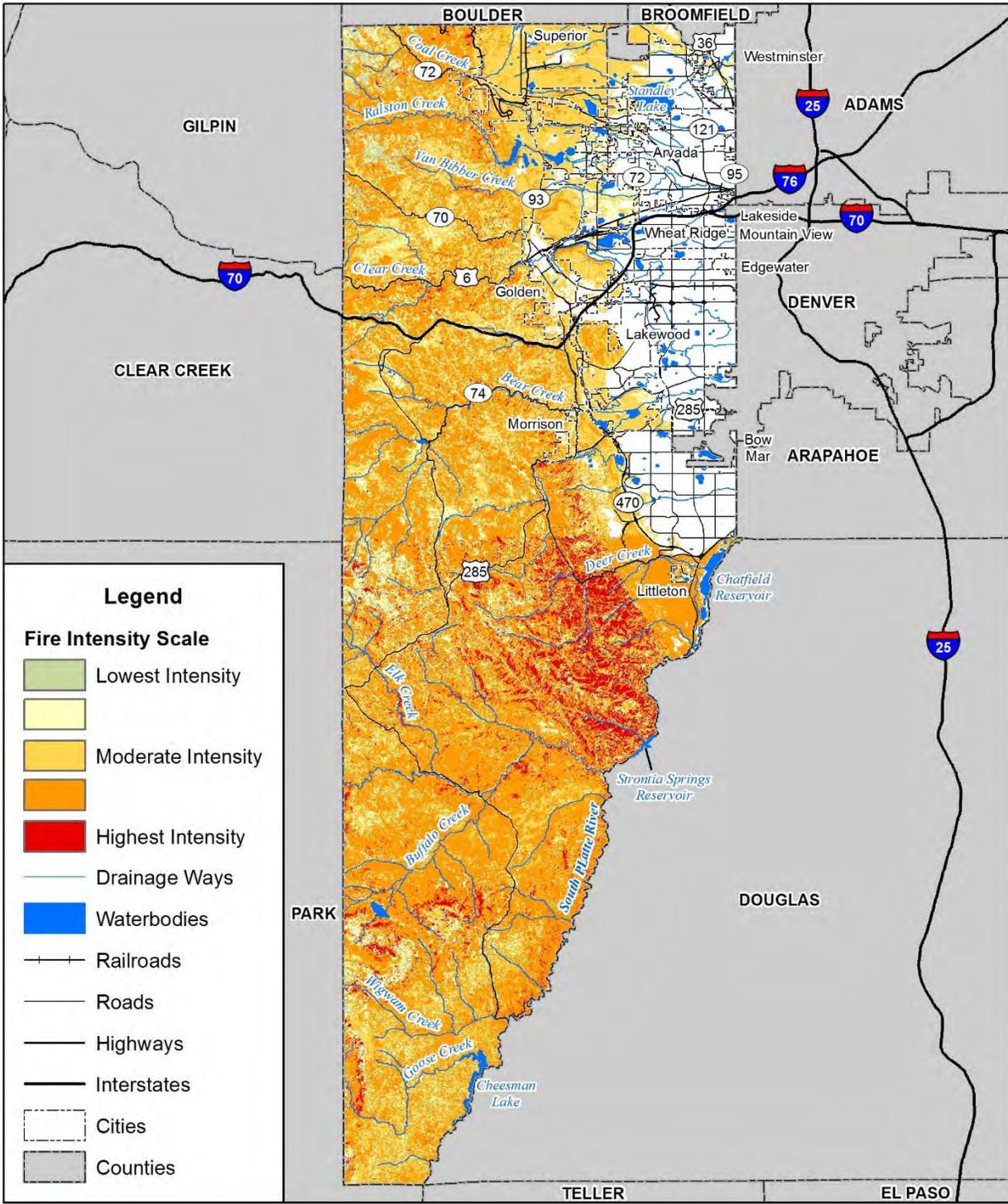
Most of the County is susceptible to wildland fires, with highest risk areas located in the Front Range foothills in western and southern Jefferson County. For the analysis described in Section 4.3 in this plan, all the area west of State Highway 93 and west/south of State Highway C-470 was included.

The Colorado Wildfire Risk Assessment Project (CO-WRAP) is an initiative led by the Colorado State Forest Service to provide information to the public and wildfire professionals to: identify areas in need of wildfire planning, disseminate information, encourage collaboration, plan response actions and prioritize fuels treatments in the state. CO-WRAP hosts a web-mapper which can display a number of wildfire related variables, such as the state's Fire Intensity Scale (FIS). This analysis uses fuels, topography and weather as inputs to determine the relative intensity (from Class 1, lowest to Class 5, highest) of a potential wildfire. According to data from the FIS, the majority of the County has at least a moderate intensity rating with the highest potential wildfire intensity areas south of Littleton and north of the Strontia Springs Reservoir in the Pleasant Park Corridor, see Figure 4.27.

Based on this assessment the geographic extent is classified as **significant**.

⁴⁰ Witcosky, J.J. 2009. *Will the Mountain Pine Beetle Epidemic Spread from Lodgepole Pine into Ponderosa Pine along the Northern Front Range Counties of Colorado?*, Final Report to Joint Ecology Working Group, Front Range Fuels Roundtable and the Colorado Bark Beetle Cooperative. 36p.

Figure 4.27. Jefferson County Fire Intensity Scale Map



Map compiled 11/2015; intended for planning purposes only.
 Data Source: Jefferson County, CDOT, NHD, CO-WRAP

0 5 10 Miles



Given worst-case (90th percentile) weather conditions, the Jefferson County Community Wildfire Protection Plan provides a breakdown of the type of fire expected in an ignition (Figure 4.28) and the rate of spread by chains per hour (Figure 4.29).

Most of the county is at-risk to active crown fire, which means the entire fuel complex is involved in flame, but the crowning phase remains dependent on heat released from surface fuel for continued spread (Scott and Reinhardt 2001). For rate of spread, essentially all county lands west of Highway 93 and south/west of C-470 have the highest chains per hour risk meaning a fire in any of these areas could spread very rapidly.

Figure 4.28. Jefferson County Crown Fire Potential

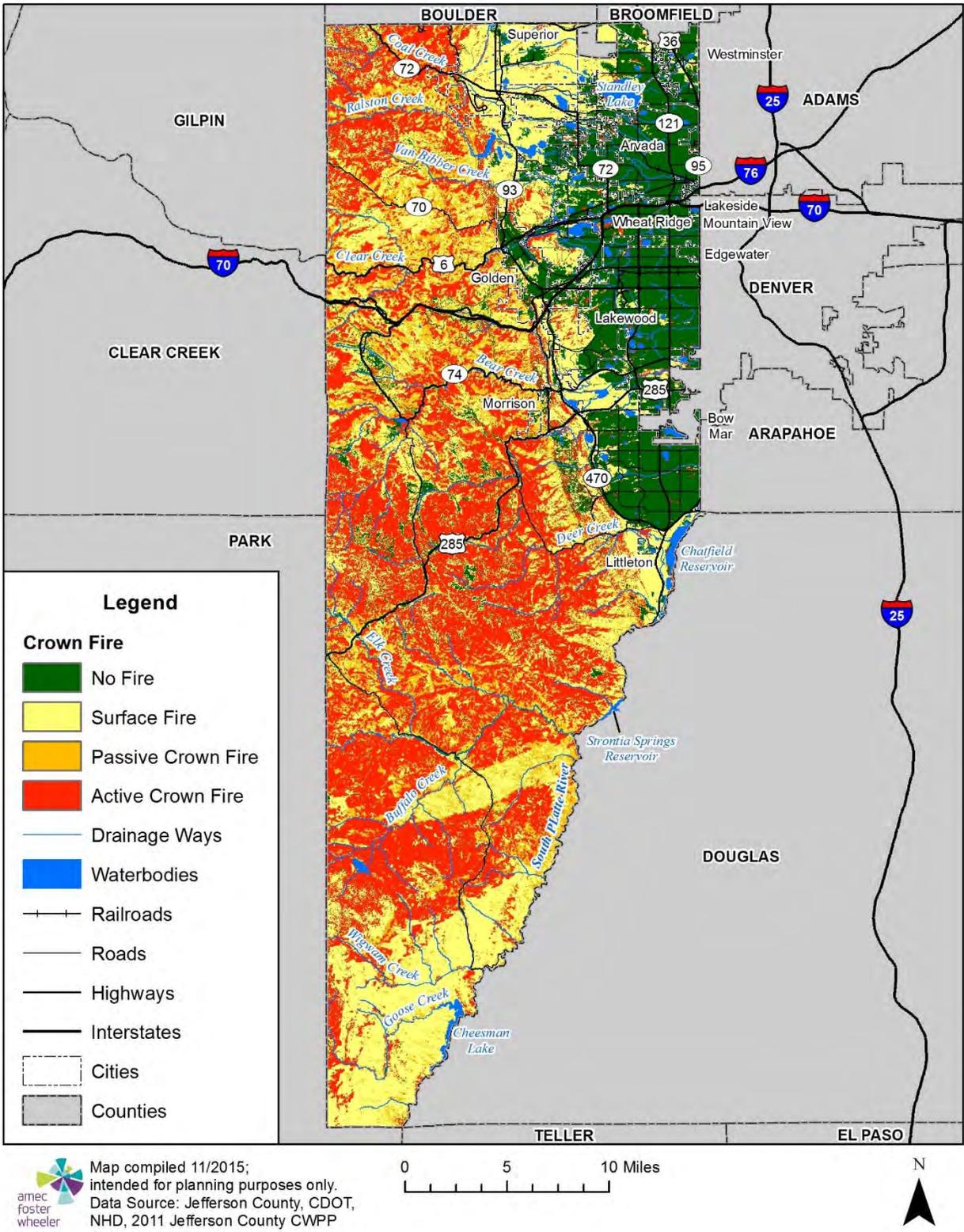
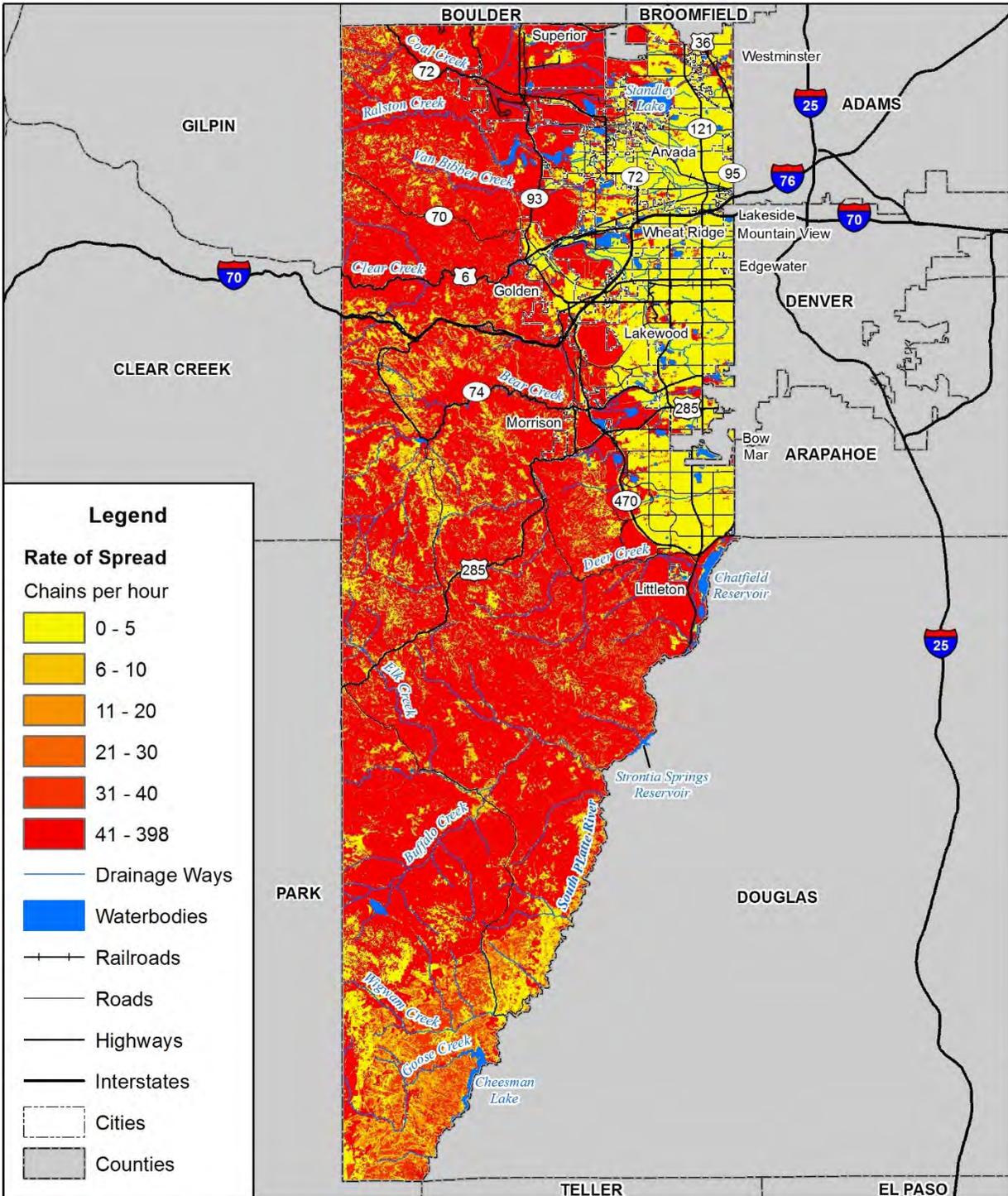


Figure 4.29. Jefferson County Rate of Spread Given 90th Percentile Weather Conditions



Map compiled 11/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD, 2011 Jefferson County CWPP

0 5 10 Miles



Previous Occurrences

Jefferson County has been impacted by several significant wildfire events. Particularly severe or significant events are profiled below.

September 21-24, 1978 – The Murphy Gulch fire burned approximately 3,300 acres. The first Emergency Fire Fund fire in the Front Range, several structures were lost to the blaze and many subdivisions were evacuated. Interagency resources were ordered to supplement local fire departments. The Federal Type 2 Team took over and managed the closeout. The agencies involved were the Inter-Canyon Fire Protection District (FPD) and Bancroft FPD. The fire burned along the foothills west of the Ken-Caryl Ranch subdivision.

September 7-9, 1988 – The North Table Mountain Fire burned between 1,300 and 2,000 acres. The human caused fire started off CO 93 and crossed the mountain, which threatened subdivisions on east side of mountain. Over 250 firefighters from 20 fire departments, the National Guard, and local law enforcement officers responded, in addition to a helicopter. In many areas, the focus was on structure protection and evacuation. The fire involved the Fairmount FPD as well as a helicopter. The area included the top, west, and east sides of North Table Mountain.

April 23-24, 1989 – The Mt. Falcon fire burned approximately 125 acres. The fire burned in open space properties, which lead to the voluntary fire reimbursement program by the County open space agencies to local fire departments to support the initial attack of the burn.

March 24-25, 1991 – The O’Fallon fire burned approximately 52 acres. Though small in comparison to other fires in this record, the fire occurred in the Denver Mountain Parks’ open space areas, which lead to 100 firefighters from 5 different departments responding. Dry winter conditions, gusty winds, and limited access slowed the control efforts, underscoring the role of weather and terrain in fire response.

May 14-15, 1991 – The Elk Creek fire in the Golden Gate FPD burned 102 acres. The steep terrain with limited access lead to the use of hand crews formed from 80+ firefighters from 15 departments and ranging across multiple counties. The fire was managed jointly by the FPDs and the Jefferson County Sheriff’s Office’s newly formed Incident Management Group (IMG).

July 9-11, 1994 – The Carpenter Peak/Chatfield fires each burned small amounts. The fires were caused by dry lightning, as part of a larger fire bust that sparked across the entire Front Range. These particular fires resulted in evacuations from Roxborough Park, and involved 300 firefighters, 40 engines, and National Guard helicopters.

May 18-25, 1996 – The Buffalo Creek fire burned approximately 10,400 acres. High winds caused extreme fire behavior, leading to a 10 mile run in only six hours. 10 homes or other outbuildings

were lost. This fire marked the first large WUI fire in the Front Range. Costs for the fire were estimated at \$3,835,000.⁴¹

June 27 – July 5, 1998 – The Beartracks fire burned 500 acres. Heavy fuel loading in roadless area and human caused fire leads to heavy initial attack and extended attack by local fire agencies along with air resources. The fire posed a threat to the Upper Bear Creek drainage area and numerous homes. The Federal Type 2 Incident Management Team (IMT) relieved the IMG on day 3 and managed to closeout.

June 12-25, 2000 – The Hi Meadow fire, caused by humans, fell under initial attack by the local FPD and burned approximately 10,800 acres. The fire ‘blew up’ on the same day as the 10,000 acre Bobcat fire in Larimer County, causing a Front Range-wide stress on resources.⁴² 52 homes were lost along with other miscellaneous structures. This fire was considered the “benchmark” WUI fire for Colorado until the Hayman fire in 2002. The fire burned from Burland Ranchettes on the west to Colorado Highway 126 on the east, and south to the Buffalo Creek Fire burn area and the town of Pine.

The Bobcat Fire also lasted several days and was started by a campfire, though the area had a long history of fire, included several caused by lightning. The control costs were estimated at \$3.5 million (\$4.3 in 2008) with no private losses, but the fire heavily impacted the watershed and water quality in the surrounding communities.⁴³ The concurrence of the two fires is significant due to the strains caused on the regional resources and mutual aid capabilities.

2002 Fire Season

The 2002 fire season is the most severe fire season on record in the state of Colorado and in particular for Jefferson County and the Front Range communities. 2002 was one of the most severe droughts on record in Colorado. During 2002, total suppression costs for the fires exceeded \$152 million.⁴⁴ 3,409 fires were documented during the year for a cumulative total of 244,252 burned acres. This is the highest number of fires in any year in Colorado since 1990 and accounted for more than three times as many burned acres as the next-largest recorded damages for one season.⁴⁵ More than 16,500 firefighters responded to the events. Nine firefighters were killed during the year, and one air tanker and one helicopter were lost, killing three additional people. 384 homes were lost statewide, with an additional 624 structures lost.

Four of the fires that Jefferson County suffered during this year resulted in Fire Management Assistance Declarations: the Schoonover, Black Mountain, Snaking and Hayman fires. The first three fires burned from the end of April through the end of May, collectively, and the Hayman fire

⁴¹ 2008 State Hazard Mitigation Plan. Hazards, page 38. In 2008 dollars, these losses equate to \$5.2 million.

⁴² According to the 2008 State Hazard Mitigation Plan, the Bobcat fire burned 10,600 acres and destroyed 18 structures.

⁴³ Information drawn from the 2003 Northern Colorado Regional Hazards Mitigation Plan, page 54.

⁴⁴ 2008 State Hazard Mitigation Plan, Hazards page 40. In 2008 dollars, the suppression costs equate to more than \$180 million.

⁴⁵ *Ibid.*, page 37.

burned for more than a month. These fires are further profiled below, using information provided by the Jefferson County Office of Emergency Management and the 2008 State Hazard Mitigation Plan.

May 20-27, 2002 - Lightning sparked a wildfire near Deckers. Extremely dry conditions and very strong winds the following day allowed the fire to consume 3,860 acres before it could be contained. Thirteen structures were destroyed, including 4 homes.

April 22 – May 2, 2002 – The Snaking Fire burned approximately 3,000 acres. Caused by humans outside of the ‘normal’ fire season, the event was exacerbated by high winds. The initial and extended attacks were coordinated mostly through Jefferson and Park Counties, with assistance from air resources. The fire threatened numerous homes and burned north of U.S. Highway 285 from Platte Canyon High School to Crow Hill, with 2 lost structures. The NRCS Emergency Watershed Protection Program authorized \$72,883 in response and recovery funds.⁴⁶

May 5-11, 2002 – The Black Mountain fire burned approximately 300 acres. While smaller than the other fires meriting emergency assistance in the County, the heavy fuel loading and steep terrain of the fire led to many difficulties in the suppression efforts. Local agencies from Jefferson and Park Counties responded along with air resources; with additional assistance from Clear Creek County, the United States Fire Service, Elk Creek FPD and the Evergreen FPD. The fire posed major threats to multiple subdivisions in Conifer and Evergreen and burned north of Conifer Mountain and south of Brook Forest. One injury was reported.

May 21-31, 2002 – The Schoonover fire was caused by lightning and burned approximately 3,000 acres. Initially under attack by USFS and local FPDs, the fire ‘blew up’ on the second day to make a 3,000 acre (four mile) run in steep terrain. The fire threatened homes, camps, businesses, watersheds, regional power lines, and other structures. 12 structures and 1 bridge were lost and 2 injuries were reported. The burn area included the area immediately south across the South Platte River from Jefferson County and burned from west of Deckers to near Moonridge. The NRCS Emergency Watershed Protection Program authorized \$74,951 in response and recovery funds.

June 8 – Mid-July, 2002 – The Hayman Fire burned more than 138,000 acres. The human caused fire expanded on the second day for a historic 19-mile run and 70,000 acres. Multiple evacuations over a two-week period were required as the fire made additional ‘runs’ in multiple counties. Over 150 homes and structures were lost, and large areas of damage were caused to Cheeseman Reservoir and South Platte Watershed areas. The fire is considered a nationally significant WUI fire for Colorado and the Rocky Mountain region. The fire is the event of record for the planning area. Insured losses were documented at \$38.7 million and more than \$5.6 million in recovery and response funds from the NRCS Emergency Watershed Protection Program. The Forest Service

⁴⁶ The purpose of the Emergency Watershed Protection (EWP) program is to undertake emergency measures, including the purchase of flood plain easements, for runoff retardation and soil erosion prevention to safeguard lives and property from floods, drought, and the products of erosion on any watershed whenever fire, flood or any other natural occurrence is causing or has caused a sudden impairment of the watershed. NRCS Website: <http://www.nrcs.usda.gov/programs/ewp/>

spent \$38 million in suppression costs and projections for rehabilitation were estimated at \$74 million.⁴⁷

July 22-24, 2005 – The North Table Mountain fire of 2005 burned significantly less land than the previous event in 1988, but threatened multiple subdivisions on all sides. The steep terrain allowed the fire to escape the initial attack. Heavy use of air resources facilitated the transition between the initial attacks to structure protection response on the first day. The fire burned the top, east, north, and west sides of Table Mountain outside of Golden and was started by kids playing with fireworks.

April 2, 2006 – Rocky Flats fire burned 1,200 acres. The fire was started by humans and exacerbated by high winds to cause an outside of ‘normal fire season’ event. The fire moved through the open space areas of Rocky Flats NWR and the adjacent lands. The rate of spread, flame lengths, and limited access contributed to the fire threatening to cross several roads and endangered multiple subdivisions, businesses, and Rocky Mountain Airport. A multi-county approach, including Jefferson, Boulder, Gilpin, and Adams was requested. Wind conditions prevented the use of air resources. Difficulties with communications and fire management across multiple jurisdictions were documented.

July 21-23, 2006 – The Centennial Cone fire burned in the no-man’s land adjacent to the Golden Gate FPD. The fire, which burned 22 acres, remained entirely contained within the open space park. However, the significant fire activity in steep terrain with no road access during the height of the 2006 national fire season limited the initial attack. The fire threatened U.S. Highway 6 in Clear Creek Canyon and those subdivisions. Limited air resources helped slow the spread of the fire, and an interagency “hotshot” hand crew supplemented local fire resources on the second day for a direct attack. Summer monsoons helped reduce fire danger on day three as the fire was controlled.

March 26-31, 2012 – The Lower North Fork wildfire south of Conifer scorched a total of 4,150 acres. Strong southwest winds ahead of an approaching cold front produced high to extreme fire danger across the Front Range Foothills and Palmer Divide. As a result, a 50-acre prescribed burn that had been conducted the previous week reignited in the foothills of Jefferson County, southwest of Denver. The strong wind gusts carried embers from the interior of the burn area, across containment lines and into very dry fuels which initiated the wildfire. It then spread into the crowns of the trees and driven by the strong winds, quickly advanced to the northeast onto private lands. Local firefighters immediately responded to the wildfire, but were unable to contain it, due to the extreme winds and dry and abundant fuels.

The combination of very strong winds, record warm temperatures and extremely dry conditions for month of March; all contributed to a rapid increase in fire growth during the afternoon of March

⁴⁷ The costs of the Hayman Fire were drawn from the “Hayman Fire Impacts” handout produced by the Wildland Fire Lessons Learned Center. The handout is available online at http://www.wildfirelessons.net/documents/Hayman_Fire_Impacts_FMT_Vol65_1.pdf

26th. A total of 900 homes were evacuated on the 26th. The fire destroyed 27 homes and resulted in the deaths of three local residents. The property damage alone was estimated to be \$11 million. The wildfire was not 100 percent contained until April 2nd.

A visual representation of all historic fires in Jefferson County is provided in Figure 4.30.

Probability of Future Occurrences

Since 1980 there have been 20 fire incidents in Jefferson County that have burned 10 or more acres. The methodology for calculating the probability of future occurrences is described in Section 4.2.1. This formula evaluates that the probability of a severe wildfire occurring in any given year is 57.1%. This corresponds to a probability of future occurrences rating of **likely**.

Magnitude and Severity

Wildfire is a significant natural hazard in Jefferson County. The wildland-urban interface is especially at risk as decades of fire suppression have resulted in large concentrations of downed timber and fuels. This problem is exacerbated by the significant amount of residential development in the semi-urban and rural portions of the region. Potential losses from wildfire include human life; structures and other improvements; natural and cultural resources; quality and quantity of the water supply; assets such as timber, range and crop land, and recreational opportunities; and economic losses. Smoke and air pollution from wildfires can be a severe health hazard. In addition, catastrophic wildfire can lead to secondary impacts or losses, such as future flooding and landslides during heavy rains.

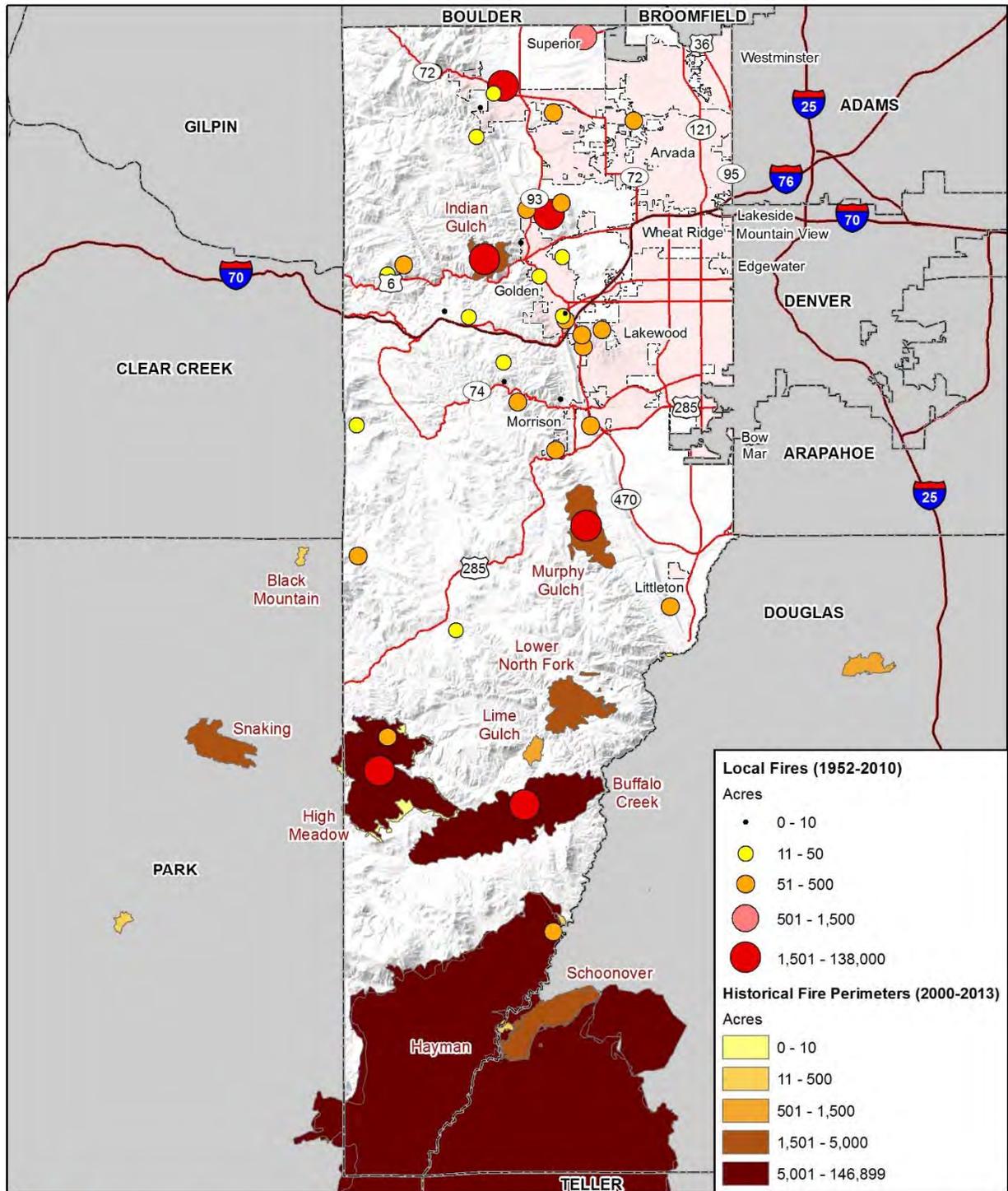
CO-WRAP also provides an analysis for Wildland-Urban Interface (WUI) risk based on housing density consistent with Federal Register National standards. The location of people living in the wildland-urban interface and rural areas is essential for defining potential wildfire impacts to people and homes.

To calculate the WUI Risk Index, the WUI housing density data was combined with flame length data and response functions were defined to represent potential impacts. The response functions were defined by a team of experts led by Colorado State Forest Service staff. By combining flame length with the WUI housing density data, it is possible to determine where the greatest potential impact to homes and people is likely to occur. The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact. For example, areas with high housing density and high flame lengths are rated -9, while areas with low housing density and low flame lengths are rated -1.

The WUI Risk Index has been calculated consistently for all areas in Colorado, which allows for comparison and ordination of areas across the entire state. Data is modeled at a 30-meter cell resolution, which is consistent with other Colorado WRA layers.

For Jefferson County, the communities south of Interstate 70 and along the US 285 corridor are the most at-risk, see Figure 4.31.

Figure 4.30. Jefferson County Historic Fires, 1952 to 2013

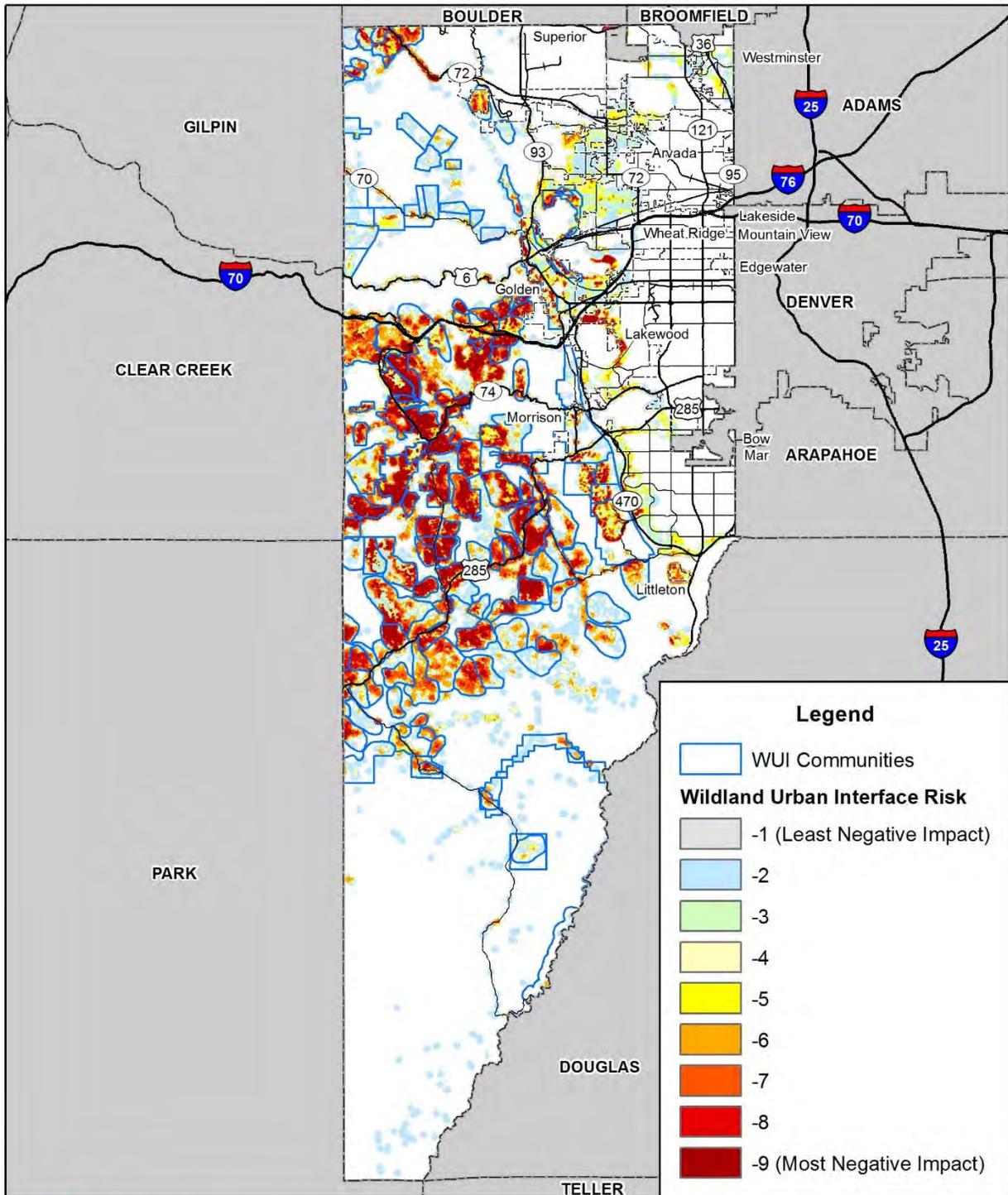


Map compiled 11/2015;
intended for planning purposes only.
Data Source: Jefferson County, CDOT,
NHD, USGS: BLM, FS, FWS, NPS,
HSIP Freedom 2015

0 5 10 Miles



Figure 4.31. Jefferson County WUI Communities and WUI Risk




 Map compiled 11/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 CO-WRAP, 2011 Jefferson County CWPP

0 5 10 Miles



The county completed a Community Wildfire Protection Plan (CWPP) in 2012. The CWPP takes an in-depth look at the risk to the county from wildfire, along with actions to mitigate fire vulnerability and impacts. Additionally, the following communities and fire protection districts have completed CWPPs:

- City of Golden
- Coal Creek Canyon Fire Protection District
- Elk Creek Fire Protection District
- Evergreen Fire Protection District
- Fairmount Fire Protection District
- Foothills Fire Protection District
- Genesee Fire Protection District
- Golden Gate Fire Protection District
- Indian Hills Fire Protection District
- Inter-Canyon Fire Protection District
- Lower North Fork Fire Protection District
- North Fork Fire Protection District
- South Platte
- West Metro Fire Protection District

In order to calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it is a reflection of common occurrence. The event of record for Jefferson County is the Hayman fire, which occurred in June and July of 2002. The event damaged 41,408 acres in the County, or about one fifth of the total acres burned. 600 buildings were destroyed, 5 wildland firefighters were killed (this was an indirect result of the wildfire, as the firefighters were from Oregon and were killed in a car accident near Grand Junction) and numerous people were evacuated or displaced due to the fire. The Hayman fire is the most expensive fire in Colorado history, and took more than three weeks to contain and is considered a nationally-significant WUI fire. Based on these factors, the magnitude severity rating for wildfire is considered **critical**.

Overall Hazard Significance

Wildfires in Jefferson County are a significant concern. The geographic extent of the hazard is considered **significant**. The probability of future occurrences is considered **likely**, and the magnitude/severity for the event of record is **critical**. In addition, the HMPC considers the hazard to have a **high** impact on the County. This equates to an overall impact rating of **high**.

4.2.17 Windstorm

Description

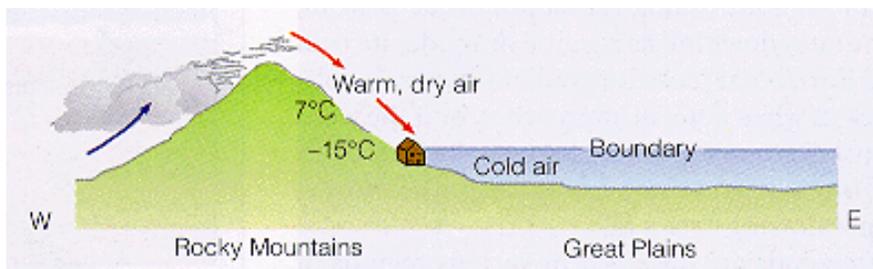
Wind is the flow of air or other gases that compose an atmosphere, and consists of air molecules in motion. The differences in density between two air masses actually lead to wind. Winds are commonly classified by their spatial scale, their speed, the types of forces that cause them, the geographic regions in which they occur, and their effect. While wind is often a standalone weather phenomenon, it can also occur as part of a storm system, most notably in a cyclone. Winds are plotted indicating the direction the wind is blowing *from* as well as its strength. Shorter duration

winds, such as wind gusts, can cause substantial damage to power lines. Winds with an intermediate duration, which sharply increase and last for a minute, are called squalls. Long-duration wind speeds have various names associated with their average strength, such as breeze, gale, storm, hurricane, and typhoon.

Wind occurs on a range of scales, from local breezes generated by heating of land surfaces and lasting tens of minutes, to global winds resulting from the difference in absorption of solar energy between the climate zones. The two major driving factors of large scale atmospheric circulation are: 1) the differential heating between the equator and the poles, which causes the jet stream and the associated climatological mid-latitude westerlies, polar easterlies, and the trade winds; and 2) the rotation of the planet called the Coriolis Effect. The Coriolis Effect is what causes the circular motion of air around areas of high and low pressure in areas that have variable terrain where mountain and valley breezes dominate the wind pattern.

Downslope winds in Colorado are referred to as Chinook winds, after the Native American tribe of the Pacific Northwest. These downslope winds can occur with violent intensity in areas where mountains stand in the path of strong air currents. These warm and dry winds occur when the winds from the west blow across the Continental Divide and descend from the foothills and out onto the plains.

Figure 4.32. Chinook Wind Pattern



Source: University of Colorado at Boulder ATOC Weather Lab

Windfalls can be small scale or large scale forest blowdowns that literally force the trees down or to breakage by the means of wind. The health of the forest can determine which trees or how many are affected during a windfall incident. Windfalls can help spread wildfires. Windfalls can increase fuels for wildfire or can cause loss of animal habitat, erosion and soil depletion due to topsoil being ripped out of the ground by fallen trees. Conversely, they can create large patches of sunlight, which is good for the ground cover and increases seedling diversity in the ecosystem.

Wind can be very dangerous. Areas of wind shear, caused by various weather phenomena, can make treacherous situations for airplanes and other flying aircraft. When winds become too strong on the ground, boats can capsize, trees can be stripped of their branches or uprooted, and man-made structures become vulnerable to damaged or destruction. Wind speed, direction, and dryness are major factors in the spreading of wildfires. Using wind weather forecasting and modeling during a wildfire can be a useful tool to help firefighters with their fire suppression strategy.

Jefferson County wind patterns range from light and breezy to severe gale force winds. There is usually some level of a constant breeze due to Jefferson County’s mountainous, Front Range, and plains topography. Other associated hazards of wind and wind damage include arcing power lines, debris blocking streets and storm water drainage systems, dust storms, and occasional structure fires. Figure 4.33 demonstrates how destructive wind can be.

Figure 4.33. July 20, 2009 Damage in Wheat Ridge



Source: Fox News Online Photo Gallery

Table 4.13 shows The Beaufort Wind Scale. The replication of the scale only reflects land-based effects.

Table 4.13 The Beaufort Wind Scale

Beaufort Number	Description	Windspeed (Knots)	Land Conditions
0	Calm	<1	Calm. Smoke rises vertically.
1	Light air	1 – 3	Wind motion visible in smoke.
2	Light breeze	4 – 6	Wind felt on exposed skin. Leaves rustle.
3	Gentle breeze	7 – 10	Leaves and smaller twigs in constant motion.
4	Moderate breeze	11 – 16	Dust and loose paper raised. Small branches begin to move.
5	Fresh breeze	17 – 21	Branches of a moderate size move. Small trees begin to sway.
6	Strong breeze	22 – 27	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic garbage cans tip over.
7	Near Gale	28 – 33	Whole trees in motion. Effort needed to walk against the wind.
8	Gale	34 – 40	Some twigs broken from trees. Cars veer on road. Progress on foot is seriously impeded.
9	Strong gale	41 – 47	Slight structural damage occurs; slate blows off roofs
10	Storm	48 – 55	Seldom experienced on land; trees uprooted or broken; considerable structural damage
11	Violent storm	56-63	
12	Hurricane	64+	

Source: National Oceanographic and Atmospheric Association, <http://www.spc.noaa.gov/faq/tornado/beaufort.html>

Geographic Extent

The entire planning area is susceptible to wind, windstorms, and wind associated with other storm systems that can have negative impacts on a community. Depending on the origination of the atmospheric system, its direction of travel, and its duration, a part of the planning area can be affected or the entire County. Typically, however, the hazard is predicted to affect between 50% and 75% of the planning area. Based on this information, the geographic extent rating for windstorms is **significant**.

Previous Occurrences

High winds associated with other severe weather and stand-alone windstorms are common occurrences in Jefferson County. The mountainous terrain and foothills topography lends itself to regular conflicts between systems of high and low pressure. Most of Colorado's most costly storms are hail-related and occurred in the Denver-metro area. Hail is usually accompanied by high winds; however the damages are not broken out to distinguish hail from wind damage.

The National Climactic Data Center recorded 141 separate windstorm occurrences between January of 1994 and December of 2014 with wind speeds over 50 knots (approximately 57 mph). The most significant of those events are recorded below.

June 14, 1976 – 78 mph winds recorded at the Jefferson County Airport near Broomfield, 66 mph at Littleton.⁴⁸

June 6, 1983 – Report of a thunderstorm with associated winds measured at 61 knots (70 mph).

August 15, 1982 – Report of a thunderstorm with associated winds measured at 61 knots (70 mph).

August 13, 1983 – Report of a thunderstorm with associated winds measured at 84 knots (97 mph).

June 9, 1987 – Report of a thunderstorm with associated winds measured at 63 knots (73 mph). One death reported

April 19, 1989 – Report of a thunderstorm with associated winds measured at 68 knots (78mph).

May 16, 1990 – Report of a thunderstorm with associated winds measured at 60 knots (69 mph).

May 26, 1993 – Report of a thunderstorm with associated winds measured at 70 knots (81mph).

October 26, 1995 – Report of a thunderstorm associated winds measured at 61 knots in Coal Creek Canyon (70 mph).

⁴⁸ Weather History (www.examiner.com)

June 22, 1997 – Report of a dry microburst which produced 69 mph winds at the Jefferson County Airport.

June 10, 2000 – Report of a dry microburst which produced 67 mph winds at the Jefferson County Airport.

July 30, 2004 – Report of a thunderstorm associated winds measured at 62 knots (71 mph) in Evergreen.

July 20, 2009 – Golf ball-sized hail and strong winds battered roofs, uprooted trees and pounded vehicles in Wheat Ridge, Lakewood, and Arvada, and portions of neighboring Arapahoe County. The insured losses are totaled at more than \$767.6 million in damage for Colorado’s 2009 severe weather season as of August 2009.

Probability of Future Occurrences

According to the NCDC, there have been 141 separate days with NCDC-recorded high winds above 57 mph (50 knots) in Jefferson County from January 1996 to December 2014. The methodology for calculating the probability of future occurrences is described in Section 4.2.1. This formula evaluates that the probability of a Windstorm occurring in any given year is 100%.

This corresponds to a probability of future occurrences rating of **likely**.

Magnitude and Severity

Windstorm severity is difficult to quantify. Wind, by itself, has not historically caused high insured dollar losses. For the insurance industry to track a weather event, it must be a large enough storm that insurance companies may declare it a “catastrophe,”⁴⁹ and then damage estimates for auto and homeowner claims are collected and published. This generally equates to damages in excess of \$25 million; though significant events impacting small communities are also tracked occasionally.

In order to calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it is a reflection of common occurrence. The significant wind and windstorm events of record for Jefferson County are identified in the Previous Occurrences section of the windstorm hazard profile. Wind damage is usually identified by the number of insurance claims made as a result of a severe weather event. Wind is not broken out from a hailstorm, rainstorm, or a tornado. The damages inflicted on critical facilities and services (critical infrastructure) for Jefferson County are not specific to windstorm activity alone.

⁴⁹ Note that this definition of ‘catastrophe’ is not congruent with the definition used in the emergency management field.

Based on these factors, the magnitude severity ratings for windstorm in Jefferson County would be **negligible**; however if the windstorm is considered a component of the larger weather system its magnitude and severity rating would be upgraded to **limited**.

Overall Hazard Significance

Windstorm in Jefferson County can have a particular impact on the planning area. Alone they can rip roofs from houses, collapse fences, tear off siding, project flying debris through windows, and uproot large trees. When accompanying other severe weather, like hail, damages are compounded. The geographic extent of the hazard is considered **significant**. The probability of future occurrences is considered **likely** and the magnitude/severity for the event of record is **limited**. The HMPC considers the hazard to have an overall impact rating of **medium** on Jefferson County. Overall, the data indicates that the overall hazard significance rating is **medium**.

4.3 Vulnerability Assessment

Requirement §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Requirement §201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

Requirement §201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

With Jefferson County’s hazards identified and profiled, the HMPC conducted a vulnerability assessment to describe the impact that the significant hazards would have on the County. The vulnerability assessment quantifies, to the extent feasible, assets at risk to natural hazards and estimates potential losses. This vulnerability assessment followed the methodology described in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses*, as well as Tasks 5 and 6 of the 2013 *FEMA Local Mitigation Planning Handbook*. The vulnerability assessment first describes the total vulnerability and values at risk and then discusses vulnerability by hazard.

4.3.1 Methodology

The vulnerability assessment was conducted based on the significance of the hazard utilizing best available data. This assessment is an attempt to quantify assets at risk, by jurisdiction where possible, to further define populations, buildings, and infrastructure at risk to natural hazards. The methods of analysis vary by hazard type and data available and are discussed further in 4.3.4 with each hazard analyzed. The information presented is for planning level assessments only. Avalanche is omitted from this vulnerability assessment due to the relatively low significance, lack of previous damages based on research, and a lack data to support quantifying future losses. Data to support the vulnerability assessment was collected and compiled from the following sources:

- Current County and municipal GIS data (hazards, base layers, critical facilities and assessor’s data)
- FEMA’s HAZUS-MH 2.2 GIS-based inventory data (Jan 12, 2015)
- 2010 US Census data and most recent (2013/2014) American Community Survey data

- 2015 Homeland Security Infrastructure Program (HSIP) Freedom data
- Written descriptions of inventory and risks provided by participating jurisdictions;
- A refined flood loss estimation by jurisdiction with the use of geospatial analysis for both 1% and 0.2% annual chance flooding
- Updated modeling of earthquake loss potential with HAZUS-MH 2.2, including a 2,500 year probabilistic scenario and a hypothetical M 6.5 event on the Golden Fault
- Existing plans and studies
- Personal interviews with planning team members, hazard experts, and County and municipal staff.

The scope of the vulnerability assessment is to describe the risks to the County as a whole. The vulnerability assessment first describes the assets in Jefferson County, including the total exposure of people and property; critical facilities and infrastructure; natural, historic, and cultural resources; and economic assets. Development trends, including population growth and land status, are analyzed in relation to hazard-prone areas. Next, where data was available, hazards are evaluated in more detail and potential losses are estimated. Data from each jurisdiction was also evaluated and is integrated here but specific variations of risk are noted in the appropriate annex. The methods to assess vulnerability presented here include an updated analysis from the 2010 Jefferson County Multi-Hazard Mitigation Plan. This includes a detailed risk assessment for all hazards based on advanced methods and updated hazard and inventory data. Thus this 2015 plan should be considered the baseline for measuring changes in vulnerability during future updates, recognizing that vulnerability information should become more refined as data sources and methodologies improve over time. Examples of refinements and changes made in this plan include:

- Updated population and building inventory information, including most recent values and 2015 assessor data;
- An updated and more comprehensive inventory of critical facilities;
- An updated inventory of natural, historic, and cultural resources;
- A refined flood loss estimation by jurisdiction with the use of geospatial data provided by the Assessor's office and FEMA DFIRM to perform GIS analysis for both 1% and 0.2% annual chance flooding;
- Updated modeling of earthquake loss potential with HAZUS-MH 2.2, including a 2,500 year probabilistic scenario M7.25 and a hypothetical M 6.5 event on the Golden Fault;
- Detailed inventory by jurisdiction of potential structures and critical facilities at risk to hazards
- Detailed inventory by jurisdiction of potential structures and critical facilities at risk to wildfire hazards

Another significant change in this plan is the addition of 5 new jurisdictions, with corresponding profiles and analysis (found in the Jurisdictional Annexes). These jurisdictions include: the Jefferson Conservation District, Fairmount Fire District, Denver Water, West Metro Fire and Rescue and Golden Gate Fire Protection District.

4.3.2 Assets at Risk

Total Exposure of Population and Structures

Table 4.1 shows the estimated total population and number of housing units for each jurisdiction based on the most recent American Community Survey and Colorado State Demography Office data. Jurisdictions that straddle County boundaries are listed as MCP (Multi-County Place). The numbers listed for these jurisdictions only represent the Jefferson County portion. Table 4.2 shows the high risk population exposures for the County by jurisdiction. In this case, the data is drawn from the American Community Survey 3-Year Estimates (where possible) and reflects the entire geographic area of the jurisdiction.

Table 4.1 Population and Housing Unit Exposure by Jurisdiction

Jurisdiction	2013 Population Estimate (JeffCo Only)	2013 Housing Units Estimate (All Jurisdiction)
Arvada (MCP)	108,582	44,518
Bow Mar (MCP)	286	302
Edgewater	5,281	2,592
Golden	19,792	7,859
Lakeside	8	10
Lakewood	149,643	64,392
Littleton (MCP)	2,475	19,907
Morrison	434	141
Mountain View	521	278
Superior (MCP)	0	4,698
Westminster (MCP)	43,612	44,441
Wheat Ridge	30,950	14,641
Unincorporated	193,999	N/A
Total County	555,583	233,275

Source: Colorado Department of Local Affairs Demography Section, www.dola.colorado.gov/dlg/demog/ and the American Community Survey 2013 <http://quickfacts.census.gov/>

Table 4.2 High Risk Population Exposure by Jurisdiction, 2013

Jurisdiction	Age <5	Age >65	Total Non-Institutionalized Population with a Disability	Do Not Speak English at Home	Families Below Poverty Line	Individuals Below Poverty Line
Arvada (MCP)	5.8%	14%	10.4%	8.4%	5.9%	8.5%
Bow Mar (MCP)*	4.3%	16.3%	N/A	N/A	N/A	N/A
Edgewater*	8.1%	9.8%	N/A	N/A	N/A	N/A
Golden	5%	9.1%	6.5%	10.7%	6.6%	15.5%
Lakeside*	0%	12.5%	N/A	N/A	N/A	N/A
Lakewood	5.9%	15%	11.5%	14.2%	9.1%	12.8%
Littleton (MCP)	6.2%	16.4%	9.9%	11.6%	6.5%	10.5%
Morrison*	2.6%	42.5%	N/A	N/A	N/A	N/A
Mountain View*	6.1%	12.4%	N/A	N/A	N/A	N/A
Superior (MCP)*	6.9%	3.1%	N/A	N/A	N/A	N/A
Westminster (MCP)	7.1%	9.8%	9.4%	17.7%	7.5%	10.6%
Wheat Ridge	4.9%	17.8%	13.7%	10.7%	10.3%	14.1%
Total County	5.5%	13.2%	9.6%	10.3%	5.6%	8.6%

Source: American Community Survey 2013

* indicates limited data availability

Building value assessments in this plan are based on data from the Jefferson County’s Assessor’s Office. Table 4.4 shows the total property inventory from the Assessor’s Office (October 2015). Table 4.3 summarizes the property inventory for the County and each participating jurisdiction with detail by property type, including jurisdictions which may not be participating in the plan, and the unincorporated area of the County.

Table 4.3 Jefferson County's Building Inventory and Value Summary by Jurisdiction

Jurisdiction	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Arvada	36,391	40,238	\$9,384,265,633	\$5,632,622,515	\$15,016,888,148
Bow Mar	94	94	\$41,041,510	\$20,520,755	\$61,562,265
Edgewater	1,445	1,783	\$341,988,370	\$221,690,180	\$563,678,550
Golden	5,021	6,634	\$2,908,182,285	\$2,326,893,061	\$5,235,075,346
Lakeside	10	21	\$13,794,500	\$13,794,500	\$27,589,000
Lakewood	43,868	52,024	\$12,836,534,342	\$8,484,368,394	\$21,320,902,736
Littleton	736	800	\$242,953,280	\$123,080,890	\$366,034,170
Morrison	151	179	\$43,699,650	\$32,486,525	\$76,186,175
Mountain View	246	272	\$43,961,560	\$25,495,750	\$69,457,310
Westminster	13,773	14,875	\$3,602,922,870	\$2,364,895,573	\$5,967,818,443
Wheat Ridge	10,114	12,982	\$2,748,121,469	\$1,909,633,702	\$4,657,755,171
Unincorporated	71,152	75,956	\$21,262,651,293	\$12,319,175,891	\$33,581,827,184
Total	183,001	205,858	\$53,470,116,762	\$33,474,657,735	\$86,944,774,497

Source: Jefferson County Assessor October 2015

*The Assessor's Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values.

**The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values (typically 50% for residential structures, 100% for commercial, 100% for agricultural, 150% for industrial, 100% for mixed use and 100% for exempt)

Table 4.4 Jefferson County's Building Inventory and Value Detail by Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Arvada	Agriculture	49	54	\$13,274,525	\$13,274,525	\$26,549,050
	Commercial	507	884	\$423,212,997	\$423,212,997	\$846,425,994
	Exempt	275	360	\$602,020,570	\$602,020,570	\$1,204,041,140
	Industrial	196	249	\$173,528,680	\$260,293,020	\$433,821,700
	Mixed Use	294	772	\$495,413,945	\$495,413,945	\$990,827,890
	Residential	35,070	37,919	\$7,676,814,916	\$3,838,407,458	\$11,515,222,374
	Total	36,391	40,238	\$9,384,265,633	\$5,632,622,515	\$15,016,888,148
Bow Mar	Residential	94	94	\$41,041,510	\$20,520,755	\$61,562,265
	Total	94	94	\$41,041,510	\$20,520,755	\$61,562,265
Edgewater	Commercial	39	62	\$30,995,000	\$30,995,000	\$61,990,000
	Exempt	28	34	\$23,784,800	\$23,784,800	\$47,569,600
	Industrial	1	1	\$298,500	\$447,750	\$746,250
	Mixed Use	35	230	\$46,015,190	\$46,015,190	\$92,030,380
	Residential	1,342	1,456	\$240,894,880	\$120,447,440	\$361,342,320
	Total	1,445	1,783	\$341,988,370	\$221,690,180	\$563,678,550
Golden	Agriculture	2	2	\$740,700	\$740,700	\$1,481,400
	Commercial	219	343	\$242,578,204	\$242,578,204	\$485,156,408
	Exempt	108	176	\$854,930,230	\$854,930,230	\$1,709,860,460
	Industrial	135	161	\$250,348,671	\$375,523,007	\$625,871,678
	Mixed Use	138	343	\$146,657,360	\$146,657,360	\$293,314,720
	Residential	4,419	5,609	\$1,412,927,120	\$706,463,560	\$2,119,390,680
	Total	5,021	6,634	\$2,908,182,285	\$2,326,893,061	\$5,235,075,346
Lakeside	Commercial	9	10	\$13,189,900	\$13,189,900	\$26,379,800
	Mixed Use	1	11	\$604,600	\$604,600	\$1,209,200
	Total	10	21	\$13,794,500	\$13,794,500	\$27,589,000
Lakewood	Agriculture	15	12	\$5,790,328	\$5,790,328	\$11,580,656
	Commercial	1,237	2,089	\$1,411,899,976	\$1,411,899,976	\$2,823,799,952
	Exempt	361	546	\$1,024,211,356	\$1,024,211,356	\$2,048,422,712
	Industrial	149	242	\$110,053,150	\$165,079,725	\$275,132,875
	Mixed Use	679	2,487	\$1,470,194,485	\$1,470,194,485	\$2,940,388,970
	Residential	41,427	46,648	\$8,814,385,047	\$4,407,192,524	\$13,221,577,571
	Total	43,868	52,024	\$12,836,534,342	\$8,484,368,394	\$21,320,902,736
Littleton	Commercial	2	2	\$3,208,500	\$3,208,500	\$6,417,000
	Residential	734	798	\$239,744,780	\$119,872,390	\$359,617,170
	Total	736	800	\$242,953,280	\$123,080,890	\$366,034,170

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Littleton	Commercial	2	2	\$3,208,500	\$3,208,500	\$6,417,000
	Residential	734	798	\$239,744,780	\$119,872,390	\$359,617,170
	Total	736	800	\$242,953,280	\$123,080,890	\$366,034,170
Morrison	Commercial	26	35	\$4,293,600	\$4,293,600	\$8,587,200
	Exempt	7	5	\$9,935,600	\$9,935,600	\$19,871,200
	Industrial	1	1	\$267,300	\$400,950	\$668,250
	Mixed Use	9	17	\$6,509,600	\$6,509,600	\$13,019,200
	Residential	108	121	\$22,693,550	\$11,346,775	\$34,040,325
	Total	151	179	\$43,699,650	\$32,486,525	\$76,186,175
Mountain View	Commercial	15	22	\$4,491,340	\$4,491,340	\$8,982,680
	Exempt	6	5	\$1,270,600	\$1,270,600	\$2,541,200
	Mixed Use	6	12	\$1,268,000	\$1,268,000	\$2,536,000
	Residential	219	233	\$36,931,620	\$18,465,810	\$55,397,430
	Total	246	272	\$43,961,560	\$25,495,750	\$69,457,310
Westminster	Agriculture	2	2	\$649,445	\$649,445	\$1,298,890
	Commercial	198	391	\$566,265,250	\$566,265,250	\$1,132,530,500
	Exempt	57	118	\$192,784,500	\$192,784,500	\$385,569,000
	Industrial	66	102	\$71,099,485	\$106,649,228	\$177,748,713
	Mixed Use	16	56	\$224,970,110	\$224,970,110	\$449,940,220
	Residential	13,434	14,206	\$2,547,154,080	\$1,273,577,040	\$3,820,731,120
	Total	13,773	14,875	\$3,602,922,870	\$2,364,895,573	\$5,967,818,443
Wheat Ridge	Agriculture	11	11	\$1,719,794	\$1,719,794	\$3,439,588
	Commercial	421	711	\$242,109,920	\$242,109,920	\$484,219,840
	Exempt	149	175	\$277,539,949	\$277,539,949	\$555,079,898
	Industrial	244	293	\$148,267,911	\$222,401,867	\$370,669,778
	Mixed Use	323	1,399	\$253,240,450	\$253,240,450	\$506,480,900
	Residential	8,966	10,393	\$1,825,243,445	\$912,621,723	\$2,737,865,168
	Total	10,114	12,982	\$2,748,121,469	\$1,909,633,702	\$4,657,755,171
Unincorporated	Agriculture	823	821	\$323,795,993	\$323,795,993	\$647,591,986
	Commercial	821	1,276	\$880,348,552	\$880,348,552	\$1,760,697,104
	Exempt	554	652	\$906,521,822	\$906,521,822	\$1,813,043,644
	Industrial	376	600	\$416,103,261	\$624,154,892	\$1,040,258,153
	Mixed Use	203	552	\$432,827,600	\$432,827,600	\$865,655,200
	Residential	68,375	72,055	\$18,303,054,065	\$9,151,527,033	\$27,454,581,098
	Total	71,152	75,956	\$21,262,651,293	\$12,319,175,891	\$33,581,827,184

Source: Jefferson County Assessor October 2015

*The Assessor's Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values.

**The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values (typically 50% for residential structures, 100% for commercial, 100% for agricultural, 150% for industrial, 100% for mixed use and 100% for exempt)

Critical Facilities, Infrastructure, and Other Important Community Assets

For the purposes of this plan, a critical facility is defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. FEMA's HAZUS-MH loss estimation software uses the following three categories of critical assets. Essential facilities are those that if damaged would have devastating impacts on disaster response and/or recovery. High potential loss facilities are those that would have a high loss or impact on the community. Transportation and lifeline facilities are a third category of critical assets. Examples of each are provided below.

Essential Facilities

- Hospitals and other medical facilities
- Police stations
- Fire stations
- Emergency Operations Centers (EOC)

High Potential Loss Facilities

- Power plants
- Dams and levees
- Colleges and associated campus housing
- Military installations
- Hazardous material sites
- Schools
- Shelters
- Day care centers
- Nursing homes
- Main government buildings

Transportation and Lifelines

- Highways, bridges, and tunnels
- Railroads and facilities
- Airports
- Water treatment facilities
- Natural gas and oil facilities and pipelines
- Communications facilities

To develop a comprehensive list of critical facilities in Jefferson County (Table 4.5), three data sources were compiled and broken down along the three aforementioned critical asset categories: Jefferson County's GIS databases of critical facilities and infrastructure, FEMA's HAZUS database for critical facilities and the Homeland Security Infrastructure Program (HSIP) database maintained by the Department of Homeland Security.

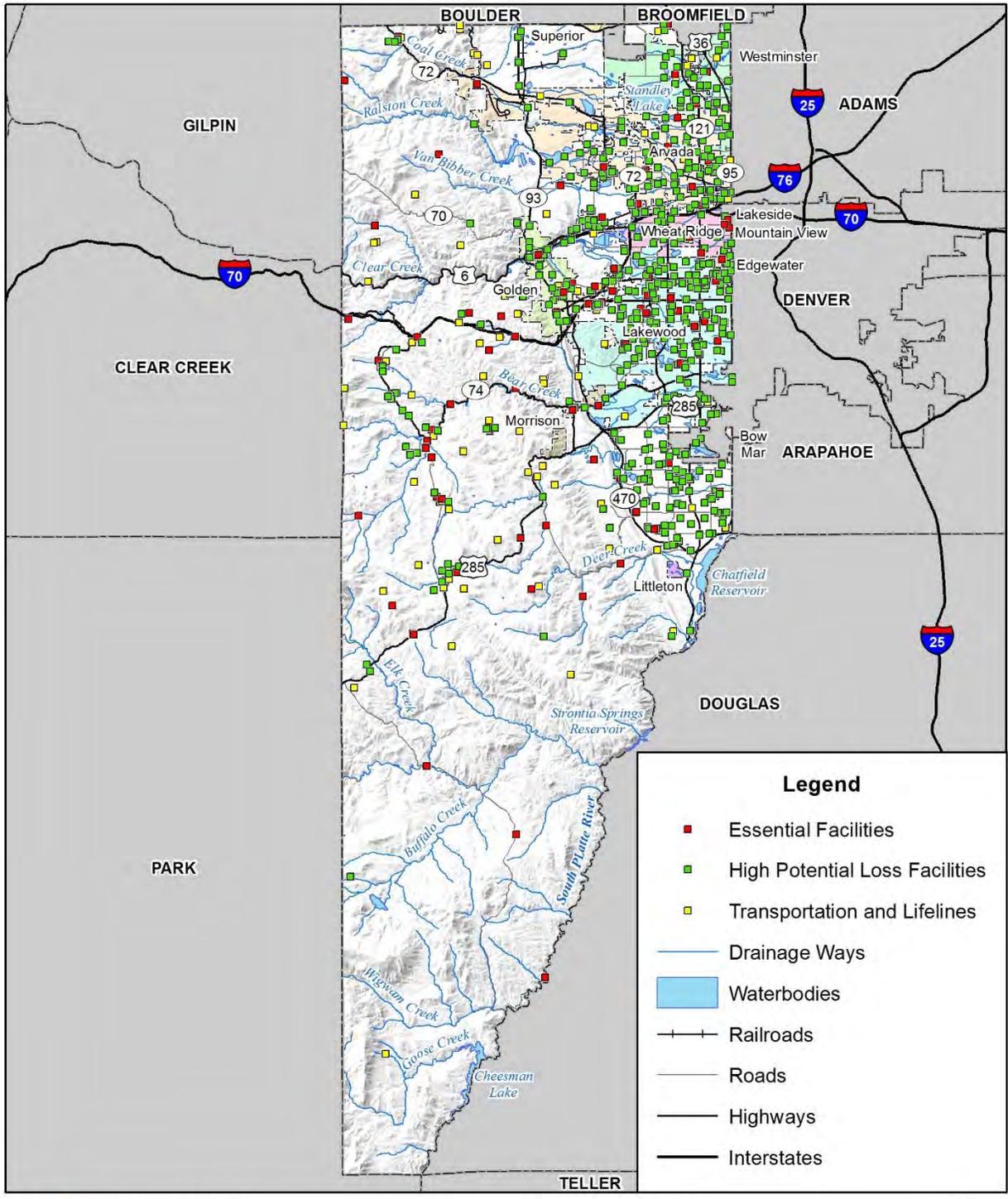
The best available data was used, but some limitations include lack of complete or comprehensive data and values such as replacement costs. These databases were used in vulnerability assessments for hazards such as wildfire and flood, and are represented in maps and tables in the vulnerability by hazard section that follows. Figure 4.1 illustrates the location of critical facilities in Jefferson County.

Table 4.5 Summary of Critical Facilities in GIS

Category	Critical Facility	Facility Count
Essential Facilities	EOC	5
	Fire Station	68
	Hospital	3
	Law Enforcement	15
	Urgent Care Facility	17
	Total	108
High Potential Loss Facilities	College	17
	Dam	41
	Day Care Center	140
	Dept. of Public Health	1
	Government Facility	87
	HAZMAT	84
	Long Term Care Facility	121
	PK-12 School	181
	Powerplant	4
	Private School	40
Total	716	
Transportation and Lifelines	Aircraft Facility	15
	Bridge	431
	Communications	205
	Natural Gas Facility	5
	Oil Facility	1
	Portable Water Facility	5
	Waste Water Facility	13
Total	675	
Grand Total		1,499

Source: Jefferson County GIS, HSIP Freedom and HAZUS Infrastructure database

Figure 4.1. Jefferson County Critical Facilities




 Map compiled 11/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD, FEMA DFIRM 02/05/2014

0 5 10 Miles



Natural, Historic, and Cultural Resources

Assessing the vulnerability of Jefferson County to different disasters also involves inventorying the natural, historical, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

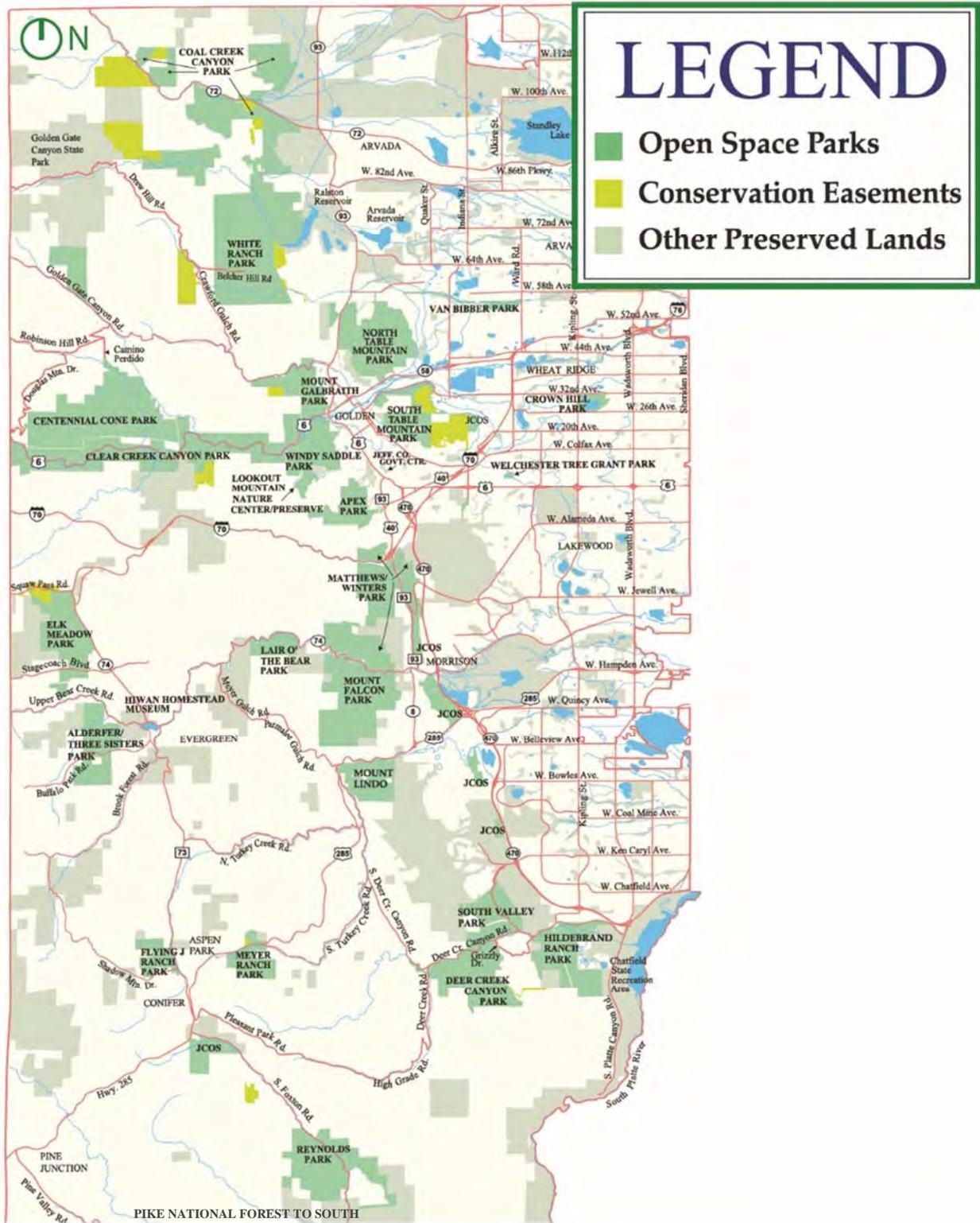
Natural Resources

Natural resources are important to include in benefit-cost analyses for future projects, and may be used to leverage additional funding for projects that also contribute to community goals for protecting sensitive natural resources. Awareness of natural assets can lead to opportunities for meeting multiple objectives. For instance, protecting wetlands areas protects sensitive habitat as well as attenuates and stores floodwaters.

Jefferson County contains a unique combination of prairie, forest, and tundra environments. The County recognizes three types of valuable natural resources worthy of protection: environmental conservation areas, natural landmarks, and natural areas. These areas are described below and mapped in Figure 4.2.

- **Environmental conservation areas** are so designated because of the value they provide in the perpetuation of those species, biological communities, and ecological processes that function over large geographic areas and require a high degree of naturalness.
- **Natural landmarks** are defined as prominent landscape features that distinguish a specific locality in Jefferson County and are important because of the views they afford, their value as scenic vistas and backdrops, and the intrinsic value they hold as wildlife or plant habitats, natural areas, park and open space preserves, and open land areas.
- **Natural areas** are physical or biological areas that either retain or have reestablished their natural characters, although they need not be completely undisturbed, and that typify native vegetation and associated biological and geological features or provide habitat for rare or endangered animal or plant species or include geologic or other natural features of scientific or educational value.

Figure 4.2. Jefferson County Public Lands (North Half)



Wetlands

Wetlands are a valuable natural resource for communities, due to their benefits to water quality, wildlife protection, recreation, and education. Wetlands also play an important role in hazard mitigation by reducing flood peaks and slowly releasing floodwaters to downstream areas. When surface runoff is dampened, the erosive powers of the water are greatly diminished. Furthermore, the reduction in the velocity of inflowing water as it passes through a wetland helps remove sediment being transported by the water. They also provide drought relief in water-scarce areas where the relationship between water storage and streamflow regulation are vital.

Jefferson County has numerous freshwater lakes and freshwater emergent wetlands in the various creeks and ditches scattered throughout the northeast (mostly urbanized) part of the County¹. These areas provide critical habitat as well as help mitigate flooding.

Endangered Species and Imperiled Natural Plant Communities

To further understand natural resources that may be particularly vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (i.e., endangered species) in the planning area. An endangered species is any species of fish, plant life, or wildlife that is in danger of extinction throughout all or most of its range. A threatened species is a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Both endangered and threatened species are protected by law and any future hazard mitigation projects are subject to these laws. Candidate species are plants and animals that have been proposed as endangered or threatened but are not currently listed.

According to the U.S. Fish and Wildlife Service, as of September 2015, there were 10 federal endangered, threatened, or candidate species in Jefferson County. These species are listed in Table 4.6 along with state listed species (excluding those identified in the County as extirpated or casual/accidental). State special concern is not a statutory category, but suggests a species may be in danger.

¹ US Fish and Wildlife Service National Wetlands Inventory, November 2015

Table 4.6 Select List of Important Species Found in Jefferson County

Common Name	Scientific Name	Type of Species	Status
Canada Lynx	<i>Lynx canadensis</i>	Mammal	T
Colorado butterfly plant	<i>Gaura neomexicana</i> ssp. <i>Coloradensis</i>	Plant	T
Preble's Meadow Jumping Mouse	<i>Zapus Hudsonius</i>	Mammal	T
Least tern (interior population) ▲	<i>Sternula antillarum</i>	Bird	E
Mexican spotted owl	<i>Strix occidentalis lucida</i>	Bird	T
Pallid sturgeon ▲	<i>Scaphirhynchus albus</i>	Fish	E
Pawnee montane skipper	<i>Hesperia leonardus montane</i>	Insect	T
Piping plover ▲	<i>Charadrius melodus</i>	Bird	T
Ute ladies'-tresses orchid	<i>Spiranthes diluvialis</i>	Plant	T
Whooping Crane ▲	<i>Grus americana</i>	Bird	E
Symbols: ▲ Water depletions in the South Platte River may affect the species and/or critical habitat in downstream reaches in other states. T Threatened E Endangered P Proposed X Experimental C Candidate			

Source: Endangered, Threatened, Proposed, and Candidate Species Colorado Counties (September 2015), U.S. Fish and Wildlife Service Mountain-Prairie Region, <http://www.fws.gov/mountain-prairie/co.html>

Note: State status information is from the NDIS, which does not track county occurrence of fish or insects at this time.

Historic and Cultural Resources

Information about historic assets in Jefferson County came from local sources, as well as two historic inventories:

The **National Register of Historic Places** is the Nation’s official list of cultural resources worthy of preservation. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archaeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior.

The **Colorado State Register of Historic Properties** is a listing of the state’s significant cultural resources worthy of preservation for the future education and enjoyment of Colorado’s residents and visitors. Properties listed in the Colorado State Register include individual buildings, structures, objects, districts, and historic and archaeological sites. The Colorado State Register program is administered by the Office of Archaeology and Historic Preservation within the Colorado Historical Society. Properties listed in the National Register of Historic Places are automatically placed in the Colorado State Register.

Table 4.7 lists the properties and districts in Jefferson County that are on the National Register of Historic Places and/or the Colorado State Register of Historic Properties.

Table 4.7 Jefferson County Historic Properties in National & State Registers

Property	Jurisdiction	Address	Date Listed
Arvada Downtown	Arvada	5580-5773 Wadsworth Blvd., 7207-7612 Grandview Ave., 755 Grant Pl., 5690 Yukon St., and 7314-7510 W. 57th Ave.	7/15/1998
Arvada Flour Mill	Arvada	5580 Wadsworth Blvd.	4/24/1975
Churches Ranch	Arvada	17999 W. 60th Ave	7/23/1998
Enterprise Grange No. 15	Arvada	7203 Simms St.	8/11/1999
Ralston Gold Discovery Site (Gold Strike Park)	Arvada	56th Ave. & Fenton St.	12/13/1995
Reno Park Addition	Arvada	7799-7899 W. 57th Ave., 7801-7906 Grandview Ave., 7800 & 7884 Ralston Rd., 5603-5720 Yarrow St., 5701-5723 Yukon St., & 5604-5723 Zephyr St.	9/29/1999
Russell-Graves House	Arvada	5605 Yukon St	5/9/1983
Stocke / Walter Addition	Arvada	6701-7014 Grandview Ave., 5708-7006 Ralston Rd., 5712-5724 Reed St. & 5705-5726 Saulsbury St.	9/24/1999
Silver Spruce Ranch	Bailey	20973 Wellington Rd.	6/12/1996
Blue Jay Inn	Buffalo Creek	Colo. Hwy. 126	10/1/1974
Green Mercantile Store	Buffalo Creek	Northwest of Buffalo Creek	10/1/1974
Green Mountain Ranch	Buffalo Creek	Colo. Hwy. 126, south of Buffalo Creek	10/1/1974
La Hacienda/John L. Jerome Summer Estate	Buffalo Creek	On State Rd., off US Hwy. 285	7/20/1973
Midway House/Meyer Ranch	Conifer	9345 US Hwy. 285, Conifer vicinity	9/18/1990
Pleasant Park School	Conifer	22551 Pleasant Park Rd.	6/12/1996
Bergen Park	Evergreen	Colo. Hwy. 74, Evergreen vicinity	11/15/1990
Corwina-Pence-O'Fallon Parks	Evergreen	Southeast of junction of Kittredge and Myers Gulch Rd.	12/28/1990
Dedisse Park	Evergreen	29614 Upper Bear Creek Rd	11/15/1990
Evergreen Conference District	Evergreen	Bear Creek & Colo. Hwy. 74	5/1/1979
Everhardt Ranch / Herzman Ranch	Evergreen	Lone Peak Dr. & N. Mountain Park Rd.	5/7/1980
Fillius Park	Evergreen	Colo. Hwy. 74, Evergreen vicinity	2/24/1995
Hiwan Homestead	Evergreen	Meadow Dr.	4/9/1974
Humphrey House / Kinnikinnik Ranch	Evergreen	620 S. Soda Creek Rd	12/31/1974
Medlen School	Evergreen	South Turkey Creek Rd., Evergreen vicinity	3/8/1995
Ammunition Igloo	Golden	15001 Denver W. Pkwy., Camp George West	5/20/1993
Astor House Hotel / Lake House/Castle Rock House	Golden	822 12th St.	3/1/1973

Property	Jurisdiction	Address	Date Listed
Oscar Barber House	Golden	714 Cheyenne St.	7/13/1994
Barnes-Peery Residence	Golden	622 Water St.	10/12/2001
Calvary Episcopal Church	Golden	1300 Arapahoe St.	3/3/1995
Camp George West Historic District	Golden	15000 S. Golden Rd., Camp George West	2/11/1993
Colorado Amphitheater	Golden	15001 Denver W. Pkwy., Camp George West	5/20/1993
Colorado Midland Railway Observation Car No. 111	Golden	17155 W. 44th Ave., Colorado Railroad Museum	12/11/1996
Colorado National Guard Armory	Golden	1301 Arapahoe St.	12/18/1978
Colorow Point Park	Golden	900 Colorow Rd., Lookout Mountain	11/15/1990
Charles Deaton Sculptured House	Golden	24501 Ski Hill Drive, Golden vicinity	2/24/2004
Herman Coors House	Golden	1817 Arapahoe St.	10/17/1997
Denver & Rio Grande Railroad Business Car No. B-8	Golden	17155 W. 44th Ave., Colorado Railroad Museum	12/11/1996
Denver & Rio Grande Railroad Coach No. 60	Golden	17155 W. 44th Ave., Colorado Railroad Museum	6/12/1996
Denver & Rio Grande Railroad Coach No. 307	Golden	17155 W. 44th Ave., Colorado Railroad Museum	3/12/1997
Denver & Rio Grande Railway Caboose No. 49	Golden	17155 W. 44th Ave., Colorado Railroad Museum	9/11/1996
Denver & Rio Grande Western Railroad Caboose No. 0578	Golden	17155 W. 44th Ave., Colorado Railroad Museum	5/16/2001
Denver & Rio Grande Western Railroad Locomotive No. 50	Golden	17155 W. 44th Ave., Colorado Railroad Museum	12/11/1996
Denver & Rio Grande Western Railroad Locomotive No. 346	Golden	17155 W. 44th Ave., Colorado Railroad Museum	9/11/1996
Denver & Rio Grande Western Railroad Locomotive No. 683	Golden	17155 W. 44th Ave., Colorado Railroad Museum	9/11/1996
Denver & Salt Lake Railway Caboose No. 10060	Golden	17155 W. 44th Ave., Colorado Railroad Museum	6/10/1998
Denver South Park & Pacific Railroad Locomotive No. 191	Golden	17155 W. 44th Ave., Colorado Railroad Museum	12/11/1996
First Presbyterian Church Of Golden (Foothills Art Center)	Golden	809 15th St	3/14/1991
Genesee Park	Golden	26771 Genesee Ln.	11/15/1990
Golden High School	Golden	710 10th St.	3/14/1997
Golden Welcome Arch	Golden	1100 block of Washington Ave.	6/14/2000
Great Western Railway Combine No. 100	Golden	17155 W. 44th Ave., Colorado Railroad Museum	9/11/1996
Lariat Trail Scenic Mountain Drive	Golden	Lookout Mountain Rd.	11/15/1990
Lookout Mountain Park	Golden	987½ Lookout Mountain Rd.	11/15/1990
Lorraine Lodge / Charles Boettcher Summer Home	Golden	900 Colorow Rd., Lookout Mountain	1/18/1984

Property	Jurisdiction	Address	Date Listed
Loveland Building And Coors Building	Golden	1120-1122 Washington	5/16/1996
Magic Mountain Site	Golden	Heritage Square	8/21/1980
Mt. Vernon House / Robert W. Steele House	Golden	At I-70, Colo. 26 & Mt. Vernon Canyon Rd., 1 mile south of Golden	11/20/1970
Quaintance Block	Golden	805 13th St	3/25/1994
Queen Of Heaven Orphanage Summer Camp	Golden	20189 Cabrini Blvd., Golden vicinity	1/14/2000
Rio Grande Southern Railroad Engine No. 20	Golden	17155 W. 44th Ave., Colorado Railroad Museum	12/14/2000
Rio Grande Southern Railroad Motor No. 2 / Galloping Goose No. 2	Golden	17155 W. 44th Ave., Colorado Railroad Museum	2/14/1997
Rio Grande Southern Railroad Motor No. 6 / Galloping Goose No. 6	Golden	17155 W. 44th Ave., Colorado Railroad Museum	2/19/1997
Rio Grande Southern Railroad Motor No. 7 / Galloping Goose No. 7	Golden	17155 W. 44th Ave., Colorado Railroad Museum	3/12/1997
Rocky Flats Plant	Golden	Colo. Hwy. 93, north of Golden	5/19/1997
Rooney Ranch	Golden	Intersection of Rooney Rd. & Alameda Pkwy.	2/13/1975
Tallman Ranch	Golden	Golden Gate Canyon State Park, west of Golden	6/14/1995
Thiede Ranch	Golden	Approximately 6 miles west of Golden	1/11/1996
Twelfth St. Historic Residential District	Golden	11th, 13th, Elm, & Arapahoe Sts.	9/22/1983
Little Park	Idledale	Colo. Hwy. 74, vicinity of Idledale	2/24/1995
Starbuck Park	Idledale	Colo. Hwy. 74, vicinity of Idledale	6/30/1995
Indian Hills Community Hall And Firehouse	Indian Hills	5381 Parmalee Gulch Rd.	5/14/1997
Ken-Caryl South Valley Archaeological District	Indian Hills	Indian Hills vicinity	4/18/2003
Building 710, Defense Civil Preparedness Agency Region 6 Operations Center	Lakewood	Denver Federal Center, W. Alameda Ave. and S. Kipling St.	3/2/2000
Davies' Chuck Wagon Diner	Lakewood	9495 W. Colfax Ave.	7/2/1997
Denver & Intermountain Interurban No. 25	Lakewood	Denver Federal Center, W. Alameda Ave. and S. Kipling St.	12/10/1997
Hill Section, Golden Hill Cemetery	Lakewood	12000 W. Colfax Ave.	7/31/1995
Howell House	Lakewood	1575 Kipling St.	9/11/1996
JEWISH CONSUMPTIVE RELIEF SOCIETY HISTORIC DISTRICT (Rocky Mountain College Of Art And Design)	Lakewood	1600 Pierce St.	6/26/1980

Property	Jurisdiction	Address	Date Listed
Office Of Civil Defense Emergency Operations Center	Lakewood	Denver Federal Center, W. Alameda Ave. and S. Kipling St.	12/16/1999
Peterson House / Ticen Or Tyson House	Lakewood	Historic Belmar Village, Lakewood	9/10/1981
Schnell Farm	Lakewood	3113 S. Wadsworth Blvd.	2/14/1997
Stone House	Lakewood	Off S. Wadsworth, south of Lakewood	5/1/1975
South Ranch	Lakewood	Address Restricted	4/18/2003
Washington Heights School	Lakewood	6375 W. First Ave.	7/13/1994
Bradford House Ii	Littleton	Littleton vicinity	2/2/2001
Bradford-Perley House	Littleton	Kildeer Ln., North Ranch at Ken-Caryl	3/12/1997
Hildebrand Ranch	Littleton	Off Deer Creek Canyon Rd., 7 miles southwest of Littleton	3/13/1975
Bear Creek Canyon Scenic Mountain Drive	Morrison	Colo. Hwy. 74	11/15/1990
Bradford House III	Morrison	4 miles south of Morrison	4/8/1980
Bradford Boyles Property	Morrison	Address Restricted	2/2/2015
Craig, Katherine, Park	Morrison	US Hwy. 40/I-70, northwest of Morrison	6/30/1995
Dinosaur Ridge	Morrison	West of Morrison	3/10/1993
District No. 17 School (Medlen)	Morrison	Address Restricted	4/14/15
The Fort	Morrison	19192 State Highway 8, Morrison vicinity	7/14/2006
Lodaiska Site	Morrison	Morrison vicinity	9/25/2003
Morrison Historic District	Morrison	Colo. Hwy. 8	9/28/1976
Morrison School House	Morrison	226 Spring St.	9/4/1974
Red Rocks Park / Mt. Morrison Civilian Conservation Corps Camp	Morrison	16351 County Rd. 93	5/18/1990
Baehr Lodge / Baehr Den Of The Rockies (Pine Valley Lodge)	Pine	16405 Colo. Hwy. 126	6/10/1998
North Fork Historic District	Pine & South Platte	Pike National Forest	10/9/1974
Crown Hill Burial Park (Crown Hill Cemetery)	Wheat Ridge	7777 W. 29th Ave., Wheat Ridge vicinity	7/24/2008
Fruitdale Grade School	Wheat Ridge	10801 W 44 th Ave	3/20/13
James Baugh House	Wheat Ridge	11361 W 44 th Ave	8/14/12
Pioneer Sod House	Wheat Ridge	4610 Robb St.	3/14/1973
Richards Mansion / Hart Estate	Wheat Ridge	5349 W. 27th Ave.	9/15/1977
Tower Of Memories	Wheat Ridge	8500 W. 29th Ave., Crown Hill Cemetery	9/25/1987
Wheat Ridge Post Office	Wheat Ridge	4610 Robb Street	8/12/1992

Sources: Directory of Colorado State Register Properties, <http://www.historycolorado.org/oahp/colorado-state-register-historic-properties> National Register Information System, <http://www.nps.gov/nr/>

*Only on the Colorado State Register of Historic Properties

It should be noted that as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National

Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

Economic Assets

Economic assets at risk may include major employers or primary economic sectors, such as agriculture, whose losses or inoperability would have severe impacts on the community and its ability to recover from disaster. After a disaster, economic vitality is the engine that drives recovery. Every community has a specific set of economic drivers, which are important to understand when planning ahead to reduce disaster impacts to the economy. When major employers are unable to return to normal operations, impacts ripple throughout the community. A list of the top employers in Jefferson County by number of employees can be found in Chapter 2.

4.3.3 Growth and Development Trends

Table 4.8 illustrates how Jefferson County has grown in terms of population and number of housing units between 2010 (the year of the last decadal Census) and 2013/2014 (the most recent American Community Survey for which data is available). Jurisdictions that are not entirely within Jefferson County are listed as multi-community places (MCPs).

Table 4.8 Jefferson County’s Change in Population and Housing Units, 2010-2013/14

Jurisdiction	2010 Population Estimate	2014 Population Estimate	Estimated Percent Change (%) 2010-2014	2010 # of Housing Units	2013 Estimated # of Housing Units	Estimated Percent Change (%) 2010-2013
Arvada (MCP)	106,474	113,574	6.7%	43,952	44,518	1.28%
Edgewater	5,159	5,289	2.5%	2,436	2,592	6.4%
Golden	18,905	20,201	6.9%	7,748	7,859	1.43%
Lakeside	8	8	0%	9	9	0%
Lakewood	142,995	149,643	4.6%	65,054	64,392	-1%
Morrison	428	434	1.4%	141	N/A	N/A
Mountain View	507	521	2.7%	278	N/A	N/A
Unincorporated Area	188,277	193,037	4%	N/A	N/A	N/A
Wheat Ridge	30,192	31,034	2.7%	15,037	14,641	-2.6%
Total County	528,614	558,503	5.6%	228,951	230,487	0.67%

Source: Colorado Division of Local Government State Demography Office, <https://www.colorado.gov/dola> and American Community Survey <http://quickfacts.census.gov/>

As indicated above, Jefferson County has grown in terms of population in recent years. Growth is projected to continue through 2040. Table 4.9 shows the population forecasts for the County as a whole and for the State through 2040 in 5 year increments.

Table 4.9 Population Forecast for Jefferson County, 2015-2040

	2015	2020	2025	2030	2035	2040
County Population	565,106	595,849	617,933	625,516	674,241	686,319
Percent Change (%)	--	5.44%	4.98%	4.29%	3.36%	1.7%
State Population	5,443,612	5,935,920	6,454,860	6,970,651	7,462,162	7,925,230
Percent Change (%)	--	9%	8.7%	7.9%	7.0%	6.2%

Sources: Colorado Department of Local Affairs Demography Section, <https://www.colorado.gov/dola>

As part of the 2015 update an analysis of the parcel layer resulted in counts of developed parcels from 2009-2015. More details on this analysis for municipalities can be referenced in the jurisdictional annexes. Concerns about future development as it relates to hazards are addressed by hazard in the following section.

4.3.4 Estimating Potential Losses

Dam Failure - High Hazard Significance

Existing Development

The impacts of a dam failure to existing development in Jefferson County could be catastrophic. Specific inundation maps and risk information are included in the dam-specific emergency action plans housed the Jefferson County Office of Emergency Management. Due to the sensitive nature of this information, it is not included in this plan. The estimated impacts to the County and its municipalities from a dam failure are similar in some cases to those associated with flood events (see the flood hazard vulnerability analysis and discussion). However, dam failures would potentially result in a much greater loss of life and more extensive destruction to property and infrastructure due to: the potential speed of onset; greater depth, extent, and velocity of flooding; and the wider damage areas caused by the ability of dam failures to flood areas outside of mapped floodplains. For reference, high hazard dams threaten lives and property, significant hazard dams threaten property only.

In general, communities located below a dam and along a waterway are likely to be exposed to the impacts of a dam failure. The reservoirs located in the foothills and Rocky Mountains have the greatest potential impacts; this includes reservoirs located in the planning area, and reservoirs that may be located outside and upstream of the planning area, but could still have impacts in Jefferson County. The dams within the planning area include the large reservoirs of Arvada, Ralston, and Standley Lake. Bear Creek Dam is primarily a flood control dam. Antero, Chatfield, Cheesman, Eleven Mile, Strontia Springs, Marston Lake, and Spinney Lake are mostly outside of the planning area on the South Platte River. The South Platte River is also the southeast border of Jefferson County. Impacts in the South Platter River Canyon could be severe if any of these dams failed, but fortunately most of this area is sparsely developed. The impacts of any of these dam failures would be great in the Denver Metropolitan Area, but this would mostly be outside of Jefferson

County. Jefferson County’s first responders would likely be heavily involved in mutual aid assistance should an event occur.

The portions of the planning area exposed to significant impacts by a dam failure are numerous. Within the planning area (the County limits) there are 27 high hazard and 14 significant hazard dams². The jurisdictions and the number of dams upstream of them are listed in Table 4.10; dam locations are shown in the maps in the hazard profile earlier in this chapter. The table notes the first jurisdiction to be impacted by dams. Note that the dams that threaten communities such as Golden in the Clear Creek watershed may also impact Wheat Ridge or other parts of the unincorporated areas.

There are numerous dams outside the county limits whose failure could have impacts inside the county. An analysis of all the watersheds that drain into Jefferson County revealed that there are 17 high hazard and 10 significant hazard dams whose failure could have impacts in Jefferson County³. These jurisdictions most at risk from these dams are listed in Table 4.11.

Table 4.10 Summary of Hazard Dams Inside Jefferson County

First Downstream Area At-Risk	# of High Hazard Dams upstream	# of Significant Hazard Dams upstream
Arvada	6	3
Bow Mar	0	1
Golden	2	0
Lakewood	8	5
Littleton	1	3
Morrison	2	0
Pleasant View	1	0
Unincorporated Jefferson County	4	1
Westminster	2	1
Wheat Ridge	1	0
Total	27	14

Source: Jefferson County, CDOT, National Inventory of Dams, NHD

² Jefferson County data, 2015

³ National Inventory of Dams (NID) 2015

Table 4.11 Summary of Hazard Dams Outside Jefferson County

First Downstream Area At-Risk	# of High Hazard Dams upstream	# of Significant Hazard Dams upstream
Golden	8	6
Unincorporated Jefferson County	9	4
Total	17	10

Source: Jefferson County, CDOT, National Inventory of Dams, NHD

Inundation maps that identify anticipated flooded areas (which may not coincide with known floodplains) are produced for all high hazard dams and are contained in the Emergency Action Plan (EAP) required for each dam. However, the information contained in those plans is considered sensitive and is not widely distributed. More information regarding the specific vulnerable buildings, populations, and infrastructure related to a dam failure can be referenced in EAPs on file with the Jefferson County Office of Emergency Management.

Losses from a dam failure vary based on the dam, cause of failure, warning time for impacted communities, and time of day. Potential property loss estimates are in the billions, along with multiple anticipated deaths and injuries. Impacts to critical facilities would be similar to those identified in the flood vulnerability analysis.

Future Development

It is important that the County and municipalities keep the dam failure hazard in mind when permitting new development, particularly downstream of the high and significant hazard dams present in the County. New residential development is occurring in western Arvada in the vicinity of Indiana and County Road 19, west of Standley Lake and below Welton reservoir. This development increases the number of properties, population, and infrastructure vulnerable to a dam failure, and may even change the ratings of upstream dams.

There are currently 101 low hazard dams within the County boundaries. These could become significant or high hazard dams if development occurs below or downstream from them.

Drought – Medium Hazard Significance

Existing Development

Based on Jefferson County’s recent multi-year droughts and Colorado’s drought history, it is evident that all of Jefferson County is vulnerable to drought. However, the impacts of future droughts will vary by region. The agricultural industry of the County, though limited, could experience hardships, including agricultural losses, and livestock feeding expenses and deaths. The County will see an increase in dry fuels, beetle kill, and associated wildfires and some loss of tourism/recreation revenue. Examples of potential impacts to recreation include low water flows in the Golden Whitewater Park, fire bans and closures of campgrounds in the Pike National Forest, and water restrictions on golf courses. Water supply issues for municipal, industrial, and domestic

needs will be a concern for the entire County during droughts. Water restrictions could lead to lawn and tree impacts in suburban areas. Much of Jefferson County's water comes from snow melt runoff in the high country of the western County that is captured in reservoir storage. Vulnerability increases with consecutive winters of below-average snow pack.

While widespread, the losses associated with drought are often the most difficult to track or quantify. While FEMA requires the potential losses to structures to be analyzed, drought does not normally have a structural impact. Drought can indirectly lead to property losses as a result of it contributing to extreme wildfire conditions (see discussion on wildfire vulnerability). This, combined with the potential for significant impacts to water intensive activities such as agriculture, wildfire suppression, municipal usage, commerce, tourism/recreation, and wildlife preservation, can lead to widespread economic ramifications.

The Drought Impact Reporter from the National Drought Mitigation Center (NDMC) at the University of Nebraska, Lincoln is a useful reference for an overview of historic impacts to drought. The NDMC developed the Drought Impact Reporter to provide a national database of drought impacts. Information comes from a number of sources, including newspapers, online reports, scientific publications, other media, government agencies, and members of the public who submit drought-related impacts online for any region in the US.

According to the 2013 Colorado State Drought Plan, Jefferson County recorded a total of 90 impacts to drought in the March 2010 – May 2013 survey period. The majority (63) of these impacts were associated with agriculture, which is typical as this industry is generally used as a proxy for drought impacts. Remaining impacts were: Business and Industry: 10, Energy: 1, Fire: 6, Plants and Wildlife: 4, Relief Response and Restrictions: 23, Society and Public Health: 14, Tourism and Recreation: 8, and Water Supply and Quality: 9.

Using the NDMC impacts to determine relative exposure/vulnerability to drought has limitations because the methodology can double-count impacts that are recorded at the state level, then counted again for each county within that state. Rather, the NDMC data should be used to develop an ongoing record of drought impacts to sector assets that relate the specific impacts to different intensity and duration droughts at a location. Over time a detailed impact profile could be developed for vulnerable sectors so that the impact of future drought vulnerability could be better defined based on historic impacts⁴.

The Colorado State Drought Mitigation Plan did, however, provide a drought vulnerability ranking for different sectors, by county. The methodology was based on literature review, drought impact reports (including local hazard mitigation plans), and interviews with agency directors, program employees, industry representatives and academics⁵. The State Drought Plan included

⁴ Drought Reporter at the University of Lincoln Nebraska <http://droughtreporter.unl.edu/>

⁵ Colorado State Drought Mitigation Plan, 2013 – Section 3.3: Vulnerability Based on State and Local Assessment

vulnerability to: state owned buildings and critical infrastructure, state land board lands, state operated recreational activity, aquatic habitat and species, agriculture activities, protected environment, recreation, socioeconomics and the municipal and industrial (M&I) sectors. Jefferson County generally ranked moderate in vulnerability across the sectors. The municipal and industrial sector vulnerability analysis included a survey of water providers by the state's major drainage basins related to impacts from the 2012 drought. Twenty-three survey respondents in the South Platte basin noted the highest ranking impacts were 1) loss of system flexibility, 2) significant loss in storage that carried over to the following year, 3) increased staff time necessary to address drought and 4) increased expenses for public education and outreach. The survey also queried respondents about residual effects of the 2002 drought experienced between 2003 and 2006. Lingering impacts included the increased expenses for public education & outreach, followed by the increased staff time necessary to address conditions. Forty eight percent of the survey respondents in the South Platte basin indicated that while conditions between 2002 and 2013 were similar, they were less susceptible to drought impacts in 2013 than in 2002 because they were better prepared. Thirteen percent of the respondents indicated that they were more susceptible to drought in 2013 because the supply/storage situation was more severe than in 2002.

According to the State Drought Plan drought vulnerability within the Denver Metropolitan Area is relatively low when compared to other regions within the State. This is primarily attributed to the fact that Denver Water owns one of the most senior urban water rights portfolios along the Front Range. Denver Water has also taken additional drought mitigation actions since 2002 to further improve water supply reliability. Additional vulnerability and capability information on drought can be referenced in the Denver Water Annex.

Future Development

Drought vulnerability will increase with future development as there will be increased demands for limited water resources. Future growth in the unincorporated areas will mean more wells and more demands on groundwater and surface water resources. Increased development also lends itself to the increased potential for impervious surface development, which reduces the amount of water absorbed into the ground from precipitation.

Earthquake - Medium Hazard Significance

Existing Development

Traditionally, earthquakes have not been considered a very likely hazard for Front Range communities and, as such, it is unlikely that many structures are built to be earthquake-resistant. All structures in the planning area are potentially exposed to damage from an event, with older or historic structures more at risk. Damage potential will vary by the size, extent, and severity of the earthquake and the location of the event's epicenter. The entire population of the planning area may also be considered at risk, and likely unprepared for earthquakes. The population at risk will vary based on the timing of a large earthquake.

Table 4.12 illustrates the potential earthquake losses in and around Jefferson County as compiled by the Colorado Geological Survey (CGS) Earthquake Reports, issued in 2013.

Table 4.12 Potential Earthquake Losses in Front Range by Fault

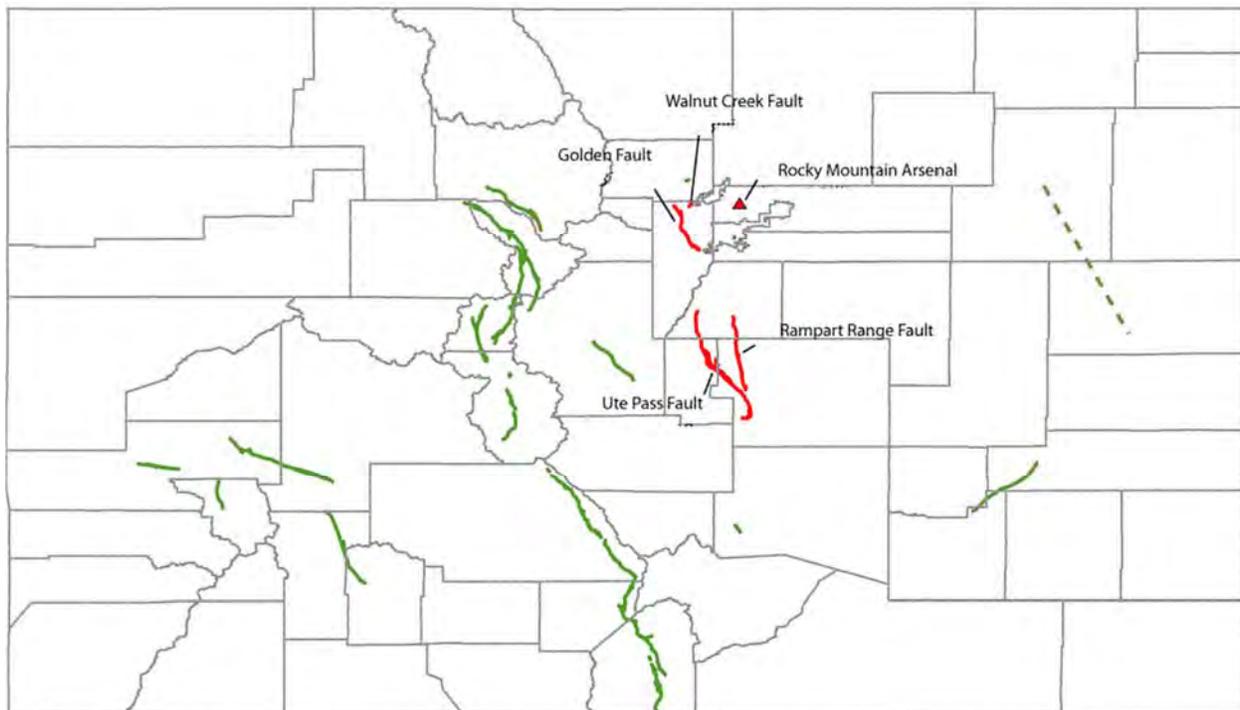
Fault/Magnitude	Fatalities 5PM	Total Economic Loss (\$)*
Inside Jefferson County		
Golden M6.5 Arbitrary	1,606	\$45 Billion
Walnut Creek M6.5 CEUS	2,303	\$60.5 Billion
Near Jefferson County/Front Range		
Chase Gulch M6.75	38	\$4.4 Billion
Mosquito M7.0 Arbitrary	125	\$8.04 Billion
Rampart M7.0 Arbitrary	743	\$28 Billion
Rocky Mountain Arsenal M6.25	1,263	\$39.9 Billion
Ute Pass M7.0 Arbitrary	594	\$22.3 Billion
Valmont M5.0 Arbitrary	22	\$2.9 Billion

Source: Earthquake Evaluation Reports, <http://coloradogeologicalsurvey.org>

*Direct and indirect losses

According to the CGS reports, the Rocky Mountain Arsenal, Golden, Rampart Range, Ute Pass, and Walnut Creek faults are considered the top five potentially most damaging faults in the state (which includes damage to Jefferson as well as other counties in the Denver Metropolitan Area). Figure 4.3 shows the relative location of these faults.

Figure 4.3. Location of Major Colorado Faults



Source: Colorado Geologic Survey

During the update of this plan in 2015, a HAZUS-MH probabilistic earthquake scenario was run with the latest version of HAZUS-MH 2.2. A driving Magnitude of 7.25 was input into the HAZUS scenario, but the results are primarily based on the USGS 2,500 year probabilistic ground shaking maps. The USGS maps provide estimates of potential ground acceleration and spectral acceleration at periods of 0.3 second and 1.0 second, respectively.

The 2,500-year return period analyzes ground shaking estimates with a 2 percent probability of being exceeded in 50 years, from the various seismic sources in the area. The International Building Code uses this level of ground shaking for building design in seismic areas. The CGS believes that the USGS probabilistic shaking maps likely underestimate the hazard, as there are limited studies of the earthquake hazard in the state to base the shaking maps on. Table 4.13 summarizes the results of the 2,500-year HAZUS-MH scenario. A 100-year return period scenario was also analyzed. This scenario did not produce any damage.

Table 4.13 HAZUS-MH Earthquake Loss Estimation 2,500-Year Scenario Results

Type of Impact	Impacts to County
Total Buildings Damaged	Slight: 17,054 Moderate: 5,638 Extensive: 876 Complete: 39
Building and Income Related Losses	\$2.12 Billion 61% of damage related to residential structures 23% of loss due to business interruption
Total Economic Losses (includes building, income and lifeline losses)	\$2.22 Billion Building: \$999.72 Million Income: \$1,125 Billion Transportation/Utility: \$98.23 Million
Casualties (based on 2 a.m. time of occurrence)	Without requiring hospitalization: 106 Requiring hospitalization: 12 Life threatening: 1 Fatalities: 2
Casualties (based on 2 p.m. time of occurrence)	Without requiring hospitalization: 160 Requiring hospitalization: 22 Life threatening: 2 Fatalities: 3
Casualties (based on 5 p.m. time of occurrence)	Without requiring hospitalization: 121 Requiring hospitalization: 16 Life threatening: 2 Fatalities: 2
Damage to Transportation and Utility Systems and essential facilities	No transportation or pipeline damage, 19 essential facilities damaged with functionality > 50% on Day 1
Fire Following Earthquake	0 Ignitions 0.00 sq. miles burnt
Debris Generation	0.24 million tons of debris generated 9,400 truckloads
Displaced Households	348
Shelter Requirements	184

Source: HAZUS-MH 2.2

Another HAZUS-MH earthquake scenario is included in this analysis. The Colorado Geologic Survey produced a report for a M6.5 event on the Golden Fault as it is presumed to be the most damaging to Jefferson County based on its proximity to the City of Golden and the Jefferson County governmental offices, including the Emergency Operations Center (EOC). The epicenter, or point on the ground surface where the earthquake originates, was chosen at an arbitrary location on the fault at -105.22 longitude and 39.74 latitude, just south of the community of Beverly Heights in Golden, along US Highway 6.

The model assumed the following fault rupture parameters: depth of 10km, rupture orientation of 157 degrees and a Central and East US CEUS 2008 attenuation function. Table 4.14 summarizes the output from this ‘worst case’ scenario for Jefferson County.

Table 4.14 HAZUS-MH Earthquake Loss Estimation Golden Fault M 6.5 Scenario Results

Type of Impact	Impacts to County
Total Buildings Damaged	Slight: 60,460 Moderate: 52,773 Extensive: 28,954 Complete: 20,340
Building and Income Related Losses	Total: \$15.5 Billion 55% of damage related to residential structures 17% of loss due to business interruption
Total Economic Losses (includes building, income and lifeline losses)	Total: \$15.5 Billion Building: \$12.5 Billion Income: \$2.6 Billion Lifeline: \$3.5 Million
Casualties (based on 2 a.m. time of occurrence)	Without requiring hospitalization: 4,212 Requiring hospitalization: 1,217 Life threatening: 195 Fatalities: 382
Casualties (based on 2 p.m. time of occurrence)	Without requiring hospitalization: 9,526 Requiring hospitalization: 2,998 Life threatening: 519 Fatalities: 1,008
Casualties (based on 5 p.m. time of occurrence)	Without requiring hospitalization: 6,109 Requiring hospitalization: 1,947 Life threatening: 471 Fatalities: 632
Damage to Transportation Facilities and essential facilities	Total Transportation Replacement Value: \$3.5 Billion 34 essential facilities damaged with functionality > 50% on Day 1
Fire Following Earthquake (Monte Carlo Simulation)	1 ignitions 0.0 sq. miles burned
Debris Generation	5.89 million tons of debris generated 235,760 truckloads
Displaced Households	19,859
Shelter Requirements	10,412

Source: HAZUS-MH 2.2

Future Development

Without earthquake-resistant building considerations, future development will exhibit similar exposure and vulnerability to earthquakes as existing structures. As the region continues to expand, the overall estimated costs of a significant earthquake, both fiscally and in terms of casualty rates, may be expected to rise.

Erosion and Deposition – Medium Hazard Significance

Existing Development

Two different areas of existing development are vulnerable to erosion. Erosion of soils due to slope grade, soil content and cover, and exposure to weather conditions is fairly limited and generally falls within underdeveloped areas. This is also due to the concurrence of erosion

potential with other geologic hazard areas, such as dipping bedrock or subsidence regions, which are regulated for development by the County. Areas susceptible to wildfire-driven erosion, which often result in debris flow (see below) or the erosion and deposition of soil into watersheds, also does not usually directly impact developed areas. There are some areas of variance, particularly in the wildland-urban interface, where debris flows may impact housing and commercial districts. The larger concern centers on the pollution of the watersheds by soils, which impacts wildlife balances and degrades water quality for downstream habitats. Continued erosion and movement of soils in wildfire areas usually degrade watershed quality and thus exert a larger or disproportionate impact on the larger planning area. In addition, recovery for the washed out areas may be prolonged or difficult, as demonstrated in the burn areas of the Hayman fire, due to the loss of nutrient-rich soil. In this sense, ‘existing development’ may refer to any area vulnerable to wildfire, which covers an extensive portion of the planning area.

In addition to the general areas of existing vulnerability, scour critical bridges are also vulnerable to the effects of erosion and deposition. These bridges are listed in Table 4.25 Erosion around bridges may compromise the construction of the structure, making them unsafe. Deposition may also press up against the structures, causing structural strain or sweeping out the structure by debris. In this instance, the vulnerability overlaps those identified in the debris flow section that follows.

Response and recovery costs to address erosion problems from the Buffalo Creek fire have cost Denver Water alone over \$24 million. This can be used as an estimate of future losses, but will vary depending on if fire and resulting erosion problems affect critical watersheds.

Future Development

Future development on steep slopes is not likely, and the areas at the base of the hogbacks are regulated by the County, therefore future development exposed to slope-driven erosion is unlikely. Unsuitable slopes are mapped in area plans (such as the Evergreen Area Community Plan) and are part of the County Comprehensive Plan. Future developments subjected to erosion and deposition as a result of wildfire are vulnerable to the same extent as discussed in the landslide, debris flow, and rockslide hazard.

Expansive Soils – Medium Hazard Significance

Existing Development

Similar to the subsidence hazard, the majority of the hazard’s significance is drawn from the exposure of existing development to this hazard. As identified in the hazard profile and noted above, extensive areas of the planning region east of the foothills are characterized to some extent by swelling soils. Older construction may not be resistant to the swelling soil conditions and, therefore, may experience expensive and potentially extensive damages. This includes heaving sidewalks, structural damage to walls and basements, the need to replace windows and doors, or dangers and damages caused by ruptured pipelines. Newer construction may have included

mitigation techniques to avoid most damage from the hazard, but the dangers continue if mitigation actions are not supported by homeowners. For example, the maintenance of grading away from foundations and the use of appropriate landscaping near structures must be continued to prevent an overabundance of water in vulnerable soils near structures. While continued public education efforts may help increase compliance for landscaping and interior finishing mitigation actions, physical reconstruction of foundations is probably not feasible in all but the most heavily impacted of existing development. Therefore, damages may be expected into the future for existing structures.

Methodology

GIS was used to create a risk assessment for geological hazards in Jefferson County. Dipping bedrock (i.e. heaving bedrock) hazard data was overlaid on Jefferson County parcel and assessor's data.⁶ For the purposes of the analysis, if the hazard zone intersects an improved parcel center, its improved value is included and parcel is counted in Table 4.15. Results are sorted by occupancy type and by jurisdiction to demonstrate how the hazard's risk varies across the planning area.

This analysis outlines the potential exposure of improvements built on dipping bedrock for existing development in the planning area. This represents only a tiny portion of the swelling-soil related building exposure, as a swelling soils GIS layer was not available. However, the exposure to the dipping bedrock alone identifies that there could be potential for damage from this hazard. The table indicates that Golden, Lakewood, Morrison, Arvada and the unincorporated areas east of the foothills have the greatest exposure to this hazard. In this analysis, improved values (typically structures and buildings) are assumed to be potentially exposed, but not necessarily 'at risk.' This analysis does not take into account site-specific mitigation measures that may be in place, thus estimating losses for dipping bedrock is difficult.

⁶ Assessor parcel data is developed and used for ad valorem tax assessment only. The Assessor's parcel maps are not accurate representations of the actual physical location of the parcels for any other purpose. The location of improvements on the parcels are not described in any way in the Assessor parcel data.

Table 4.15 Exposure of Buildings to Dipping Bedrock

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value
Arvada	Agriculture	1	1	\$133,300
	Exempt	2	1	\$1,453,100
	Industrial	2	1	\$2,356,000
	Residential	22	24	\$6,193,300
	Total	27	27	\$10,135,700
Golden	Commercial	42	42	\$49,745,900
	Exempt	32	59	\$320,827,500
	Industrial	33	31	\$24,274,100
	Mixed Use	51	205	\$64,743,900
	Residential	1,295	2,330	\$434,549,680
Total	1,453	2,667	\$894,141,080	
Lakewood	Commercial	2	1	\$107,400
	Exempt	12	3	\$2,129,870
	Residential	928	918	\$395,830,030
	Total	942	922	\$398,067,300
Morrison	Commercial	1	1	\$626,000
	Exempt	4	2	\$9,099,700
	Industrial	1	1	\$267,300
	Total	6	4	\$9,993,000
Unincorporated	Agriculture	45	46	\$14,264,903
	Commercial	193	255	\$245,336,800
	Exempt	65	75	\$218,768,122
	Industrial	113	119	\$84,957,300
	Mixed Use	23	82	\$114,059,330
	Residential	17,950	20,004	\$3,947,697,180
Total	18,389	20,581	\$4,625,083,635	
Grand Total	20,817	24,201	\$5,937,420,715	

Source: Jefferson County GIS and Assessor's Data

Existing critical facilities impacted by dipping bedrock and other swelling soil hazards are of particular concern, as the damages caused to these structures may impact the ability of the planning area to provide critical services to the population. Schools built on the area may pose a danger to occupants if the buildings are severely damaged in an event. If building integrity is compromised, it may also reduce the sheltering capacity or public health distribution capacity of the County, as schools are often used for these functions.

Table 4.16 includes the results of a GIS overlay of critical facilities on the dipping bedrock areas. A number of schools and fire stations in the planning area are potentially exposed. This analysis does not take into account site-specific mitigation measures that may be in place.

Table 4.16 Critical Facilities in Dipping Bedrock Zones in Jefferson County

Jurisdiction	Category	Facility Type	Facility Count
Arvada	Transportation and Lifelines	Bridge	2
	Total		2
Golden	Essential Facilities	EOC	1
	Essential Facilities	Urgent Care Facility	1
	High Potential Loss Facilities	College	1
	High Potential Loss Facilities	Day Care Center	2
	High Potential Loss Facilities	Government Facility	7
	High Potential Loss Facilities	Long Term Care Facility	2
	High Potential Loss Facilities	PK-12 School	1
	High Potential Loss Facilities	Private School	1
	Transportation and Lifelines	Bridge	7
	Transportation and Lifelines	Water Facility	1
	Total		24
Lakewood	High Potential Loss Facilities	Dam	1
	Transportation and Lifelines	Bridge	6
	Transportation and Lifelines	Communication	2
	Total		9
Morrison	Essential Facilities	Fire Station	1
	High Potential Loss Facilities	Day Care Center	1
	High Potential Loss Facilities	Private School	1
	Total		3
Unincorporated	Essential Facilities	Fire Station	2
	Essential Facilities	Law Enforcement	1
	Essential Facilities	Urgent Care Facility	1
	High Potential Loss Facilities	Dam	8
	High Potential Loss Facilities	Day Care Center	12
	High Potential Loss Facilities	Government Facility	5
	High Potential Loss Facilities	HAZMAT	11
	High Potential Loss Facilities	Long Term Care Facility	7
	High Potential Loss Facilities	PK-12 School	13
	High Potential Loss Facilities	Powerplant	2
	High Potential Loss Facilities	Private School	7
	Transportation and Lifelines	Bridge	41
	Transportation and Lifelines	Communication	5
Transportation and Lifelines	Natural Gas Facility	1	
	Total		116
		Grand Total	154

Source: AMEC analysis of data provided by Jefferson County GIS

The most effective mitigation actions for expansive soil are complete avoidance or non-conflicting use, or correct engineering design (which includes foundation design, adequate drainage, landscaping, and appropriate interior finishing.) While some areas are devoted to non-conflicting use permits, in particular the areas which are included in the dipping bedrock zones, so much of the Colorado basin is covered in swelling soils that complete avoidance is not possible.⁷

Future Development

Land use planning regulations in place should temper the risk of swelling soil impacts on future development. Continued efforts to regulate building in areas of high or moderate swelling potential increase the number of structures and infrastructure built with swelling-adaptive methods, which in turn reduces the amount of damage incurred each year on the property. Continued education on the hazard, particularly in regards to landscaping and maintenance concerns, will be needed to reduce the impacts of the hazard on development. As existing development deteriorates and requires either renovation or reconstruction, mitigation methods should be implemented to bring the developments up to contemporary mitigation standards.

Since the last plan update, the most significant areas that intersect Golden and Morrison remain largely undeveloped; however, growth in western Arvada, unincorporated areas along Highway 93, and in Lakewood exposes new development to this hazard. It is important to note that recent development east of Highway 93 in West Arvada and north of Golden was not reflected in the 2015 parcel and associated databases; once added, it is estimated that considerable exposure will be identified for these areas.

Extreme Temperatures – Medium Hazard Significance

Existing Development

Recent research indicates that the impact of extreme temperatures, particularly on populations, has been historically under-represented. The risks of extreme temperatures are often profiled as part of larger hazards, such as severe winter storms or drought. However, as temperature variances may occur outside of larger hazards or outside of the expected seasons but still incur large costs, it is important to examine them as stand-alone hazards. Extreme heat may overload demands for electricity to run air conditioners in homes and businesses during prolonged periods of exposure and presents health concerns to individuals outside in the temperatures. Extreme heat may also be a secondary effect of droughts, or may cause temporary drought-like conditions. For example, several weeks of extreme heat increases evapotranspiration and reduces moisture content in vegetation, leading to higher wildfire vulnerability for that time period even if the rest of the season is relatively moist. Extreme cold impacts structures when pipes or water mains freeze and burst, causing damage. Cold can also, in the most extreme of circumstances, make materials more fragile and breakable, although the Front Range rarely gets this cold. Extreme cold may also lead to

⁷ W.P. Rogers, L.R. Ladwig, A.L. Hornbaker, S.D. Schwochow, S.S. Hart, D.C. Shelton, D.L. Scroggs, and J.M. Soule, *Guidelines and Criteria for Identification and Land-Use Controls of Geologic Hazard and Mineral Resource Areas* (Special Publication 6, Colorado Geological Survey, 1974. Reprinted in 1979.) pp 71-72.

higher electricity and natural gas demands to maintain appropriate indoor heating levels combined with damages caused to the delivery infrastructure such as frozen lines and pipes. Cold may impact transportation as well. Exposed populations may be at risk while waiting for public transportation, particularly when combined with wind-chill, and some vehicles may not start which impacts the commute of the workforce and, in worst case scenarios, the movement of emergency services personnel.

The impacts of cold and extreme heat on health are also a consideration. Traditionally, the very young and very old are considered at higher risk to the effects of extreme temperatures, but any populations outdoors in the weather are exposed, including otherwise young and healthy adults and homeless populations. Arguably, the young-and-otherwise-healthy demographic may be more exposed and experience a higher vulnerability because of the increased likelihood that they will be out in the extreme temperature deviation, whether due to commuting for work or school, conducting property maintenance such as snow removal or lawn care, or for recreational reasons.

The impact of severe temperature deviation on power delivery is a significant factor when assessing current development exposure.

The utility provider for Jefferson County (Xcel Energy) estimates that service outages due to extreme temperatures cost the utility an average of \$50,000 to fix for every 20,000 people affected. This includes repair and replacements costs, equipment usage and crew overtime.

In a typical year (for this analysis, 2006 was chosen as a representative year) approximately 13,000 Xcel customers in the planning area will be affected by power supply delays due to extreme temperatures, spread across a total of 5 days⁸. According to the FEMA Standard Values multiplier found in Appendix C of the Benefit Cost Reference Guide (2009) the total economic impacts of loss of power per person per day equals \$126.

Given this multiplier, estimated total yearly economic impacts for Jefferson County due to loss of power equal \$8,190,000 (13,000 customers * 5 days of service interruption * \$126.00 = \$8.19M).

Future Development

Since structures are not usually directly impacted by severe temperature fluctuations, continued development is less impacted by this hazard than others in the plan. However, pre-emptive cautions such as construction of green buildings that require less energy to heat and cool, use of good insulation on pipes and electric wirings, and smart construction of walkways, parking structures, and pedestrian zones that minimize exposures to severe temperatures may help increase the overall durability of the buildings and the community to the variations. Continued development also implies continued population growth, which raises the number of individuals potentially exposed to variations. Public education efforts should continue to help the population

⁸ Xcel Energy, August 2009

understand the risks and vulnerabilities of outdoor activities, property maintenance, and regular exposures during periods of extreme heat and cold.

Flood – High Hazard Significance

Existing Development

Floods pose a significant risk to existing development in the planning area. In addition to the enormous economic loss potential associated with flood hazards, floods have historically been a source of significant loss of life in the planning area.

Methodology

A flood vulnerability assessment was performed for Jefferson County using GIS. The county's parcel layer and associated assessor's building improvement valuation data were provided by the county and were used as the basis for the inventory. Jefferson County's effective DFIRM was used as the hazard layer. DFIRM is FEMA's flood risk data that depicts the 1% annual chance (100-year) and the 0.2% annual chance (500-year) flood events. Jefferson County's effective FEMA DFIRM, dated February 5, 2015, was determined to be the best available floodplain data.

GIS was used to intersect the parcel boundaries with a master address layer to obtain number of buildings per parcel. The parcel layer was then converted into a centroid, or point, representing the center of each parcel polygon.

Only parcels with improvement values greater than zero were used in the analysis, which assumes that improved parcels have a structure of some type. The DFIRM flood zones were overlaid in GIS on the parcel centroid data to identify structures that would likely be inundated during a 1% annual chance and 0.2% annual chance flood event. These overlays can be seen graphically in the maps in Figure 4.4 (countywide) and Figure 4.5 (urbanized area) and in more detail in the jurisdictional annexes.

Building improvement values and counts for those points were then extracted from the parcel/assessor's data and summed for the unincorporated county and jurisdictions. Results of the overlay analysis area shown in Table 4.17 for the 1% annual chance flood and Table 4.18 for the 0.2% annual chance flood and are sorted by the parcel's occupancy type, and jurisdiction. Occupancy type refers to the land use of the parcel and includes residential, agricultural, commercial, industrial, mixed use and exempt. Building loss is the number of impacted structures divided by the total number of structures in the jurisdiction.

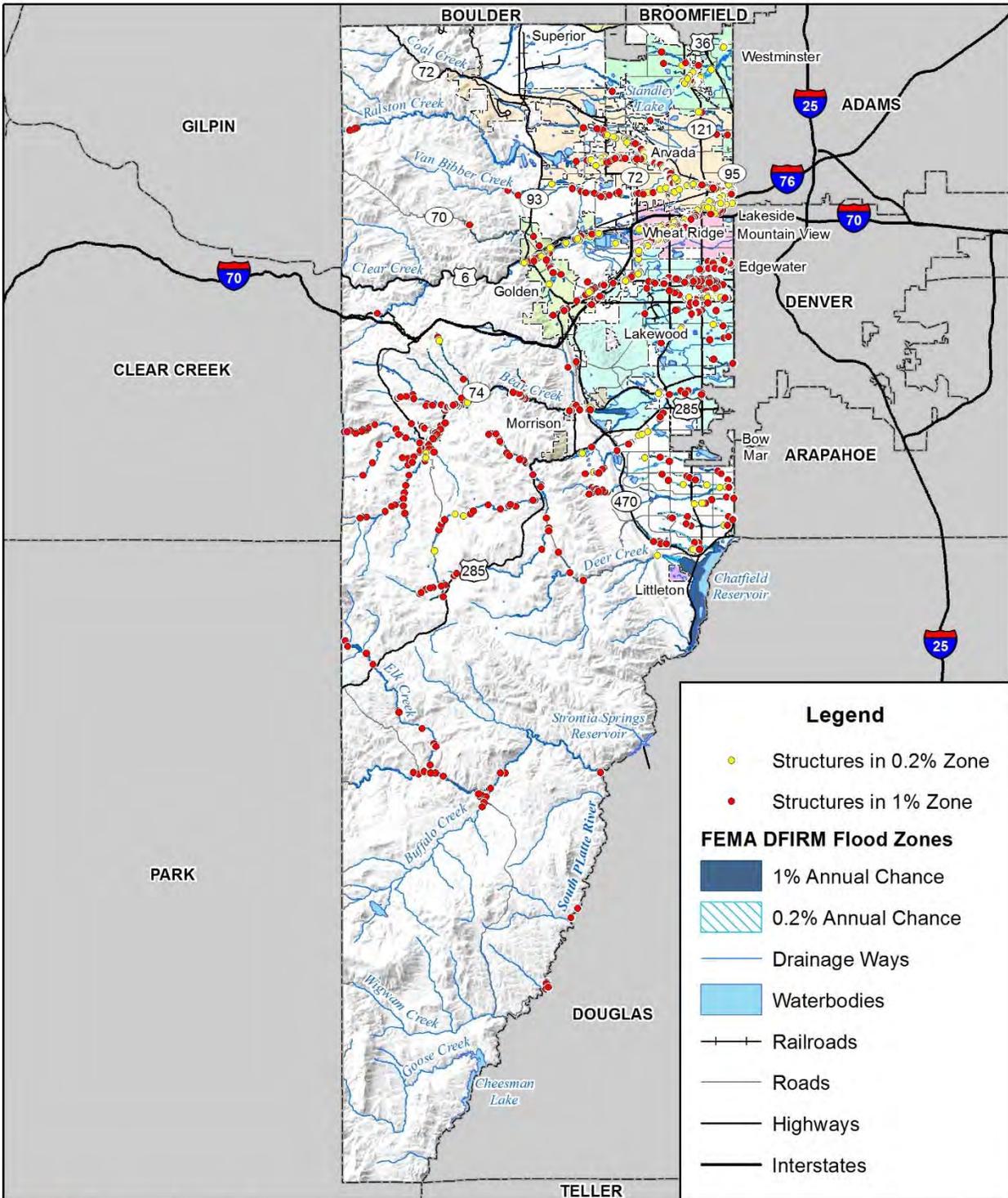
A loss estimate analysis was also performed based on depth damage functions developed by the Corp of Engineers and applied in FEMA's BCA software. The loss curves depict the expected flood losses associated with the depth of flooding at a structure. Contents values were estimated as a percentage of building value based on their occupancy type, using FEMA/HAZUS estimated content replacement values. This includes 100% of the structure value for agricultural,

commercial, mixed used and exempt structures, 50% for residential structures and 150% for industrial structures. Building and contents values were totaled to obtain total exposure.

There are different curves for structure and content losses. For the purposes of this planning level analysis, an average flood depth of 2 feet is assumed. A depth damage ratio of 17% was used for residential content loss and 30% for structural loss, based on the FEMA damage curves for a 2 foot flood. The remainder of the property types (e.g. commercial, industrial, etc.) used 42% for content loss and 24% for structural loss. The results are shown in the loss estimate columns in Table 4.19 for the 1% annual chance flood and Table 4.20 for the 0.2% annual chance flood.

It is important to note that there could be more than one structure or building on an improved parcel (i.e., condo complex occupies one parcel but might have several structures). Only improved parcels and the value of their improvements were analyzed. The end result is an inventory of the number and types of parcels and buildings subject to the hazards. Results are presented by unincorporated county and incorporated jurisdictions. Detailed tables show counts of parcels by jurisdictions and land use type (Agriculture, Commercial, Exempt, Industrial, Mixed Use and Residential) within each flood zone. This flood loss analysis does not account for business disruption, emergency services, environmental damages, or displacement costs, thus actual losses could exceed the estimate shown.

Figure 4.4. FEMA DFIRM Flood Hazards and At-Risk Properties



Legend

- Structures in 0.2% Zone
- Structures in 1% Zone

FEMA DFIRM Flood Zones

- 1% Annual Chance
- 0.2% Annual Chance
- Drainage Ways
- Waterbodies
- Railroads
- Roads
- Highways
- Interstates

Map compiled 11/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD, FEMA DFIRM 02/05/2014

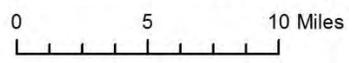
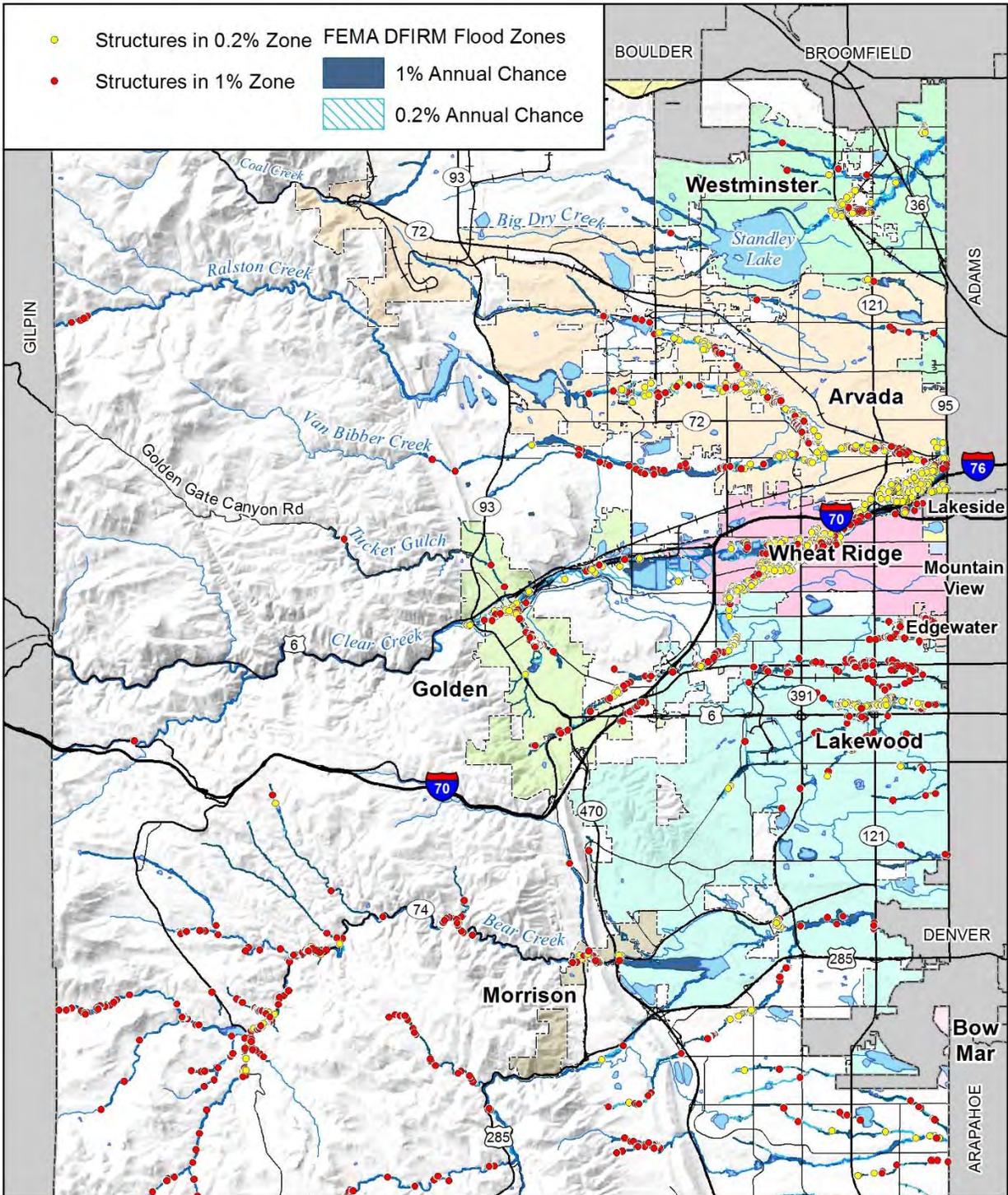


Figure 4.5. FEMA DFIRM Flood Hazards and At-Risk Properties (North Half)




 Map compiled 11/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD, FEMA DFIRM 02/05/2014

Table 4.17 Buildings At-Risk to 1% Annual Chance Flood by Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Building Count	% of Total Buildings in flood hazard areas
Arvada	Commercial	3	9	1.65%
	Exempt	10	3	
	Industrial	6	14	
	Mixed Use	15	49	
	Residential	581	587	
	Total	615	662	
Edgewater	Exempt	3	2	3.59%
	Mixed Use	2	7	
	Residential	53	55	
	Total	58	64	
Golden	Commercial	23	25	3.08%
	Exempt	8	12	
	Industrial	5	6	
	Mixed Use	9	90	
	Residential	69	71	
	Total	114	204	
Lakewood	Agriculture	1	1	0.52%
	Commercial	54	85	
	Exempt	12	11	
	Industrial	9	22	
	Mixed Use	15	33	
	Residential	122	120	
Total	213	272		
Morrison	Commercial	21	30	36.31%
	Mixed Use	5	11	
	Residential	12	24	
	Total	38	65	
Wheat Ridge	Agriculture	3	3	3.27%
	Commercial	7	12	
	Exempt	10	18	
	Industrial	13	24	
	Mixed Use	9	34	
	Residential	290	333	
Total	332	424		
Unincorporated	Agriculture	31	23	0.76%
	Commercial	37	31	
	Exempt	22	14	
	Industrial	11	12	
	Mixed Use	11	35	
	Residential	498	466	
Total	610	581		
Grand Total		1,980	2,272	1.20%

Source: Amec Foster Wheeler analysis with Jefferson County Assessor's Data, 2015 and 2/5/14 FEMA DFIRMs

Table 4.18 Buildings At-Risk to 0.2% Annual Chance Flood by Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Building Count	% of Total Buildings in flood hazard areas
Arvada	Agriculture	4	3	2.05%
	Commercial	35	76	
	Exempt	9	6	
	Industrial	45	63	
	Mixed Use	14	42	
	Residential	607	636	
	Total	714	826	
Golden	Commercial	6	6	2.52%
	Exempt	5	4	
	Industrial	1	5	
	Mixed Use	4	4	
	Residential	52	148	
	Total	68	167	
Lakewood	Commercial	4	3	0.32%
	Exempt	3	5	
	Industrial	1	1	
	Residential	150	156	
	Total	158	165	
Morrison	Commercial	2	2	12.85%
	Exempt	3	1	
	Mixed Use	3	5	
	Residential	14	15	
	Total	22	23	
Wheat Ridge	Agriculture	1	1	7.66%
	Commercial	28	34	
	Exempt	9	8	
	Mixed Use	54	241	
	Residential	605	711	
	Total	697	995	
Unincorporated	Agriculture	7	6	0.52%
	Commercial	21	31	
	Exempt	7	7	
	Industrial	48	124	
	Mixed Use	9	12	
	Residential	208	215	
	Total	300	395	
Grand Total		1,959	2,571	1.35%

Source: Amec Foster Wheeler analysis with Jefferson County Assessor's Data, 2015 and 2/5/14 FEMA DFIRMs

Table 4.19 Property Values At-Risk in 1% Annual Chance Flood Zone

Jurisdiction	Property Type	Improved Value	Content Value	Total Value	Structure Loss	Content Loss	Total Loss Estimate
Arvada	Commercial	\$3,323,200	\$3,323,200	\$6,646,400	\$797,568	\$1,395,744	\$2,193,312
	Exempt	\$9,611,500	\$9,611,500	\$19,223,000	\$2,306,760	\$4,036,830	\$6,343,590
	Industrial	\$6,057,000	\$9,085,500	\$15,142,500	\$1,453,680	\$3,815,910	\$5,269,590
	Mixed Use	\$11,676,900	\$11,676,900	\$23,353,800	\$2,802,456	\$4,904,298	\$7,706,754
	Residential	\$99,283,130	\$49,641,565	\$148,924,695	\$29,784,939	\$8,439,066	\$38,224,005
	Total	\$129,951,730	\$83,338,665	\$213,290,395	\$37,145,403	\$22,591,848	\$59,737,251
Edgewater	Exempt	\$8,174,500	\$8,174,500	\$16,349,000	\$1,961,880	\$3,433,290	\$5,395,170
	Mixed Use	\$732,200	\$732,200	\$1,464,400	\$175,728	\$307,524	\$483,252
	Residential	\$9,162,880	\$4,581,440	\$13,744,320	\$2,748,864	\$778,845	\$3,527,709
	Total	\$18,069,580	\$13,488,140	\$31,557,720	\$4,886,472	\$4,519,659	\$9,406,131
Golden	Commercial	\$7,378,464	\$7,378,464	\$14,756,928	\$1,770,831	\$3,098,955	\$4,869,786
	Exempt	\$18,223,400	\$18,223,400	\$36,446,800	\$4,373,616	\$7,653,828	\$12,027,444
	Industrial	\$1,102,700	\$1,654,050	\$2,756,750	\$264,648	\$694,701	\$959,349
	Mixed Use	\$4,542,090	\$4,542,090	\$9,084,180	\$1,090,102	\$1,907,678	\$2,997,779
	Residential	\$17,482,530	\$8,741,265	\$26,223,795	\$5,244,759	\$1,486,015	\$6,730,774
	Total	\$48,729,184	\$40,539,269	\$89,268,453	\$12,743,956	\$14,841,177	\$27,585,133
Lakewood	Agriculture	\$61,100	\$61,100	\$122,200	\$14,664	\$25,662	\$40,326
	Commercial	\$31,604,100	\$31,604,100	\$63,208,200	\$7,584,984	\$13,273,722	\$20,858,706
	Exempt	\$9,099,600	\$9,099,600	\$18,199,200	\$2,183,904	\$3,821,832	\$6,005,736
	Industrial	\$3,510,400	\$5,265,600	\$8,776,000	\$842,496	\$2,211,552	\$3,054,048
	Mixed Use	\$24,179,900	\$24,179,900	\$48,359,800	\$5,803,176	\$10,155,558	\$15,958,734
	Residential	\$28,158,480	\$14,079,240	\$42,237,720	\$8,447,544	\$2,393,471	\$10,841,015
	Total	\$96,613,580	\$84,289,540	\$180,903,120	\$24,876,768	\$31,881,797	\$56,758,565
Morrison	Commercial	\$3,188,300	\$3,188,300	\$6,376,600	\$765,192	\$1,339,086	\$2,104,278
	Mixed Use	\$1,405,100	\$1,405,100	\$2,810,200	\$337,224	\$590,142	\$927,366
	Residential	\$2,016,050	\$1,008,025	\$3,024,075	\$604,815	\$171,364	\$776,179
	Total	\$6,609,450	\$5,601,425	\$12,210,875	\$1,707,231	\$2,100,592	\$3,807,823
Wheat Ridge	Agriculture	\$904,481	\$904,481	\$1,808,962	\$217,075	\$379,882	\$596,957
	Commercial	\$5,402,500	\$5,402,500	\$10,805,000	\$1,296,600	\$2,269,050	\$3,565,650
	Exempt	\$2,999,700	\$2,999,700	\$5,999,400	\$719,928	\$1,259,874	\$1,979,802
	Industrial	\$4,493,400	\$6,740,100	\$11,233,500	\$1,078,416	\$2,830,842	\$3,909,258
	Mixed Use	\$5,106,600	\$5,106,600	\$10,213,200	\$1,225,584	\$2,144,772	\$3,370,356
	Residential	\$42,608,190	\$21,304,095	\$63,912,285	\$12,782,457	\$3,621,696	\$16,404,153
	Total	\$61,514,871	\$42,457,476	\$103,972,347	\$17,320,060	\$12,506,116	\$29,826,177
Unincorporated	Agriculture	\$11,615,455	\$11,615,455	\$23,230,910	\$2,787,709	\$4,878,491	\$7,666,200
	Commercial	\$19,959,178	\$19,959,178	\$39,918,356	\$4,790,203	\$8,382,855	\$13,173,057
	Exempt	\$14,650,972	\$14,650,972	\$29,301,944	\$3,516,233	\$6,153,408	\$9,669,642
	Industrial	\$90,753,210	\$136,129,815	\$226,883,025	\$21,780,770	\$57,174,522	\$78,955,293
	Mixed Use	\$8,320,710	\$8,320,710	\$16,641,420	\$1,996,970	\$3,494,698	\$5,491,669
	Residential	\$125,743,730	\$62,871,865	\$188,615,595	\$37,723,119	\$10,688,217	\$48,411,336
Total	\$271,043,255	\$253,547,995	\$524,591,250	\$72,595,005	\$90,772,192	\$163,367,197	
Grand Total	\$632,531,650	\$523,262,510	\$1,155,794,160	\$171,274,895	\$179,213,380	\$350,488,276	

Source: Amec Foster Wheeler analysis with Jefferson County Assessor's Data and 2/5/14 FEMA DFIRMs

Table 4.20 Property Values At-Risk 0.2% Annual Chance Flood Zone

Jurisdiction	Property Type	Improved Value	Content Value	Total Value	Structure Loss	Content Loss	Total Loss Estimate
Arvada	Agriculture	\$493,858	\$493,858	\$987,716	\$118,526	\$207,420	\$325,946
	Commercial	\$54,376,050	\$54,376,050	\$108,752,100	\$13,050,252	\$22,837,941	\$35,888,193
	Exempt	\$14,019,100	\$14,019,100	\$28,038,200	\$3,364,584	\$5,888,022	\$9,252,606
	Industrial	\$49,203,800	\$49,203,800	\$98,407,600	\$11,808,912	\$20,665,596	\$32,474,508
	Mixed Use	\$19,660,400	\$19,660,400	\$39,320,800	\$4,718,496	\$8,257,368	\$12,975,864
	Residential	\$99,738,770	\$99,738,770	\$199,477,540	\$29,921,631	\$16,955,591	\$46,877,222
	Total	\$237,491,978	\$237,491,978	\$474,983,956	\$62,982,401	\$74,811,938	\$137,794,339
Golden	Commercial	\$16,766,100	\$16,766,100	\$33,532,200	\$4,023,864	\$7,041,762	\$11,065,626
	Exempt	\$5,123,800	\$5,123,800	\$10,247,600	\$1,229,712	\$2,151,996	\$3,381,708
	Industrial	\$9,031,118	\$9,031,118	\$18,062,236	\$2,167,468	\$3,793,070	\$5,960,538
	Mixed Use	\$9,484,000	\$9,484,000	\$18,968,000	\$2,276,160	\$3,983,280	\$6,259,440
	Residential	\$14,325,570	\$14,325,570	\$28,651,140	\$4,297,671	\$2,435,347	\$6,733,018
	Total	\$54,730,588	\$54,730,588	\$109,461,176	\$13,994,875	\$19,405,454	\$33,400,330
Lakewood	Commercial	\$5,364,300	\$5,364,300	\$10,728,600	\$1,287,432	\$2,253,006	\$3,540,438
	Exempt	\$1,345,000	\$1,345,000	\$2,690,000	\$322,800	\$564,900	\$887,700
	Industrial	\$387,700	\$387,700	\$775,400	\$93,048	\$162,834	\$255,882
	Residential	\$41,949,685	\$41,949,685	\$83,899,370	\$12,584,906	\$7,131,446	\$19,716,352
	Total	\$49,046,685	\$49,046,685	\$98,093,370	\$14,288,186	\$10,112,186	\$24,400,372
Morrison	Commercial	\$123,000	\$123,000	\$246,000	\$29,520	\$51,660	\$81,180
	Exempt	\$277,700	\$277,700	\$555,400	\$66,648	\$116,634	\$183,282
	Mixed Use	\$1,017,500	\$1,017,500	\$2,035,000	\$244,200	\$427,350	\$671,550
	Residential	\$1,976,300	\$1,976,300	\$3,952,600	\$592,890	\$335,971	\$928,861
	Total	\$3,394,500	\$3,394,500	\$6,789,000	\$933,258	\$931,615	\$1,864,873
Wheat Ridge	Agriculture	\$10,800	\$10,800	\$21,600	\$2,592	\$4,536	\$7,128
	Commercial	\$9,006,200	\$9,006,200	\$18,012,400	\$2,161,488	\$3,782,604	\$5,944,092
	Exempt	\$19,714,800	\$19,714,800	\$39,429,600	\$4,731,552	\$8,280,216	\$13,011,768
	Mixed Use	\$31,598,700	\$31,598,700	\$63,197,400	\$7,583,688	\$13,271,454	\$20,855,142
	Residential	\$116,112,530	\$116,112,530	\$232,225,060	\$34,833,759	\$19,739,130	\$54,572,889
	Total	\$176,443,030	\$176,443,030	\$352,886,060	\$49,313,079	\$45,077,940	\$94,391,019
Unincorporated	Agriculture	\$1,274,509	\$1,274,509	\$2,549,018	\$305,882	\$535,294	\$841,176
	Commercial	\$12,901,517	\$12,901,517	\$25,803,034	\$3,096,364	\$5,418,637	\$8,515,001
	Exempt	\$4,799,500	\$4,799,500	\$9,599,000	\$1,151,880	\$2,015,790	\$3,167,670
	Industrial	\$44,229,600	\$44,229,600	\$88,459,200	\$10,615,104	\$18,576,432	\$29,191,536
	Mixed Use	\$2,064,740	\$2,064,740	\$4,129,480	\$495,538	\$867,191	\$1,362,728
	Residential	\$43,376,800	\$43,376,800	\$86,753,600	\$13,013,040	\$7,374,056	\$20,387,096
	Total	\$108,646,666	\$108,646,666	\$217,293,332	\$28,677,808	\$34,787,400	\$63,465,208
Grand Total	\$629,753,447	\$629,753,447	\$1,259,506,894	\$170,189,607	\$185,126,534	\$355,316,141	

Source: Amec Foster Wheeler analysis with Jefferson County Assessor's Data and 2/5/14 FEMA DFIRMs

*The Assessor's Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values.

**The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values

Based on this analysis, Arvada, Wheat Ridge and the unincorporated parts of the County have the most total vulnerable buildings to the 1% annual chance flood (662, 424 and 581 structures, respectively). Additionally, these same jurisdictions have the most total vulnerable buildings to the 0.2% annual chance flood (826, 995 and 395 structures, respectively). As a percentage of structures at risk, Morrison is most at risk with over 36% of its buildings being damaged in a 1% annual chance flood event.

It is also evident that the jurisdictions of Arvada, Lakewood and the unincorporated parts of the county have the highest total dollar exposure to potential losses from the 1% annual chance flood. The analysis shows potential losses for Arvada at \$59.7M, Lakewood at \$56.7M and \$163.3M for the unincorporated County. In the 0.2% annual chance scenario Arvada, Wheat Ridge and the unincorporated County show the greatest losses at \$137.7M, \$94.3M and \$63.4M respectively.

Losses from building and content damage were summed and divided by total exposure (contents and building) values to determine loss ratios for each jurisdiction in each flood scenario. Results are summarized below in Table 4.22. From this analysis, Morrison has the highest relative values at risk with flood losses from a 1% annual chance flood event estimated at 5% of its total building value.

Table 4.21 Loss Ratio in 1% and 0.2% Flood Scenarios

Jurisdiction	1% Annual Chance Flood	0.2% Annual Chance Flood
Arvada	0.40%	0.92%
Edgewater	1.67%	0.00%
Golden	0.53%	0.64%
Lakewood	0.27%	0.11%
Morrison	5.00%	2.45%
Wheat Ridge	0.64%	2.03%
Unincorporated	0.49%	0.19%

Source: Amec Foster Wheeler analysis with Jefferson County Assessor's Data

Table 4.22 is an estimate of population affected by both the 1% annual chance and the 0.2% annual chance flood scenarios. Consistent with the building and value vulnerabilities, Arvada, Wheat Ridge and the unincorporated County are most at-risk. The numbers are based on multiplying the counts of residential structures within the flood hazard areas by the average household size for the County based on the U.S. Census.

Table 4.22 Jefferson County Population Affected: 1% and 0.2% Flood Scenarios

Jurisdictions	Population Affected 1% Annual Chance Flood	Population Affected 0.2% Annual Chance Flood (Over and Above 1%)
Arvada	1,453	1,518
Edgewater	112	0
Golden	157	119
Lakewood	279	344
Morrison	25	29
Wheat Ridge	626	1,307
Unincorporated	1,205	503
Total	3,857	3,819

Source: Amec Foster Wheeler analysis with Jefferson County Assessor's Data and 2010 US Census Population Data

Critical Facilities

To estimate the potential impact of floods on critical facilities, a GIS overlay was performed of the flood hazard layer for critical facility point locations (countywide in Figure 4.6 and urbanized area in Figure 4.7). Critical facilities at-risk to the 1% annual chance flood are listed in Table 4.23. Critical facilities at-risk to the 0.2% annual chance flood are shown in Table 4.24.

Replacement values were not available with the data, thus an estimate of potential monetary loss could not be performed. Impacts to any of these facilities could have wide ranging ramifications, in addition to property damage. As expected, most bridges and other critical facilities are located in the urbanized northeastern part of the county where the majority of the population is located. Nevertheless, the critical facilities in the southern part of the County are extremely important as failure of one of these could require assistance and emergency services to be brought in from distant locations. Bridges and road infrastructure in Coal Creek Canyon and the canyons of Boulder and Larimer County was severely impacted in the 2013 floods. The bridge maps indicate concentrations of bridges along Highway 74 west of Morrison.

Table 4.23 Critical Facilities in 1% Annual Chance Flood Hazard Areas

Jurisdiction	Category	Facility Type	Facility Count
Arvada	High Potential Loss Facilities	Dam	1
	High Potential Loss Facilities	HAZMAT	1
	Transportation and Lifelines	Bridge	30
	Transportation and Lifelines	Communication	2
	Total		34
Edgewater	High Potential Loss Facilities	Government Facility	1
	Total		1
Golden	High Potential Loss Facilities	Day Care Center	1
	High Potential Loss Facilities	Government Facility	1
	High Potential Loss Facilities	HAZMAT	3
	High Potential Loss Facilities	Powerplant	1
	Transportation and Lifelines	Bridge	3
	Transportation and Lifelines	Water Facility	1
	Total		10
Lakewood	Essential Facilities	Fire Station	1
	Essential Facilities	Urgent Care Facility	1
	High Potential Loss Facilities	Dam	2
	High Potential Loss Facilities	Day Care Center	1
	High Potential Loss Facilities	HAZMAT	3
	Transportation and Lifelines	Bridge	11
	Total		19
Morrison	Transportation and Lifelines	Bridge	3
	Total		3
Wheat Ridge	Essential Facilities	Urgent Care Facility	1
	Transportation and Lifelines	Bridge	8
	Total		9
Unincorporated	Essential Facilities	Fire Station	1
	Essential Facilities	Law Enforcement	1
	High Potential Loss Facilities	Dam	7
	High Potential Loss Facilities	Day Care Center	1
	High Potential Loss Facilities	Government Facility	1
	High Potential Loss Facilities	HAZMAT	1
	Transportation and Lifelines	Bridge	68
	Transportation and Lifelines	Water Facility	1
	Transportation and Lifelines	Waste Water Facility	2
	Total		83
	Grand Total		159

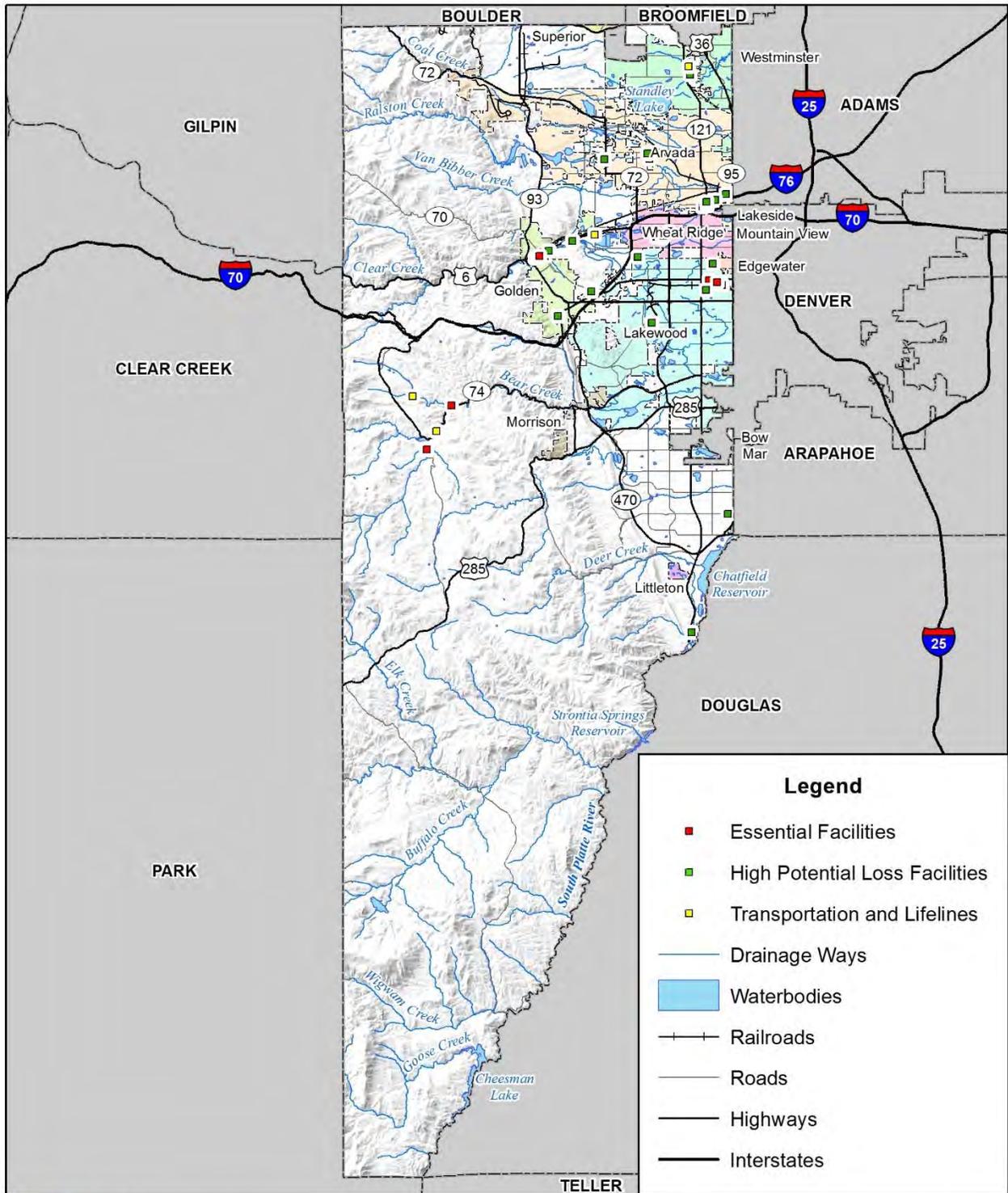
Source: Jefferson County, HSIP Freedom and HAZUS databases

Table 4.24 Critical Facilities in 0.2% Annual Chance Flood Hazard Areas

Jurisdiction	Category	Facility Type	Facility Count
Arvada	Essential Facilities	Urgent Care Facility	1
	High Potential Loss Facilities	College	1
	High Potential Loss Facilities	Day Care Center	1
	High Potential Loss Facilities	HAZMAT	6
	High Potential Loss Facilities	PK-12 School	1
	Transportation and Lifelines	Bridge	11
	Total		21
Golden	Essential Facilities	EOC	1
	Essential Facilities	Fire Station	1
	Essential Facilities	Law Enforcement	1
	Transportation and Lifelines	Bridge	1
	Total		4
Lakewood	High Potential Loss Facilities	Dam	1
	High Potential Loss Facilities	HAZMAT	1
	Transportation and Lifelines	Bridge	1
	Total		3
Wheat Ridge	Essential Facilities	Fire Station	1
	High Potential Loss Facilities	Government Facility	1
	High Potential Loss Facilities	Long Term Care Facility	1
	Transportation and Lifelines	Bridge	11
	Transportation and Lifelines	Communication	1
	Total		15
Unincorporated	High Potential Loss Facilities	Day Care Center	1
	High Potential Loss Facilities	Government Facility	2
	High Potential Loss Facilities	HAZMAT	3
	Transportation and Lifelines	Bridge	14
	Transportation and Lifelines	Communication	1
	Transportation and Lifelines	Waste Water Facility	1
	Total		22
Grand Total			65

Source: Jefferson County, HSIP Freedom and HAZUS databases

Figure 4.6. Jefferson County Critical Facilities At-Risk to Flood

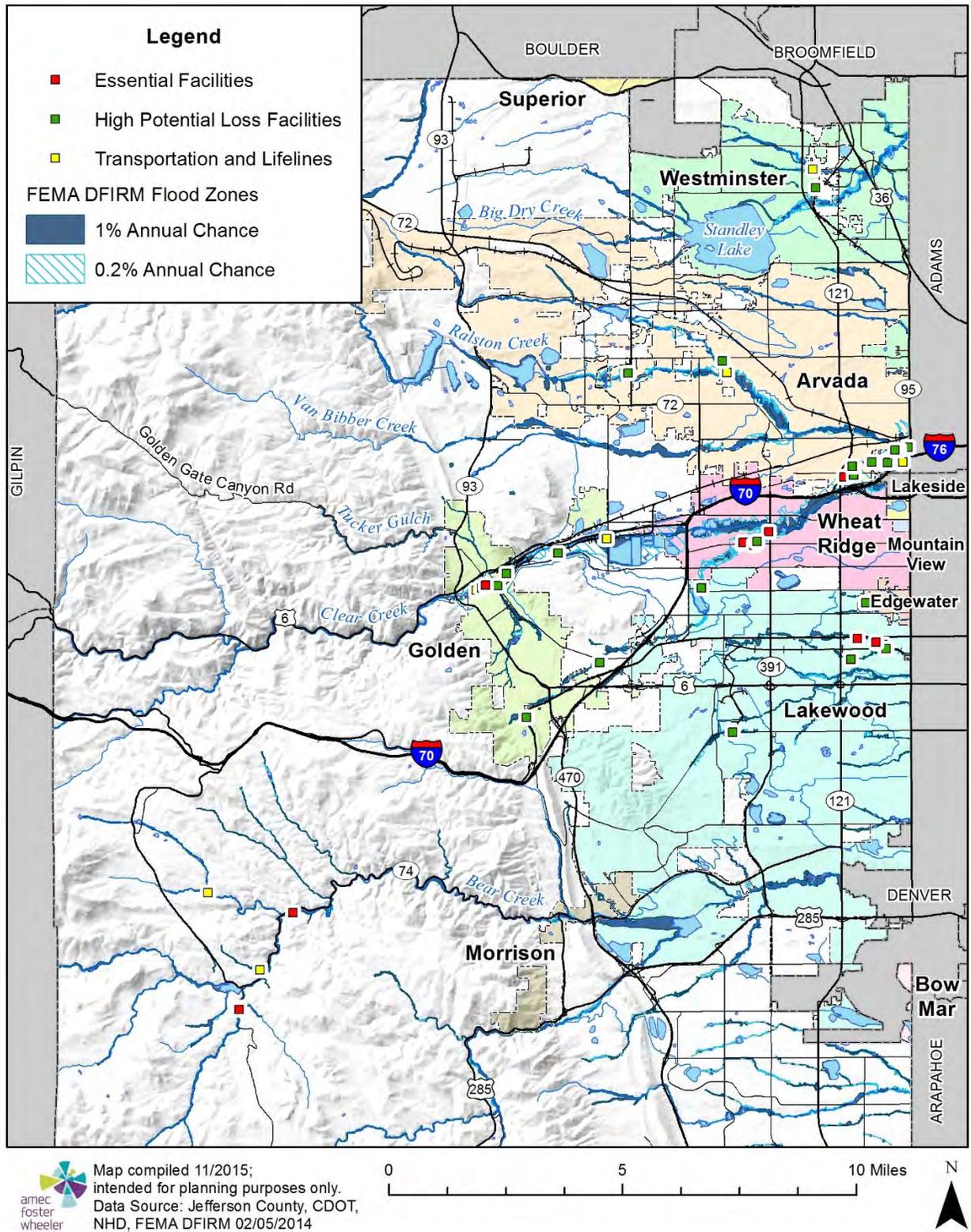



 Map compiled 11/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD, FEMA DFIRM 02/05/2014

0 5 10 Miles



Figure 4.7. Jefferson County Critical Facilities At-Risk to Flood (North Half)



Bridges

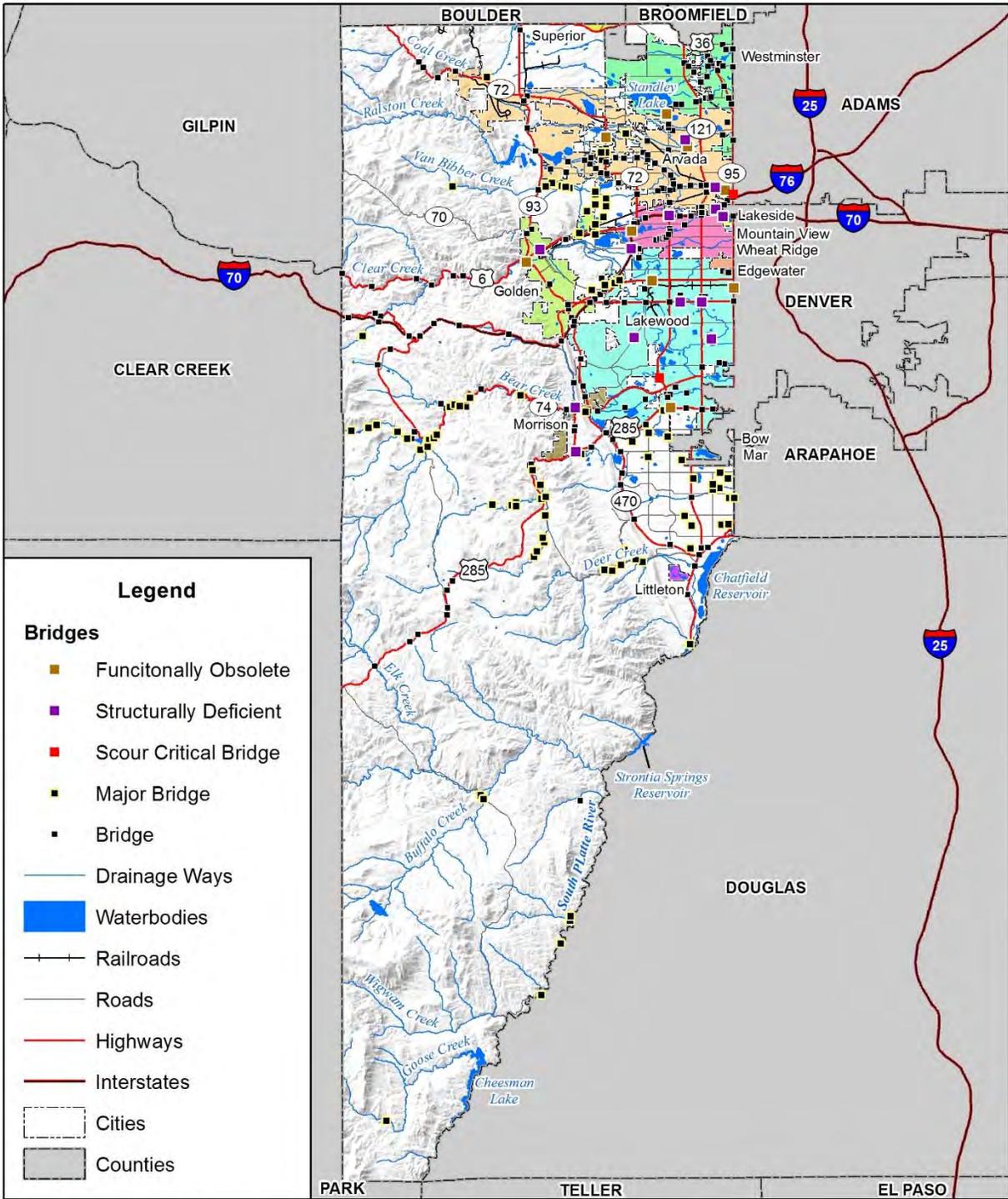
Jefferson County does have a number of bridges of concern, including scour critical (a bridge with a foundation element determined to be unstable for the observed or evaluated scour condition) structurally deficient (when key components like the superstructure are inspected and rated ‘poor’ or worse by a bridge engineer) and functionally obsolete (when design components are outdated) facilities. A list of these bridges follows in Table 4.25 and are displayed graphically in Figure 4.8 (countywide) and Figure 4.9 (urbanized area).

Table 4.25 Jefferson County Bridges of Concern

Jurisdiction	Bridge Name	Critical Factor	Address
Arvada	ARVA-74-0.90-01	Functionally Obsolete	.1 MI W OF CARR STREET
	ARVA-74-0.90-02	Functionally Obsolete	.1 MI WEST OF CARR STREET
	ARVA-86-0.5-01	Functionally Obsolete	.1 MI WEST OF KIPLING
	ARVA-RR-5.55-04	Functionally Obsolete	.5 MI W OF SHERIDAN
	ARVA-CR-0.25-01	Structurally Deficient	.25 MI NORTH OF 74TH AVE
	ARVA-NN-0.06-01	Structurally Deficient	.06 MI N OF 58TH AVENUE
Golden	E-16-HA	Structurally Deficient	IN GOLDEN
Lakeside	E-16-FZ	Structurally Deficient	IN WHEATRIDGE
Lakewood	F-16-AR	Functionally Obsolete	Between Quail & Simms St.
	F-16-RP	Functionally Obsolete	1.5 MI W OF JCT SH 121
	F-16-ER	Structurally Deficient	IN LAKEWOOD
	F-16-O	Structurally Deficient	IN LAKEWOOD
	LKWD-04-0.00-01	Structurally Deficient	N OF ALAMEDA AT PARK SER.
	LKWD-04-0.50-02	Structurally Deficient	1/2 BLK W OF PIERCE ST
Morrison	MORR-PARK AVE	Structurally Deficient	AT INTER. WITH SH 8
Unincorporated	E-16-BE	Functionally Obsolete	INDIANA ST ABOUT 7800 N
	E-16-PY	Functionally Obsolete	IN GOLDEN
	F-16-BO	Functionally Obsolete	IN LAKEWOOD
	E-16-P	Scour Critical Bridge	Sheridan 1.0 MI N of I 70
	F-16-JP	Scour Critical Bridge	KIPLING 1.5 MI N OF US285
	E-16-JT	Structurally Deficient	.75 MI E. OF WADSWORTH
	F-16-FB	Structurally Deficient	2 MI SOUTH OF MORRISON
Wheat Ridge	WTRE-1-0.79-01A	Functionally Obsolete	.79 MI N OF W 32ND AVENUE
	E-16-HE	Structurally Deficient	WHEATRIDGE
	E-16-HF	Structurally Deficient	WHEATRIDGE
	E-16-JU	Structurally Deficient	IN ARVADA
	E-16-GX	Structurally Deficient	WHEATRIDGE
	E-16-GY	Structurally Deficient	WHEATRIDGE

Source: National Bridge Inventory in HSIP Freedom, 2015

Figure 4.8. Jefferson County Bridges

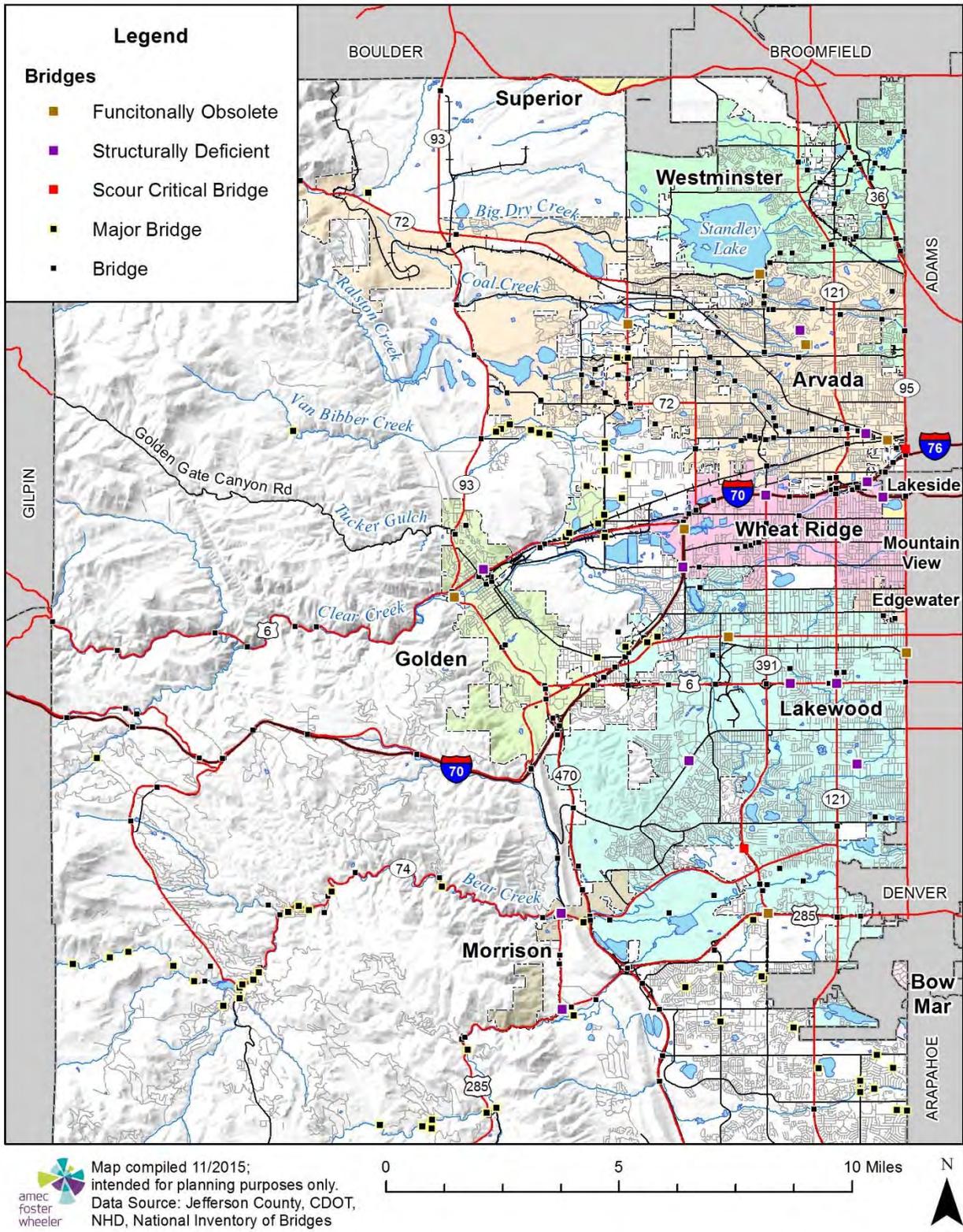



 Map compiled 11/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD, National Inventory of Bridges

0 5 10 Miles



Figure 4.9. Jefferson County Bridges (North Half)



National Flood Insurance Program/Community Rating System

The National Flood Insurance Program (NFIP) is a federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses. A jurisdiction's eligibility to participate is premised on their adoption and enforcement of state and community floodplain management regulations intended to prevent unsafe development in the floodplain, thereby reducing future flood damages. Thus, participation in the NFIP is based on an agreement between communities and the federal government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction in floodplains, the federal government will make flood insurance available within the community as a financial protection against flood losses. Table 4.26 shows the dates the jurisdictions in Jefferson County joined the NFIP, the date of the most recent FIRM maps, total number of claims since joining and total dollar value of claims. The data shows that the unincorporated parts of the county have the highest dollar value of claims, with Lakewood the highest number of claims.

Table 4.26 NFIP Data, Jefferson County

Jurisdiction	Date Joined	Effective FIRM Date	Number of Claims	Claims Totals (\$)
Arvada, City of	10/1/1991	2/5/2014	68	57,818
Edgewater, City of	n/a	2/5/2014	25	51,637
Golden, City of	10/1/1996	2/5/2014	18	70,608
Lakewood, City of	10/1/1991	2/5/2014	147	576,684
Morrison, Town of	10/1/1996	2/5/2014	2	1,232
Westminster, City of	10/1/1991	2/5/2014	38	260,099
Wheat Ridge, City of	10/1/1991	2/5/2014	44	91,282
Unincorporated	10/1/2005	2/5/2014	129	1,339,740

Source: National Flood Insurance Program September 2015; Community Rating System, September 2015

Table 4.27 shows the trends of policies in force from 2010 to 2015, with the exceptions of Lakewood and Arvada, all jurisdictions in Jefferson County have increased numbers of policies in force.

Table 4.27 NFIP Policies in Force, 2010 to 2015

Jurisdiction	Policies in Force		Change 2010 to 2015
	2010	2015	
Arvada	521	484	-37
Edgewater	35	42	7
Golden	87	93	6
Lakewood	428	412	-16
Morrison	1	12	11
Westminster	95	121	26
Wheat Ridge	190	254	64
Unincorporated	435	597	162

Source: National Flood Insurance Program September 2015; Community Rating System, September 2015

Table 4.28 shows the same data, in terms of total dollar amounts insured. This analysis shows all jurisdictions increasing net dollar amounts insured. This is likely due to inflation as well as increases in total number of policies for most jurisdictions, however there are many factors that could change these numbers.

Table 4.28 NFIP Insurance in Force, 2010 to 2015 (Non-Adjusted US Dollars)

Jurisdiction	Insurance in Force		Change 2010 to 2015
	2010	2015	
Arvada	\$106,760,600	\$114,839,400	\$8,078,800
Edgewater	\$7,722,100	\$8,859,200	\$1,137,100
Golden	\$23,436,300	\$25,629,000	\$2,192,700
Lakewood	\$96,384,300	\$113,461,100	\$17,076,800
Morrison	\$2,511,600	\$2,590,000	\$78,400
Westminster	\$24,590,600	\$33,447,400	\$8,856,800
Wheat Ridge	\$39,192,100	\$58,590,100	\$19,398,000
Unincorporated	\$104,965,200	\$150,687,200	\$45,722,000

Source: National Flood Insurance Program September 2015; Community Rating System, September 2015

The Community Rating System (CRS) was created in 1990 to recognize communities whose floodplain management activities go above and beyond the NFIP's minimum requirements. Under the CRS, if a community implements certain program activities, such as public information, mapping, regulatory, loss reduction, and/or flood preparedness activities, then its residents can qualify for a flood insurance premium rate reduction.

Table 4.29 shows how jurisdictions in Jefferson County have progressed in the CRS system since 2010.

Table 4.29 Jefferson County Jurisdictions, CRS Rating Trends 2010 - 2015

Jurisdiction	CRS Rating		Change in Class 2010 to 2015
	2010	2015	
Arvada	6	5	+1
Golden	9	7	+2
Lakewood	6	6	0
Morrison	9	9	0
Westminster	6	6	0
Wheat Ridge	7	6	+1
Unincorporated	9	6	+3

Source: National Flood Insurance Program September 2015; Community Rating System, September 2015

All jurisdictions in Jefferson County maintained status quo or achieved a lower CRS rating, suggesting progress in the floodplain management and flood mitigation efforts.

A “repetitive loss” property is one that has received two or more flood insurance claim payments for at least \$1,000 each in any 10-year period since 1978. According to NFIP data provided by the Colorado Water Conservation Board and data provided by the City of Lakewood, there were 26 repetitive loss claims in Jefferson County at the time of this plan’s development. 17 claims were associated with the City of Lakewood and 7 claims were associated with unincorporated areas of the County⁹.

Future Development

Jefferson County’s continued population, housing, and employment growth creates pressure for land use change and the supporting infrastructure improvements. Floodplain management practices implemented through local floodplain management ordinances should mitigate the flood risk to new development in floodplains. Urbanization and increasing impervious surface areas tend to increase both the rate and the volume of stormwater runoff. Thus, the largest issue with future development trends is urbanization and stormwater drainage issues that add to the peak discharge and volume of floodwaters in floodplains.

Hail – High Hazard Significance

Existing Development

Research into the damages inflicted by this hazard indicates the hazard has a high impact on the entire planning area, and perhaps the greatest economic impacts. Hail impacts anything exposed to the event, including structures, infrastructure, landscaping, personal property and vehicles,

⁹ 2 Two repetitive losses were associated with the City of Westminster, which did not participate as a stakeholder in the development of this plan.

people, agriculture, and livestock. Jefferson County has the highest number of reported injuries due to hail in the state. Hail is also the most costly insured-losses natural disaster to impact the state of Colorado, with nine separate incidents falling within the ‘top ten disasters’ list for the state. Existing development remains exposed to hail with minimal mitigation opportunities. Individuals can mitigate exposure by remaining indoors and away from windows during hailstorm events. Vehicles can be parked under shelters to help minimize damage costs incurred in that arena. However, in many cases it is impossible to move existing development away from the impact areas. For example, hail heavily impacts the economic contributors who house merchandize outdoors, such as car retailers, home improvement stores and gardening stores. Damage to landscape and agriculture is also almost impossible to prevent, as the plants cannot be transported indoors for the storm.

Methodology

Past damages were analyzed to estimate the potential for future hailstorm losses. Nine of the ten costliest disasters in Colorado history are attributed to hail.

The Rocky Mountain Insurance Information Association (RMIIA) provided extensive insurance-based damages and losses for hailstorms in Colorado, which were helpful in establishing the severity of losses. However, storm damages are not typically tracked by specific area (example: Jefferson County or the Southwest Metro Area) or by variations or by damage type (hail damage separated from wind damage separated from lightning damages) unless the damage type is explicitly unique and quantifiable in a large dollar amount. As such, the plan relies on documentation about a given event to further interpret the RMIIA data for planning area-specific information. Thus it is difficult to calculate an average annual loss for Jefferson County alone.

The ten costliest hailstorms in Colorado total \$4.5 billion dollars in damages (inflation adjusted amount) since 1984. If these were evenly distributed over the time period, that equates to \$150 million dollars per year in damages to Colorado in insured losses alone.

According to the National Oceanic and Atmospheric Administration, in Jefferson County there have been 315 hailstorm events since 1960, 11 of which have caused property damage and 6 of which caused damages over \$500,000.

The effect of wind, combined with lightning, rain and hail, on power delivery is a significant factor when assessing current development exposure. Xcel Energy provided data for the number customers within their service area who experienced impacted power supply caused by these hazards. As with extreme temperatures, Xcel estimates that outages cost the utility approximately \$50,000 per 20,000 people affected.

In a typical year (based on historic Xcel data from 2006-2009) utility customers in Jefferson County experience 3 days of service interruption per year impacting (on average) 17,244 people per outage. FEMA Standard Values for Loss of Service for Utilities, located in Appendix C of the

FEMA BCA Reference Guide, estimates that a power supply interruption costs the average person \$126 per day of service outage.

This equates to an average annual loss of \$6,518,232 based on power outages due to wind, hail and rain (3 average days of outage * 17,244 average number of people impacted by an outage * \$126 = \$6,518,232). Unfortunately this analysis cannot be refined to solely reflect any one hazard.

Future Development

Consideration for future development may include the use of resilient landscaping, construction of covered parking, or semi-sheltered structures to minimize these extensive losses. The availability of shelters in the many open spaces of Jefferson County may afford some protection to recreation populations. In some cases, the costs of future mitigation efforts, even in new future development, may outweigh the potential insurance losses.

Landslides, Debris Flows, Rockfall - Medium Hazard Significance

Existing Development

Research in the hazard profile for landslide, debris flow, and rockfall events revealed sporadic impacts, particularly in the canyons that dissect the region, most of which have County roads or State highways running through them, and repetitive debris flow issues in areas that have had recent wildfire burns. Future property losses to existing developments would likely be minor, based on patterns of previous events, and impact mostly infrastructure. Rockfall impacts on Jefferson County foothill highways and County roads have the potential to cause significant indirect economic loss, in addition to the potential for serious injury or death. The most significant road that could be impacted by rockfall and related road closures is Highway 6 in Jefferson County in Clear Creek Canyon. Economic losses from this road closure and resulting detours could be estimated with traffic counts and detour mileage.

Methodology

GIS was used to create a risk assessment for geological hazards in Jefferson County. Landslide, rockfall, slope failure and subsidence hazard data was overlaid on Jefferson County parcel and assessors data¹⁰.

For the purposes of this analysis, GIS was used to create a centroid, or point representing the center of the parcel polygon. Geologic hazard data was then overlaid on the parcel centroids. For the purposes of this analysis, the hazard zone that intersected a parcel centroid was assigned the hazard

¹⁰ Assessor parcel data is developed and used for ad valorem tax assessment only. The Assessor's parcel maps are not accurate representations of the actual physical location of the parcels for any other purpose. The location of improvements on the parcels are not described in any way in the Assessor parcel data.

for the entire parcel. The model assumes that every parcel with a structure value greater than zero is improved in some way. Specifically, an improved parcel assumes there is a building.

These counts are listed in Table 4.30 (landslide) and Table 4.31 (slope failure). Critical facilities at risk to slope failure are listed in Table 4.32. The model did not identify any buildings at risk to rockfall hazards.

These tables show the value of developed parcels exposed to the hazard. Results are sorted by occupancy type and by jurisdiction to demonstrate how the hazard's risk varies across the planning area. Maps that display the parcels affected by these hazards can be referenced in the applicable jurisdictional annexes.

Table 4.30 Building Exposure to Landslides

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Unincorporated	Commercial	1	1	\$3,025,900	\$3,025,900	\$6,051,800
	Total	1	1	\$3,025,900	\$3,025,900	\$6,051,800

Source: Based on analysis of Jefferson County GIS and Assessor's Data

Table 4.31 Building Exposure to Slope Failure

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Golden	Exempt	3	5	\$41,292,700	\$41,292,700	\$82,585,400
	Residential	291	291	\$129,238,960	\$64,619,480	\$193,858,440
	Total	294	296	\$170,531,660	\$105,912,180	\$276,443,840
Lakewood	Exempt	2	1	\$1,136,100	\$1,136,100	\$2,272,200
	Residential	16	16	\$4,794,400	\$2,397,200	\$7,191,600
	Total	18	17	\$5,930,500	\$3,533,300	\$9,463,800
Morrison	Commercial	2	2	\$326,500	\$326,500	\$653,000
	Exempt	1	1	\$27,500	\$27,500	\$55,000
	Industrial	1	1	\$267,300	\$400,950	\$668,250
	Residential	4	4	\$375,400	\$187,700	\$563,100
	Total	8	8	\$996,700	\$942,650	\$1,939,350
Unincorporated	Commercial	2	0	\$5,722,278	\$5,722,278	\$11,444,556
	Exempt	1	0	\$10,200	\$10,200	\$20,400
	Industrial	1	0	\$431,200	\$646,800	\$1,078,000
	Residential	63	63	\$32,277,230	\$16,138,615	\$48,415,845
	Total	67	63	\$38,440,908	\$22,517,893	\$60,958,801
Grand Total		387	384	\$215,899,768	\$132,906,023	\$348,805,791

Source: Based on analysis of Jefferson County GIS and Assessor's Data

*The Assessor's Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values.

**The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values.

Table 4.32 Critical Facilities At-Risk to Slope Failure

Jurisdiction	Category	Facility Type	Facility Count
Golden	High Potential Loss Facilities	Government Facility	3
Total			3

Source: Jefferson County, HSIP Freedom and HAZUS databases

Future Development

Steep slope regulations limit problems from these hazards for future development, thus the exposure of infrastructure to these hazards is not anticipated to grow. As expansion of the gambling communities grows in nearby Gilpin County, the amount of traffic along the Clear Creek Canyon Highway 6 corridor will increase, and thus the amount of people exposed to danger from rockfall hazards may increase. While mitigation projects are in place to reduce dangers to drivers from falling rock along this corridor, more may be necessary in the future.

Lightning – Medium Hazard Significance

Existing Development

It is difficult to quantify where specific losses will occur due to the random nature of this hazard. Given the lightning statistics for Colorado and Jefferson County, the County remains at risk and is vulnerable to the effects of lightning. Persons recreating or working outdoors during the months of April through September will be most at risk to lightning strikes. It is difficult to quantify future deaths and injuries due to lightning, other than to note that future occurrences are likely without increased public education. Critical facilities and infrastructure will have the greatest consequences if damaged by a lightning strike. The greatest losses from lightning result from the secondary hazard of wildfire. The effect of wind, combined with lightning, rain and hail, on power delivery is a significant factor when assessing current development exposure. An analysis of this impact is described in the hail vulnerability section. Unfortunately we cannot refine the analysis to reflect potential economic losses from lightning triggered power outages alone.

According to NCDC data, the average significant lightning strike in Jefferson County occurs every 1.5 years. The strike most likely occurs in the summer, between 12 PM and 5 PM. Thirty-eight percent of damaging lightning strikes cause damage to either property or crops; damaging strikes in Jefferson County average \$143,700 in damage to property, and \$4,000 in damage to crops. Sixteen percent of damaging strikes caused injuries, and 6% of them caused fatalities.

Future Development

New critical facilities such as communications towers should be built with lightning protection measures. As the population continues to increase and the number of people exposed to the hazard increases, it is reasonable to assume that injuries and deaths will also increase proportionately. Construction of lightning shelters at outdoor venues and increased public awareness campaigns may help minimize increase effects of lightning on growing populations.

Severe Winter Storms – High Hazard Significance

Existing Development

All buildings in the planning area are exposed to winter storms at some level, as are all members of the population. The threat to public safety is typically the greatest concern when it comes to impacts of winter storms, but these storms also impact the local economy by disrupting transportation and commercial activities.

Winter storms are occasionally severe enough to overwhelm snow removal efforts, transportation, livestock management, and business and commercial activities. Travelers on highways in Jefferson County, particularly along remote stretches of road or on steeply graded passages can become stranded, requiring search and rescue assistance and shelter provisions. The County may experience high winds and drifting snow during winter storms that can occasionally isolate individuals and/or entire communities and lead to serious damage to property. Winter storms are also a direct contributor to extremely cold temperatures, which are profiled separately in this plan.

Research presented in Section 4 yielded significant impacts from this hazard in the past. Structural losses to buildings are possible and structural damage from winter storms in Colorado has resulted from severe snow loads on rooftops. Older buildings are more at risk, as are buildings with large flat rooftops; often found in public buildings, commercial structures, and schools. The commuting population, particularly those that commute to the Denver metropolitan area, is another demographic potentially at risk during winter storm events due to increased dangers in driving conditions and the potential for being stranded. Special needs populations such as long term care facilities, daycare centers, and hospitals may be more vulnerable to heavy snowfall that strands or isolates staff and residents, delays the delivery of critical supplies, or interrupts power and heat to the facilities. Mountain communities or individuals living the foothills of unincorporated Jefferson County may be isolated from services and emergency assistance for extended periods of time during and immediately after a severe winter storm event.

Xcel Energy provided data for the number customers within their service area who experienced loss of power supply caused by snow and ice. As with extreme temperatures and wind/hail, Xcel estimates that outages cost the utility approximately \$50,000 per 20,000 people affected.

In a typical year (based on historic Xcel data from 2006-2009) utility customers in Jefferson County experience 2 days of service interruption due to snow and ice per year impacting (on average) 48,809 people per outage. FEMA Standard Values for Loss of Service for Utilities, located in Appendix C of the FEMA BCA Reference Guide, estimates that a power supply interruption costs the average person \$126 per day of service outage.

This equates to an average annual loss of \$12,299,742 based on power outages due to snow and ice (2 average days of outage * 48,809 average number of people impacted by an outage * \$126 = \$12,299,742).

Future Development

Future residential or commercial buildings built to code should be able to withstand snow loads from severe winter storms. Population and commercial growth in the County will increase the potential for complications with traffic and commerce interruptions associated winter storms, as well as increased exposed populations vulnerable to the impacts of a severe winter storm such as power outages or delays in vital services. Future power outages or delays in power delivery to future developments may be mitigated by construction considerations such as buried power lines. Future development will also require future considerations for snow removal capacity including equipment, personnel, and logistical support. Adequate planning will help establish the cost-effective balance.

Public education efforts may help minimize the risks to future populations by increasing knowledge of appropriate mitigation behaviors, clothing, sheltering capacities, and decision making regarding snow totals, icy roads, driving conditions, and outdoor activities (all of which are contributors to decreased public safety during severe winter storms.) New establishments or increased populations who are particularly vulnerable to severe winter storms (such as those with health concerns or those who live in communities that may be isolated for extended periods of time due to the hazard) should be encouraged to maintain at least a 72-hour self-sufficiency as recommended by FEMA. Encouraging contingency planning for businesses may help alleviate future economic losses caused by such hazards while simultaneously limiting the population exposed to the hazards during commuting or commerce-driven activities.

Subsidence – Medium Hazard Significance

Existing Development

Existing development makes up almost all of the risk to subsidence in the planning area; the hazard rating for subsidence was elevated based on the existing development vulnerabilities and losses. The areas of subsidence vulnerability, as identified earlier in this chapter, make up a fairly limited area of the County and is largely undeveloped. However, there are areas of Golden, Arvada, Lakewood, and the unincorporated County that are already developed, which means there is exposure to the hazard. Once the land is developed, subsidence mitigation becomes extremely expensive. In addition, poor or inaccurate mapping of former mining efforts may lead to unknown areas of vulnerability which are only discovered after the land is developed, when pre-emptive techniques are unavailable. Vulnerable construction includes roads, homes, business, and landscaped recreational areas. Dangers include damage caused to structures or roads and the secondary impacts such as injuries to occupants or passers-by, the rapid development of deep holes under people or cars which results in injury, death and/or property damage, and the fiscal cost of the damages.

Methodology

GIS was used to create a risk assessment for geological hazards in Jefferson County. Subsidence hazard data was overlaid on Jefferson County parcel and assessor's data. For the purposes of this analysis, GIS was used to create a centroid, or point representing the center of the parcel polygon. Subsidence hazard data was then overlaid on the parcel centroids. If the parcel centroid intersects the hazard layer, the hazard is assigned for the entire parcel. The model assumes that every parcel with a structure value greater than zero is improved in some way. Specifically, an improved parcel assumes there is a building. The parcel, its improvement value and estimated content value are listed in Table 4.33.

Results are sorted by occupancy type and by jurisdiction to demonstrate how the hazard's risk varies for all property types across the planning area. According to this analysis, over \$444 million in structure value is to the hazard. It is difficult to estimate potential losses beyond this exposure analysis, however these values are included as a reference. The City of Golden has the greatest exposure to the hazard.

Table 4.33 Exposure of Improved Properties to Subsidence in Jefferson County

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Arvada	Agriculture	1	1	\$133,300	\$133,300	\$266,600
	Residential	407	422	\$130,235,160	\$65,117,580	\$195,352,740
	Total	408	423	\$130,368,460	\$65,250,880	\$195,619,340
Golden	Commercial	7	7	\$6,594,500	\$6,594,500	\$13,189,000
	Exempt	10	37	\$112,967,500	\$112,967,500	\$225,935,000
	Industrial	15	15	\$8,465,000	\$12,697,500	\$21,162,500
	Mixed Use	5	14	\$15,594,700	\$15,594,700	\$31,189,400
	Residential	325	332	\$119,742,430	\$59,871,215	\$179,613,645
	Total	362	405	\$263,364,130	\$207,725,415	\$471,089,545
Lakewood	Exempt	2	0	\$154,970	\$154,970	\$309,940
	Residential	30	30	\$14,582,090	\$7,291,045	\$21,873,135
	Total	32	30	\$14,737,060	\$7,446,015	\$22,183,075
Unincorporated	Agriculture	3	3	\$4,536,400	\$4,536,400	\$9,072,800
	Commercial	2	2	\$1,576,600	\$1,576,600	\$3,153,200
	Exempt	4	3	\$12,799,200	\$12,799,200	\$25,598,400
	Industrial	1	1	\$290,200	\$435,300	\$725,500
	Residential	73	73	\$17,003,790	\$8,501,895	\$25,505,685
	Total	83	82	\$36,206,190	\$27,849,395	\$64,055,585
Grand Total		885	940	\$444,675,840	\$308,271,705	\$752,947,545

Source: Jefferson County GIS

*The Assessor's Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values.

**The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values.

Table 4.34 displays the critical facilities at risk to subsidence in the planning area. As shown in the table, all are located in the City of Golden.

Table 4.34 Critical Facility Exposure to Subsidence

Jurisdiction	Category	Facility Type	Facility Count
Golden	High Potential Loss Facilities	College	1
		Government Facility	2
		Long Term Care Facility	1
		Total	4
	Transportation and Lifelines	Bridge	2
		Water Facility	1
		Total	3
		Grand Total	7

Source: Jefferson County, HSIP Freedom and HAZUS databases

Future Development

New development will largely fall outside of known subsidence-vulnerable areas due to building regulations adopted by the County. In addition, since areas of vulnerability are identified, new development can include subsidence-resistant construction and mitigation efforts during the initial construction phase. As noted in the hazard profile section there are areas of western Arvada, Lakewood and unincorporated areas along the highway 93 and 470 corridors that are experiencing growth pressures near potential subsidence hazard areas.

This is more cost effective than retroactive mitigation efforts and helps prevent damage from occurring. As such, vulnerability to this hazard is not anticipated to increase with new development, provided that land use planning and engineering practices are followed. Increased efforts to monitor mining operations, increased accuracy of mapping of former mining works, and emphasis on appropriate grading and ground compaction during development will help alleviate vulnerability for future development in unknown areas of risk. In many ways, the efforts of Jefferson County to pre-empt the subsidence hazard (along with the erosion and swelling soils hazards) is a best-practices example for successful mitigation efforts and projects.

Tornado – Medium Hazard Significance

Existing Development

Tornadoes are possible anywhere in the planning area. Generally, it is difficult to assign an area of the County at higher risk than others, as tornadoes have been reported in all topographic conditions represented in the planning area, even in the higher elevations. In addition, the random nature of tornadoes causes difficulty in quantifying losses further and hinders attempts to estimate impacts on critical facilities. In general, vulnerabilities to existing developments are determined by structure type. Therefore, critical infrastructures built from less-sturdy materials or without solid, attached foundations are more vulnerable to tornadoes. In addition, historic and cultural resources, due to age, construction, or location, may also be particularly vulnerable to the effects of a tornado.

According to the National Climactic Data Center (NCDC) Jefferson County has experienced 11 tornados since 1950. Of these storms, seven were F0, five were F1 and one was recorded as an F2 in June of 1981. The June '81 tornado caused approximately \$2.5M of damage (non-inflation adjusted). Because of the lack of tornado events in the County, estimating the damages due to a typical event is not possible. The effect of tornadic winds on power delivery is a relevant factor when assessing current development exposure. Xcel Energy provided data from one tornadic wind event in 2009 when 2 days of high winds interrupted power for 67,128 customers. This event is still in dispute as to the official 'tornado' designation, so losses may be also interpreted as a windstorm.

Xcel estimated it cost \$167,820 to repair the outage equating to a cost of roughly \$25,000 for every 10,000 customers impacted by high winds. FEMA Standard Values for Loss of Service for Utilities, located in Appendix C of the FEMA BCA Reference Guide, estimates that a power supply interruption costs the average person \$126 per day of service outage.

By this estimate, this event caused \$16,916,256 in economic impacts or \$8,458,128 per day of service interruption due to high winds. From this data alone it is evident that a tornado affecting anywhere in the urbanized Jefferson County area would have losses amounting to at least several million dollars.

Future Development

As the County continues to develop, the number of people and housing developments exposed to the hazard increases. Proper education on building techniques and the use of sturdy building materials, basements, attached foundations, and other structural techniques may minimize the property vulnerabilities. Public shelters at parks and open spaces may help reduce the impacts of tornadoes on the recreational populations exposed to storms.

Wildfire – High Hazard Significance

Existing Development

Wildfire has the potential to cause widespread damage and loss of life in Jefferson County. The significance of this hazard and the availability of digital hazard data in GIS drove the development of a detailed vulnerability assessment that is discussed in the following pages.

Methodology

The HMPC determined that the best representation of wildfire risk in Jefferson County is a combination of various wildfire risk layers. These layers include fire behavior modeling associated with the Jefferson County Community Wildfire Protection Plan, Community hazard risk ratings from the local CWPPs, and Colorado State Forest Service Colorado Wildfire Risk Assessment Portal (CO-WRAP) data. These are listed below:

County CWPP:

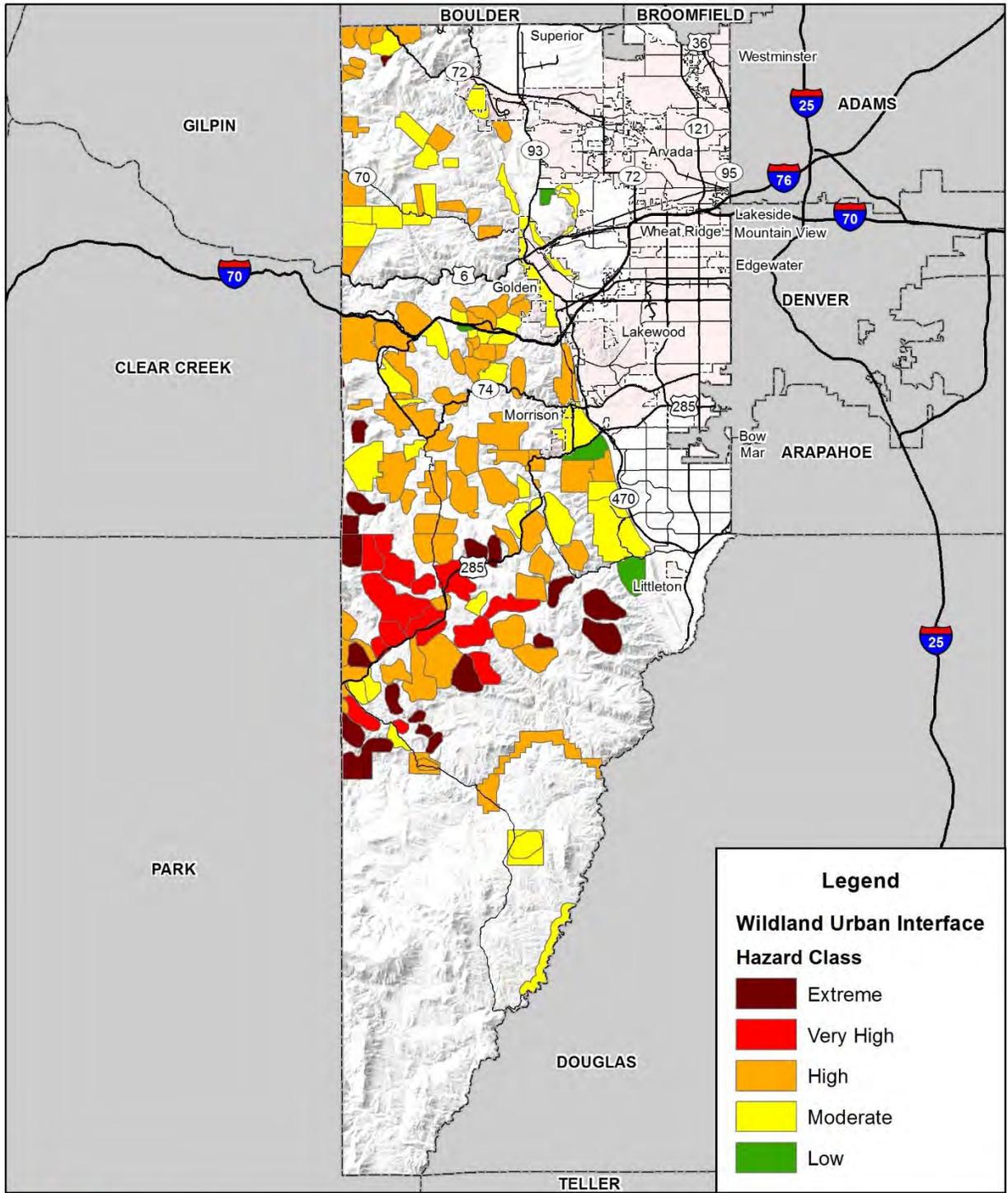
- Rate of Spread (90th percentile)
- Crown Fire Potential (90th percentile)
- Wildland Urban Interface community polygons and associated hazard ratings

CO-WRAP:

- Fire Intensity mapping
- WUI risk area mapping

These GIS layers indicate the extensiveness and nature of the wildfire hazard in the county and provided the basis for further loss analyses. Maps of this data are shown in Section 4.2 in the wildfire hazard profile. More detailed maps are shown in the jurisdictional annexes, including maps displaying the crown fire potential and WUI community boundaries. The Wildland Urban Interface community polygons were used to indicate where groups of structures define a ‘community’ in the WUI. These communities have hazard ratings assigned during the CWPP planning process, generally based on NFPA methodologies that evaluate hazard based on types of construction, fuels, topography, and community access/egress. For the WUI analysis in this section, hazard classifications for wildland-urban communities were referenced from the corresponding local CWPPs. In a few instances the hazard classification was modified during the County CWPP process, but based on discussion with the County Wildland Fire Coordinator the preference was to use the hazard classifications originally assigned (this included fire protection districts of: Elk Creek, Evergreen, Genesee and West Metro). These community boundaries and hazard classifications used in the analysis are shown in Figure 4.10. It should be noted that there are large areas within a wildfire hazard area but not a designated WUI community. These areas include portions of northern Jefferson County generally west of Highways 93 and C470, as well as all of southern Jefferson County and generally coincide with the County’s Wildfire Hazard Overlay District Zone. Development within these areas was assigned an ‘unrated’ hazard class.

Figure 4.10. Jefferson County WUI Communities and Hazard Classifications




 Map compiled 11/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 2011 Jefferson County CWPP

0 5 10 Miles



Jefferson County’s parcel and associated assessor’s data were used as the basis for the inventory of developed parcels.¹¹ Parcels and their attributes, including building and contents value and occupancy type (i.e. residential, commercial, industrial) were compiled and intersected with the WUI community polygons. GIS was used to create a centroid, or point, representing the center of each parcel polygon. For the purposes of this analysis, if a parcel’s centroid intersected the wildfire hazard data, the entire parcel is considered to be within the WUI area. The following discussion present the results of the exposure analysis in detail.

Results were sorted by occupancy type, and then organized by urban jurisdiction (Table 4.35) and fire protection district (Table 4.36). These tables display the value of structures at risk and an estimated contents value (a percentage of 50% of the structure’s value was applied).

According to this analysis, there are a total of 1,505 improved parcels in the wildland-urban interface area within the jurisdictions of Arvada, Golden and Morrison. Estimated total value (structure plus estimated contents) for these jurisdictions is \$903.3 million dollars with the City of Golden having the highest total exposure.

Table 4.35 Wildland Urban Interface Vulnerability by Municipality

Jurisdiction	WUI Name	Hazard Class	Improved Parcels	Improved Value	Content Value	Total Value
Arvada	Blue Mountain	Moderate	8	\$3,769,690	\$1,884,845	\$5,654,535
	Total		8	\$3,769,690	\$1,884,845	\$5,654,535
Golden	North & Southwest Assessment Area	Moderate	1,351	\$564,461,620	\$282,230,810	\$846,692,430
	Total		1,351	\$564,461,620	\$282,230,810	\$846,692,430
Morrison	Morrison	Moderate	145	\$33,836,250	\$16,918,125	\$50,754,375
	Red Rocks	High	1	\$137,700	\$68,850	\$206,550
	Total		146	\$33,973,950	\$16,986,975	\$50,960,925
Grand Total			1,505	\$602,205,260	\$301,102,630	\$903,307,890

Source: Amec Foster Wheeler Analysis with Jefferson County data

¹¹ Assessor parcel data is developed and used for ad valorem tax assessment only. The Assessor's parcel maps are not accurate representations of the actual physical location of the parcels for any other purpose. The locations of improvements on the parcels are not described in any way in the Assessor parcel data.

Fire protection districts were used as the unit of analysis for the communities in the unincorporated and less densely populated areas of the county. Based on this analysis, there are a total of 27,574 improved parcels within the wildland-urban interface area, with a total value (structure plus estimated contents) of \$14.6 billion. It is apparent that Evergreen, Elk Creek, and West Metro fire protection districts have the greatest potential for wildfire loss. See Table 4.36.

There are a total of 1,591 improved parcels located in WUI communities rated 'Extreme' for a total value (structure plus estimated contents) of \$583.1 million dollars. There are a total of 15,277 improved parcels located in WUI communities rated 'high' or 'very high' with a total value (structure plus estimated contents) of \$2.1 billion dollars.

Based on observations in wildland-urban interface fires, structures and contents are often completely destroyed, thus the estimated total value also represents potential dollar losses. Land value can decline following a large wildfire. This reduction in property value results in lower property taxes collected, and can significantly impact the County's tax revenue.

It should be noted that many of the historic and cultural resources mentioned in Table 4.7 are located in wildfire hazard areas.

Finally, a wildfire is not likely to burn all the wildland-urban interface areas in Jefferson County at once, though it is possible as demonstrated by the massive footprint of the Hayman fire in 2002.

Table 4.36 Wildland Urban Interface Vulnerability by Fire Protection District

Fire Protection District	WUI Hazard Class	Improved Parcels	Improved Value	Content Value	Total Value
Coal Creek FPD*	Extreme	28	\$2,672,600	\$1,336,300	\$4,008,900
	Very High	0	\$0	\$0	\$0
	High	515	\$113,954,630	\$56,977,315	\$170,931,945
	Moderate	356	\$85,847,296	\$42,923,648	\$128,770,944
	Low	0	\$0	\$0	\$0
	n/a	106	\$24,506,691	\$12,253,346	\$36,760,037
	Total	1,005	\$226,981,217	\$113,490,609	\$340,471,826
Elk Creek FPD	Extreme	833	\$182,523,144	\$91,261,572	\$273,784,716
	Very High	2,841	\$802,645,597	\$401,322,799	\$1,203,968,396
	High	1,256	\$385,653,701	\$192,826,851	\$578,480,552
	Moderate	134	\$48,276,460	\$24,138,230	\$72,414,690
	Low	0	\$0	\$0	\$0
	n/a	230	\$114,596,326	\$57,298,163	\$171,894,489
	Total	5,294	\$1,533,695,228	\$766,847,614	\$2,300,542,842
Evergreen FPD	Extreme	557	\$152,984,240	\$76,492,120	\$229,476,360
	Very High	0	\$0	\$0	\$0
	High	5,970	\$1,931,746,161	\$965,873,081	\$2,897,619,242
	Moderate	1,512	\$524,750,865	\$262,375,433	\$787,126,298
	Low	0	\$0	\$0	\$0
	n/a	812	\$410,374,338	\$205,187,169	\$615,561,507
	Total	8,851	\$3,019,855,604	\$1,509,927,802	\$4,529,783,406
Fairmount FPD	Extreme	0	\$0	\$0	\$0
	Very High	0	\$0	\$0	\$0
	High	13	\$4,983,200	\$2,491,600	\$7,474,800
	Moderate	30	\$18,731,013	\$9,365,507	\$28,096,520
	Low	0	\$0	\$0	\$0
	n/a	33	\$25,179,768	\$12,589,884	\$37,769,652
	Total	76	\$48,893,981	\$24,446,991	\$73,340,972
Foothills FPD	Extreme	0	\$0	\$0	\$0
	Very High	0	\$0	\$0	\$0
	High	1,316	\$517,496,831	\$258,748,416	\$776,245,247
	Moderate	392	\$191,463,851	\$95,731,926	\$287,195,777
	Low	0	\$0	\$0	\$0
	n/a	99	\$42,302,702	\$21,151,351	\$63,454,053
	Total	1,807	\$751,263,384	\$375,631,692	\$1,126,895,076

Fire Protection District	WUI Hazard Class	Improved Parcels	Improved Value	Content Value	Total Value
Genesee	Extreme	0	\$0	\$0	\$0
	Very High	0	\$0	\$0	\$0
	High	749	\$355,213,840	\$177,606,920	\$532,820,760
	Moderate	391	\$157,494,890	\$78,747,445	\$236,242,335
	Low	22	\$22,204,500	\$11,102,250	\$33,306,750
	n/a	9	\$8,571,500	\$4,285,750	\$12,857,250
	Total		1,171	\$543,484,730	\$271,742,365
Golden Gate FPD	Extreme	0	\$0	\$0	\$0
	Very High	0	\$0	\$0	\$0
	High	110	\$32,943,597	\$16,471,799	\$49,415,396
	Moderate	183	\$58,794,095	\$29,397,048	\$88,191,143
	Low	0	\$0	\$0	\$0
	n/a	84	\$25,755,077	\$12,877,539	\$38,632,616
	Total		377	\$117,492,769	\$58,746,385
Indian Hills FPD	Extreme	0	\$0	\$0	\$0
	Very High	0	\$0	\$0	\$0
	High	689	\$186,303,220	\$93,151,610	\$279,454,830
	Moderate	0	\$0	\$0	\$0
	Low	0	\$0	\$0	\$0
	n/a	21	\$43,731,462	\$21,865,731	\$65,597,193
	Total		710	\$230,034,682	\$115,017,341
Inter-Canyon FPD	Extreme	148	\$40,514,193	\$20,257,097	\$60,771,290
	Very High	2	\$532,800	\$266,400	\$799,200
	High	825	\$238,610,690	\$119,305,345	\$357,916,035
	Moderate	274	\$131,761,757	\$65,880,879	\$197,642,636
	Low	134	\$88,468,504	\$44,234,252	\$132,702,756
	n/a	483	\$131,432,368	\$65,716,184	\$197,148,552
	Total		1,866	\$631,320,312	\$315,660,156
North Fork FPD	Extreme	13	\$6,028,400	\$3,014,200	\$9,042,600
	Very High	0	\$0	\$0	\$0
	High	358	\$47,912,708	\$23,956,354	\$71,869,062
	Moderate	96	\$21,798,560	\$10,899,280	\$32,697,840
	Low	0	\$0	\$0	\$0
	n/a	85	\$35,815,647	\$17,907,824	\$53,723,471
	Total		552	\$111,555,315	\$55,777,658

Fire Protection District	WUI Hazard Class	Improved Parcels	Improved Value	Content Value	Total Value
West Metro FPD**	Extreme	0	\$0	\$0	\$0
	Very High	0	\$0	\$0	\$0
	High	626	\$280,598,064	\$140,299,032	\$420,897,096
	Moderate	2,243	\$932,424,622	\$466,212,311	\$1,398,636,933
	Low	404	\$178,963,803	\$89,481,902	\$268,445,705
	n/a	280	\$120,979,596	\$60,489,798	\$181,469,394
	Total	3,553	\$1,512,966,085	\$756,483,043	\$2,269,449,128
Unincorporated No Fire Protection District	Extreme	12	\$4,039,847	\$2,019,924	\$6,059,771
	Very High	0	\$0	\$0	\$0
	High	7	\$1,586,100	\$793,050	\$2,379,150
	Moderate	1,360	\$566,291,720	\$283,145,860	\$849,437,580
	Low	0	\$0	\$0	\$0
	n/a	933	\$413,853,710	\$206,926,855	\$620,780,565
	Total	2,312	\$985,771,377	\$492,885,689	\$1,478,657,066
Grand Total		27,574	\$9,713,314,684	\$4,856,657,342	\$14,569,972,026

Source: Amec Foster Wheeler analysis with Jefferson County Assessor and Jefferson County CWPP

* Includes 8 properties in Arvada City Limits

** Includes 146 properties in Morrison City Limits

To estimate the potential impact of wildfires on critical facilities a GIS overlay was performed to indicate those facilities that might be at risk and possible candidates for mitigation projects. Based on discussion with the County Wildland Fire Coordinator the crown fire potential GIS layer was used. Those facilities within an ‘active crown fire’ area are considered most at-risk. The results are shown in Table 4.37.

Table 4.37 Critical Facilities Located in Fire Hazard Zones

Jurisdiction	Category	Facility Type	Active Crown Fire	Passive Crown Fire	Surface Fire
Arvada	High Potential Loss Facilities	College	1	0	0
	High Potential Loss Facilities	HAZMAT	4	1	1
	Transportation and Lifelines	Bridge	9	4	8
	Transportation and Lifelines	Aircraft Facility	0	1	0
	Transportation and Lifelines	Communication	0	3	3
	Essential Facilities	Fire Station	0	2	0
	High Potential Loss Facilities	Government Facility	0	0	1
	High Potential Loss Facilities	Long Term Care Facility	0	0	2
	High Potential Loss Facilities	PK-12 School	0	0	1
	High Potential Loss Facilities	Day Care Center	0	0	3
	Total			14	11
Edgewater	High Potential Loss Facilities	Day Care Center	1	0	0
	Total		1	0	0
Golden	High Potential Loss Facilities	HAZMAT	1	0	1
	High Potential Loss Facilities	Powerplant	1	0	0
	High Potential Loss Facilities	Long Term Care Facility	0	0	1
	Transportation and Lifelines	Aircraft Facility	0	0	1
	High Potential Loss Facilities	Government Facility	0	0	1
	Transportation and Lifelines	Bridge	3	0	1
	Total			5	0
Lakewood	High Potential Loss Facilities	College	1	1	1
	High Potential Loss Facilities	Dam	3	1	1
	High Potential Loss Facilities	Day Care Center	1	1	4
	Essential Facilities	Fire Station	0	0	1
	Essential Facilities	Hospital	0	0	2
	Essential Facilities	Law Enforcement	0	0	1
	High Potential Loss Facilities	Private School	0	0	1
	High Potential Loss Facilities	HAZMAT	2	0	3
	Transportation and Lifelines	Aircraft Facility	1	0	0
	Transportation and Lifelines	Bridge	4	0	2
	Transportation and Lifelines	Communication	4	1	5
Total			16	4	21

Jurisdiction	Category	Facility Type	Active Crown Fire	Passive Crown Fire	Surface Fire
Morrison	High Potential Loss Facilities	Private School	0	0	1
	Transportation and Lifelines	Bridge	1	0	0
	Total		1	0	1
Wheat Ridge	High Potential Loss Facilities	HAZMAT	1	0	0
	High Potential Loss Facilities	Long Term Care Facility	0	0	1
	Transportation and Lifelines	Communication	0	1	1
	Transportation and Lifelines	Bridge	2	1	2
	Total		3	2	4
Unincorporated	High Potential Loss Facilities	Dam	6	0	0
	High Potential Loss Facilities	Government Facility	1	0	6
	Essential Facilities	Fire Station	0	0	4
	High Potential Loss Facilities	College	0	0	1
	High Potential Loss Facilities	Day Care Center	0	4	6
	High Potential Loss Facilities	HAZMAT	3	1	3
	High Potential Loss Facilities	Long Term Care Facility	2	1	3
	High Potential Loss Facilities	Private School	0	1	4
	High Potential Loss Facilities	PK-12 School	1	3	7
	High Potential Loss Facilities	Powerplant	1	0	1
	Transportation and Lifelines	Aircraft Facility	4	1	4
	Transportation and Lifelines	Bridge	9	16	13
	Transportation and Lifelines	Communication	52	25	44
	Transportation and Lifelines	Waste Water Facility	2	3	1
	Transportation and Lifelines	Natural Gas Facility	0	0	3
	Transportation and Lifelines	Oil Facility	0	0	1
	Transportation and Lifelines	Water Facility	1	0	0
	Total		82	55	101
	Grand Total		122	72	151

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, Jefferson County CWPP

Table 4.38 captures the population at risk to wildfire by jurisdiction. Population was estimated by applying the 2010-2013 American Community Survey 3-Year Estimate average household size by jurisdiction to the count of residential structures within the WUI hazard class zone.

Total population at risk (moderate or above WUI hazard class) within the wildland urban interface is 56,791. This represents 10% of the total County population.

Table 4.38 Population At-Risk to Wildfire

Jurisdiction	WUI Hazard Class				Totals
	Extreme	Very High	High	Moderate	
Arvada	0	0	0	18	18
Edgewater	0	0	0	0	0
Golden	0	0	0	2,966	2,966
Lakeside	0	0	0	0	0
Lakewood	0	0	0	0	0
Morrison	0	0	2	221	224
Mountain View	0	0	0	0	0
Wheat Ridge	0	0	0	0	0
Unincorporated	3,778	6,662	28,834	12,749	53,584
Total	3,778	6,662	28,836	15,954	56,791

Source: Amec Foster Wheeler based on data from the Jefferson County CWPP

This analysis provides a general overview of the amount of people and property exposed to the wildfire hazard in Jefferson County. It does not account for mitigation efforts that have been ongoing within the County to moderate the risk. More detail on specific vulnerabilities and fuels treatment priorities can be referenced in the local Community Wildfire Protection Plans.

Future Development

Growth in the wildland urban interface has been significant in the past twenty years in Jefferson County. While this growth has recently slowed, there still remains potential for development of primary and secondary residences in wildfire hazard areas in the unincorporated County. Wildfire risk to future development in these areas will be tempered by the County's land use regulations.

2014 was the lowest activity of the Mountain Pine Beetle (MPB) in Colorado since 1996. Only 15,000 acres were recorded as infested in the aerial forest survey, the majority of which were in Larimer County. While MPB is in the decline in general, the situation will need to be monitored closely. At least one community in Jefferson County has developed a MPB Action Plan (Genesee Foundation).

Windstorm – Medium Hazard Significance

Existing Development

Based on the hazard profile in Section 4.2, windstorms will continue to cause property damage annually in Jefferson County. Due to the random and widespread nature of the hazard it is difficult to estimate future losses and where they will occur. Communities in and along the base of the foothills are most susceptible to the hazard, but high winds can damage communities anywhere in the County. Highway 93 between Golden and Boulder is an area that is subject to severe cross winds that threatens motorists typically in the winter months. Periodic road closures help mitigate car and truck damage and injuries and deaths, but economic impacts and traffic jams resulting from detours remain.

Windstorms can cause injury and death in Jefferson County. The highest risk demographic is to first responders who are dealing with emergency situations resulting from the windstorm. Those working or recreating outdoors will be susceptible to injury from wind borne debris. Winds can also be hazardous to hikers in areas of beetle or fire killed trees, which occurred when a hiker was killed by a falling tree in Rocky Mountain National Park in 2007. The NCDC database records 2 deaths, 18 injuries, and \$25.5M in damages due to high wind since 1950 for the region defined as: Boulder and Jefferson Counties below 6,000 feet including Broomfield County. Other injuries can occur to occupants of buildings if windows are blown in, or to people outside who are injured by flying debris. Wind can also blow cars across lanes or off of roadways. High profile vehicles have been tipped over, leading to transportation-related accidents. Impacts to critical facilities are difficult to estimate, but buildings could be susceptible to roof and window damage, such as the losses experienced across Jefferson County in July of 2009, though those losses also included heavy hail damages.

The effect of high winds on power delivery is a relevant factor when assessing current development exposure. Xcel Energy provided data from one high wind event in 2009 when 2 days of high winds interrupted power for 67,128 customers.

Xcel estimated it cost \$167,820 to repair the outage equating to a cost of roughly \$25,000 for every 10,000 customers impacted by high winds. FEMA Standard Values for Loss of Service for Utilities, located in Appendix C of the FEMA BCA Reference Guide, estimates that a power supply interruption costs the average person \$126 per day of service outage. By this estimate, this event caused \$16,916,256 in economic impacts or \$8,458,128 per day of service interruption due to high winds.

Future Development

Construction sites are particularly vulnerable to windstorms. Wind-borne construction materials can become hazards to life and property. New construction designed in accordance with the Jefferson County wind load map should be able to withstand or at least resist wind damage if properly constructed. Backup power systems in critical facilities could help mitigate impacts from power outages associated with windstorms.

The ongoing development along State Highway 93 is in a region of the County that is very vulnerable to high winds. Construction sites, both residential and transportation related (the Jefferson Parkway, a multi-lane arterial planned to connect Highway 93 to Highway 36 through Arvada) could be at risk of wind borne construction materials.

4.3.5 Risk Summaries

The Risk Assessment revealed a number of problem areas to be addressed in the mitigation strategy. These key findings are summarized here, with a focus on the more significant hazards for each jurisdiction. The jurisdictional annexes include additional specifics related to risk from the identified hazards. Some of the hazards not listed do not result in significant impacts or are addressed in land use planning and zoning, or development regulations; these capabilities are discussed further in Section 4.4.

Jefferson County (All)

Dam Failure – Within Jefferson County limits, there are 27 high hazard and 14 significant hazard dams whose failure pose imminent risk to life and property. In addition, there are 17 high hazard and 10 significant hazard dams that are outside County limits, but whose failure would have downstream impacts within the County.

Flood – The northeastern and mainly urban part of the County is vulnerable to flooding, as was seen in the September, 2013 flood event. Jefferson was among the Counties declared a federal disaster area. The event caused millions of dollars of damage to private and public facilities and caused displacement in the Coal Creek Canyon watershed.

Hailstorm – Spring and summer hail can cause significant monetary damage in the urbanized parts of the County, particularly to vehicles parked in exposed areas such as parking lots and public right of way. Hailstorms can have rapid onset, which can strand individuals in vulnerable places.

Severe Winter Storms – Severe winter storms, particularly those that include heavy snowfall and high winds, can cause dangerous travel conditions and even closures of roads and facilities. This can delay emergency response and leave some mountain communities isolated from receiving supplies and/or emergency services. The March 2003 regional storm caused closure of roadways and caused approximately \$108M in damage.

Wildfire – Most of the unincorporated parts of western Jefferson County are vulnerable to wildfire with a high potential for property damage and loss of life due to development in the wildland urban interface. The likeliness of a wildfire incident in the County on any given year is nearly 100%.

To date, the Hayman Fire (2002) is still the most destructive event on record burning 138,000 acres in the Pike National Forest.

Landslides/Debris Flows/Rockfalls – These hazards have occasionally caused damage to road infrastructure in the county and created a hazard for motorists, particularly in Clear Creek Canyon (rockfall).

City of Arvada

Flood – The numerous creeks and tributaries in the City of Arvada put it at higher risk of displaced population and flood losses than most of the rest of the county. Ralston Creek, in particular, poses a threat to the residential areas south of 72nd avenue.

Wind – The rapidly developing western part of the City is prone to high winds. The area east of Highway 93 and west of Indiana Street is exposed to wind gusts that come off the foothills, and there is little in the way of vegetation or other barriers to moderate the potentially damaging and disruptive winds.

City of Edgewater

Flood – The Walker Branch Park near the southern boundary of Edgewater functions as a water detention facility, and is connected to Sloan’s Lake via a network of ditches and greenways to channel water away from the neighborhood. In a 1% annual chance flood, the homes, businesses and facilities adjacent to the greenway are at risk. There is a low-lying residential area in the northeastern part of the community that is also at risk in a 1% annual chance flood.

City of Golden

Flood – Clear Creek and its numerous tributaries that flow through downtown Golden can cause economic losses and displaced populations in a flood event. There are 10 critical facilities at risk to flooding.

Severe Winter Storms - Severe winter storms, particularly those that include heavy snowfall, can cause dangerous travel conditions and even closures of roads and facilities. This can delay emergency response and leave Golden isolated from receiving supplies and/or emergency services.

Wildfire – The municipal area of Golden west of 6th Avenue is at wildfire risk. While this part of the City is not as densely populated as the downtown area, the subdivisions of Canyon Point, Trip Ranch and Beverly Heights fall within the wildfire zone.

Wind – Because of its location at the base of the foothills, the City of Golden is susceptible to impacts from high winds.

Dam Failure – Dam failure in the Clear Creek watershed upstream of the City of Golden poses a risk to the recreational and commercial areas adjacent to the creek including numerous parks, the Golden Library, the Police Department and the Coors Brewing facility.

City of Lakewood

Flood – Flooding is Lakewood’s primary hazard concern. Lakewood is the only jurisdiction in the county to experience repetitive loss claims (17) after flooding, including one severe repetitive loss.

City of Wheat Ridge

Dam Failure – Maple Grove Dam, part of the Clear Creek watershed in northwestern Lakewood, is classified as a high hazard facility, which can cause extensive flooding in the Lena Gulch floodplain in Wheat Ridge if breached.

Flood – The Clear Creek and Lena Gulch floodplains bisect the City of Wheat Ridge from east to west. 1% annual chance floods can cause economic losses and evacuations of the residential areas in and around the floodplain.

Wind – The topography and location of Wheat Ridge at the base of the foothills make it vulnerable to high winds. Wind events can be especially damaging when coupled with another storm type, like in the July 2009 hail/wind storm when 80 MPH (mile per hour) winds propelled nickel to golf ball size hailstones to damaging velocities. Mature trees in the city are also prone to wind and winter storm damage, with cascading property and infrastructure impacts.

Town of Lakeside

Tornado – Given the low number of structures (both residential and commercial) in the Town of Lakeside, a direct hit from an EF3 or stronger tornado could potentially destroy the entire town or severely damage the town's limited commercial economic base.

Hailstorm – Rapid onset hailstorms, like the one at Elitch Gardens in 1990, could strand and injure visitors on the rides at Lakeside Amusement Park.

Town of Morrison

Flood – The Bear and Mt. Vernon Creeks run directly through downtown Morrison, putting most of the commercial and retail structures of the Town at risk of flooding.

Severe Winter Storms - Severe winter storms, particularly those that include heavy snowfall, can cause dangerous travel conditions and even closures of roads and facilities. This can delay emergency response and leave Morrison isolated from receiving supplies and/or emergency services.

Dam Failure – Failure of the Morrison Raw Water Dam (Operations Reservoir) or of the upstream Evergreen Lake Dam (Bear Creek) could cause inundation through the Morrison floodplain, which constitutes most of the commercial area of the Town.

Town of Mountain View

Flood/Storm Water Runoff – The street pattern of the neighborhood south of 41st Avenue does not align with the street pattern of Mountain View. This causes occasional pooling and buildup of storm water as the curb and gutter systems were not designed to function together.

Denver Water

Dam Failure – Denver Water owns and operates a number of dams and reservoirs as part of its facility infrastructure. Failure of any of these dams could cause loss of life, a drop in water quality, service outages and/or damage to roads/bridges and homes.

Erosion and Sedimentation due to Wildfire – Wildfires have can have secondary impacts beyond the initial damage and destruction of buildings and infrastructure. Hills barren of trees and other vegetation are more prone to erosion, which can cause sedimentation flows into reservoirs that are collected by Denver Water for treatment and human usages.

Pleasant View Metropolitan District

Flood – Lena Gulch runs directly through the metropolitan district, posing a flood risk to the residential structures in the floodplain. Heavy rains in the drainage above the District (in the southern part of the City of Golden) could cause downstream flooding.

Lookout Mountain Water District

Drought – A multi-year drought could impact the District’s ability to provide water in the service area, as storage capacity in the District’s reservoirs along Beaver Brook is limited.

Wildfire – Wildfire in and around the District can cause erosion and sedimentation, which would adversely impact source water quality.

Dam Failure – The Lookout Mountain dam is above Golden. The water held by the dam is released by the District for water rights purposes. Normally there is less than 80AF (acre-feet) of water stored in the reservoir. There are no structures below the dam until after the water flows beyond Highway US 6, which is significantly below the dam.

Jefferson Conservation District

Erosion and Sedimentation – The Conservation District was initially set up to stabilize agricultural soils that were eroding due to the dustbowl drought of the 1930s. While approaches and tactics have changed since then, the District’s primary purpose is still to prevent erosion of soils through wildfire prevention and watershed management.

Wildfire – Wildfire in the District can cause erosion and sedimentation in addition to property losses and public safety concerns.

All Fire Protection Districts

Wildfire – Golden Gate, Evergreen, Indian Hills, North Fork, Fairmount and West Metro FPDs are primarily focused on mitigating, fighting and preventing wildfire within the communities in Jefferson County. Historically, the southern part of the County has been most impacted by wildfire, however a large-scale wildfire could theoretically happen anywhere in the unincorporated and wildland-urban interface areas of the County.

4.4 Capabilities Assessment

Thus far, the planning process has identified the natural hazards posing a threat to Jefferson County and described, in general, the vulnerability of the County to these risks. The next step is to assess what loss prevention mechanisms are already in place. This part of the planning process is the mitigation capability assessment. Combining the risk assessment with the mitigation capability assessment results in the County's "net vulnerability" to disasters, and more accurately focuses the goals, objectives, and proposed actions of this plan.

The HMPC used a two-step approach to conduct this assessment for the County. First, an inventory of common mitigation activities was made through the use of a matrix. The purpose of this effort was to identify policies and programs that were either in place, needed improvement, or could be undertaken if deemed appropriate. Second, the HMPC conducted an inventory and review of existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses or if they inadvertently contributed to increasing such losses.

This section presents Jefferson County's mitigation capabilities and discusses select state and federal mitigation capabilities that are applicable to Jefferson County. Information about capabilities specific to the other participating jurisdictions can be found in the annexes to this plan.

Similar to the HMPC's effort to describe hazards, risks, and vulnerabilities of Jefferson County, this mitigation capability assessment describes the County's existing capabilities, programs, and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This assessment is divided into four sections: regulatory mitigation capabilities; administrative and technical mitigation capabilities; fiscal mitigation capabilities; and mitigation outreach and partnerships.

4.4.1 Jefferson County Regulatory Mitigation Capabilities

Table 4.1 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Jefferson County. Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities.

Table 4.1 Jefferson County Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General or Comprehensive plan	Y	JeffCo Comprehensive Plan 2013
Zoning ordinance	Y	Passed March 3, 2015 (http://jeffco.us/planning-and-zoning/regulations/zoning-resolution/)
Subdivision ordinance	Y	Section 6 to 8 of the Jefferson County Land Development Regulation passed December 9, 2014 (http://jeffco.us/planning-and-zoning/regulations/land-development-regulation/)
Growth management ordinance	Y	2014 Land Development Regulation
Floodplain ordinance	Y	Section 30 of the Jefferson County Zoning Resolution: Floodplain Overlay District
Other special purpose ordinance (stormwater, steep slope, wildfire)	Y	Jefferson County Zoning Resolution
Building code	Y	County Building Code
Fire department ISO rating	Y	Varies – See Annexes
Erosion or sediment control program	Y	2014 Land Development Regulation
Storm water management program	Y	Section 19 of Land Development Regulation
Site plan review requirements	Y	Sections 3 to 8 of Land Development Regulation and Development Review section of Comp. Plan
Capital improvements plan	Y	Section 23 of Land Development Regulation
Economic development plan	N	
Local emergency operations plan	Y	2007 EOP, County Fire Plan, Dams, Airport Plan, I-70 Evacuation Plan, 2008 Debris Plan, ADP
Other special plans	Y	Area (Community) Plans, Mineral Extraction Plan, Open Space Plan, Telecom Plan
Flood insurance study or other engineering study for streams	Y	FIS Updated February 5, 2014
Elevation certificates (for floodplain development)	Y	Elevation Certificates at: http://jeffco.us/planning-and-zoning/floodplains/elevation-certificates/
BCEGS Ratings (1-10, 1 being best)	Y	Personal (1 and 2 family dwellings) 4 Commercial (all other buildings) 3 2010
Other		

Source: Jefferson County

Jefferson County Comprehensive Land Use Plan

The Jefferson County Comprehensive Land Use Plan has been integrated into the Jefferson County Comprehensive Plan under the Development Review section (Page 30). The Land Use chapter of the Development Review section includes: general provisions, guidelines on infill and redevelopment, guidelines for business and industry, residential structures, mixed use buildings, community uses, public utilities, schools, agricultural uses, renewable energy, extractive activities, waste and hazardous materials, activity centers and site planning/design. Each section includes a

series of goals with corresponding actions/policies to accomplish the stated goals for that section of the chapter.

The overall vision projects a sustainable balance and use of residential, commercial, community, and recreational lands. This balance protects and maintains the quality of the mountain and plains environment, provides economic vitality for current and future generations, and maintains Jefferson County as a place of choice to live, work, and recreate. The plan identifies that location, availability and the convenience of goods and services is an important element in the quality of life, and that a balance of such key services as an educated workforce, schools, commercial services, and recreational and employment opportunities are vital. Well-planned retail and service levels provide a source of community identity. The roads, rivers, and trails that connect homes, offices, stores, schools, and parks are the conduits for social interaction that knit together a community. Ensuring that residential areas are balanced by commercial and service centers can contribute to an orderly pattern of development and sense of place.

The general land use management goal is to encourage diversity of residential, commercial, community, recreational, and open land uses. The plan identifies Urban and Non-Urban Interface development with an objective to accommodate higher intensity uses in areas with adequate infrastructure and minimal hazards, and provide decreasing land use intensity where constraints exist and as distance to services increases. There are policies that protect important wildlife habitats and avoid development or mitigate impacts in severe wildfire areas, such as steep forested canyons and slopes greater than 30%. The plan includes provisions for infill and redevelopment, which supports adaptive reuse of historical and outdated buildings; and future growth, which complements the existing community character with efforts to accommodate anticipated growth in the Denver metro area over the next 30 years. The policy states that the County should incorporate land planning techniques that manage resources effectively.

Building Codes

The Jefferson County Building Department enforces building codes in Jefferson County. Listed below are the codes effective September, 2015.

International Codes:

- 2015 International Building Code
- 2015 International Residential Code
- 2015 International Fuel Gas Code
- 2015 International Mechanical Code
- 2015 International Plumbing Code
- 2015 International Existing Building Code
- 2009 International Energy Conservation Code
- 2014 National Electrical Code

In addition, the Jefferson County Board of County Commissioners adopted and promulgated deletions and additions to the 2015 International Residential Code and the 2015 International

Building Code. This Code shall apply to the unincorporated area of Jefferson County. These plans can be accessed at <http://jeffco.us/building-safety/adopted-building-codes/codes-effective-2016/>

Local fire districts have individual authority to enforce fire code standards beyond the County’s requirements.

Highlights of 2015 Residential and International Building Code Supplement include:

Climactic and Geographic Design Criteria

Add the following sentence: Manufactured housing including HUD homes shall meet the wind and snow load requirements of table R301.2(1).

Table 4.2 – Climactic and Geographic Design Criteria R301.2(1)

Ground and Roof Snow Load	Wind Design		Seismic Design Category	Subject to Damage from			Winter Design Temp.
	Speed	Topographic Effects		Weathering	Frost Line Depth	Termite	
Varies – See Table R301.2.3	100MPH	Yes	‘B’	Severe	36”	Slight to Moderate	1’F
Ice Barrier Underlayment Required	Flood Hazard	Air Freezing	Mean Annual Temp				
Yes	Varies	532	50.5’F				

Wildfire – Building Codes

Jefferson County has 2 wildfire hazard overlay zones which have mitigation requirements for construction. The wildfire hazard overlay zones line generally follow what is called the “mountain front.” The State Forest Service concurs that this line indicates the predominant change from plain to mountain topography. The canyons are within wildfire zone 1 because of the chimney-effect of the terrain. The location of the wildfire zone line recognizes vegetation, slope, fire department accessibility, water supply, response time and infrastructure.

R901.1.1.1 Buildings located in more than one Wildfire Zone. A building or structure which is located partly in one Wildfire Zone and partly in another shall be considered to be in the Wildfire Zone in which more than one-half of its total floor area is located.

R901.1.1.2 Moved buildings. Any building or structure moved within or into any Wildfire Zone shall be made to comply with all the requirements for new buildings in that Wildfire Zone.

R901.1.2.1 General. Buildings hereafter erected, constructed, enlarged, altered, repaired or moved into Wildfire Zone 1 shall comply with the following: 2015 IRC Supplement Jefferson County, Colorado Page 20 of 35

R901.1.3.1 General. Buildings hereafter erected, constructed, enlarged, altered, repaired or moved into Wildfire Zone 2 shall comply with the following:

R901.1.3.2 Roof coverings, material Zone 2. Except where this code requires greater protection, roof coverings for new buildings, structures or additions, roof coverings utilized for re-roofing shall be Class A, Class B or Class C, or any other roof covering permitted by this code.

R905.2.8.3 Sidewall Flashing. The first sentence in this Section shall be amended by deleting the words “continuous or” (Step flashing shall be required, continuous flashing shall be prohibited.)

Add the following Section:

R908.1.2 Re-roofing. Any roof repair of more than 2 squares requires a permit.

R908.3.1.1 Recovery versus replacement. Add Item: Item 4. Where the existing roof covering is asphalt shingles.

Wildfire – Community Wildfire Protection Plans (CWPPs)

In addition to the building codes and wildfire zones, the County has a number of Community Wildfire Protection Plans (CWPPs) that assess wildfire risk and provide specific recommendations for mitigation based on scientifically sound wildfire management principles. In general, these plans are consistent with the National Fire Plan (2000) and the Healthy Forests Restoration Act (2003) both of which are federal level frameworks for wildfire hazard evaluation and strategic planning.

The following jurisdictions and communities in Jefferson County have CWPPs in place:

- Jefferson County CWPP, ALL (2012)
- City of Golden CWPP (2007)
- Coal Creek Canyon Fire Protection District CWPP (2008)
- Elk Creek Fire Protection District CWPP (2005)
- Evergreen Fire Protection District CWPP (2007)
- Fairmount Fire Protection District CWPP (2007)
- Foothills Fire Protection District CWPP (2008)
- Genesee Fire Protection District CWPP (2008)

- Golden Gate Fire Protection District CWPP (2011)
- Indian Hills Fire Protection District CWPP (2007)
- Inter-Canyon Fire Protection District CWPP (2007)
- Lower North Fork CWPP (2007)
- North Fork Fire Protection District CWPP (2011)
- South Platte CWPP (2007)
- West Metro Fire Protection District CWPP (2006)

Slash Collection Program

Slash is debris, from nature, such as tree limbs, prunings and pine needles. If not removed, slash can add to potential fire hazards. Wildfires have become more common in Jefferson County and clearing this debris can prevent fire damage to structures and spread of wildfire. In 2015, the County expanded its slash collection program which helps homeowners to mitigate fire risk by collecting and removing loads of slash at predetermined collection sites around the County. The cost to drop off a single truck load is \$20 (2015) and is used to partially cover the administrative costs of the program. Locations and dates of collection sites are updated and posted at: www.jeffco.us/slash

Foundations and Soils Investigation

The Designated Dipping Bedrock Area is determined by the Planning and Zoning Department. The building codes identify specific pier length, as well as diameter and support penetration for building in dipping bedrock areas. The codes also identify specifications for foundation walls and structural basement floors

Flood Loads

Planning and Zoning Department approval required pursuant to other County regulations.

Floodplain Management

In accordance with the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973, Jefferson County has applied and subsequently qualified for participation in the National Flood Insurance Program. Jefferson County joined the NFIP on August 5, 1986 and the Community Rating System (CRS) on October 1, 2005.

Since 2010, the County has made significant progress in implementing flood capabilities, which is reflected in the updated Community Rating System (CRS) classification. Unincorporated Jefferson County went from CRS 9 to 6 in 2014, a 3 class increase which results in a 20% discount (previously 5%) for flood insurance policies in SFHA, and 10% premium reduction (previously 5%) for non SFHA policies.

The County requires developments that impact floodplains to comply with the floodplain regulations of the Zoning Resolution and Regulation. Although in many circumstances it may be desirable to leave the floodplain in its natural state, it is evident that development in areas

encumbered by floodplains often results in alterations within the floodplain limits. The County has adopted floodplain regulations as part of its Zoning Resolution and Regulation. These regulations should be referenced when alterations within floodplains are proposed.

Stormwater Management

Jefferson County is responsible for the stormwater quality that drains from property into the storm sewer system and discharges to state waters. As part of the Stormwater Phase II Regulations, Jefferson County was applies to the State of Colorado Department of Public Health and Environment for a Municipal Separate Storm Sewer System (MS4) Permit. The five-year permit was first granted to Jefferson County in March 2003. Under this permit Jefferson County is mandated to improve the quality of stormwater.

Jefferson County has created stormwater management regulations. These regulations together with all future amendments are known as the “Jefferson County Storm Drainage Design and Technical Criteria” adopted March 24th 2009 and referenced in the Jefferson County Land Development Regulation. The criteria apply to all lands within the unincorporated areas of the County, including all public lands. Policies and technical criteria not specifically addressed in these criteria will follow the provisions of the Urban Drainage and Flood Control District “Urban Storm Drainage Criteria Manual.”

Stormwater runoff is a by-product of urbanization. Drainage planning is required for all new developments. These plans define major drainage facilities, including those that are required public improvements for new developments. Drainage reports and plans, construction drawings, specifications, and as-built information will be submitted and approved as required by the Regulation and Building Permit Procedure. AutoCAD example drawings are available from the County at:

<http://jeffco.us/planning-and-zoning/regulations/storm-drainage-design-and-technical-criteria/>

Design Storm - For drainage basins less than five square miles, a two-hour storm distribution without area adjustment of the point rainfall values will be used for the Colorado Urban Hydrograph Profile. For drainage basins between five and ten square miles, a two-hour storm distribution is used but the incremental rainfall values are adjusted for the large basin area in accordance with suggested procedures in the NOAA Atlas for Colorado.

Wildfire Hazard Overlay District Zoning Resolution – Section 32 of Jefferson County Zoning Resolution (2002)

This district is intended to: promote the public health, safety, and welfare of the citizens of Jefferson County; minimize the risk of loss of life and property in Wildfire Hazard Overlay Zone District; encourage and regulate prudent land use in the Wildfire Hazard Overlay Zone District so as not to increase the danger to the public health, safety, and property; reduce the demands for public expenditures for relief and protection of structures and facilities permitted in the Wildfire

Hazard Overlay Zone District; and regulate buildings and structures so as to minimize the hazard to public health, safety, welfare, and to public or private property.

No building permit may be issued for a new dwelling, the replacement of an existing dwelling, or for additional space of 400 square feet or more (cumulatively measured) from May 21, 2002, the date of this regulation's adoption, until written evidence has been submitted and approved by the Zoning Administrator or his/her appointed designee stating that the following have been satisfied:

- Defensible space and associated fuel break thinnings have been created around the dwelling, or a wildfire mitigation site plan has been reviewed and a special exception granted by the Board of Adjustment for the property for which a building permit has been requested.
- Access standards as specified in the General Provisions and Regulations section of the Zoning Resolution have been satisfied.

Grading, Erosion, and Sediment Control Regulation – Section 17 of the Jefferson County Land Development Regulation

Grading, erosion, and sediment control plans shall be submitted as required by the Submittal Requirements Section in accordance with the following standards.

- The existing and final contours shall be shown at 2-foot intervals for subdivisions within the plains area and contours at 5-foot intervals for subdivisions within the mountain areas including the method utilized to obtain all contour intervals. Contours shall be accurate to within 0.5 contour. Elevations shall be based on USGS sea level datum. The USGS quad maps shall not be accepted as evidence for topographic contours.
- Grading, erosion and sediment control plans shall be prepared in accordance with and in compliance with the standards in the Land Disturbance Section of the Zoning Resolution.
- Grading, erosion and sediment control plans must include the following:
 - Plans for all private and public streets/roads in accordance with the Roadway Design and Construction Manual and the Circulation Section.
 - Conceptual driveway plans if existing slopes exceed 30%.
 - Overlot grading plans for all non-residential, multi-family, manufactured home developments, and single family residential developments with lot sizes under ½ acre. Overlot grading plans are not required for single family residential lots over ½ acre in size if the developer is not proposing overlot grading, grading is not required and/or shown on the drainage plan, and the slopes in the buildable areas do not exceed 30%. Overlot grading plans must be consistent with the grading and basin boundaries shown on the drainage plan.
 - Plans for all drainage improvements including but not limited to detention/ water quality facilities, drainage channels, storm sewer, and outlet protection.
 - Grading, erosion and sediment control plans for each lot in residential developments with lot sizes under ½ acre shall be prepared in accordance with and in compliance with the Notice of Intent standards in the Land Disturbance Section of the Zoning Resolution.

- Approvals: The Planning and Zoning Division shall approve the plans prior to development approval. The Jefferson Conservation District shall approve the seed mix and mulching rates.

The intent of these specifications is to ensure excavation and grading occur according to the approved plan and to establish minimum materials, methods, and standards to be used in the construction of site grading fills for support of residences and other structures, embankments or excavations for streets, roads, drainage channels, structures, or other purposes. The work covered by these specifications includes excavation, embankment, grading, compaction, clearing and grubbing, removal of topsoil, trees, stumps, vegetation, removal and/or resetting of minor obstructions, and any other work incidental to the construction of site grading fills.

Geologic and Geotechnical Regulations – Section 25 of the Jefferson County Land Development Regulation

The geologic and geotechnical standards were adopted to protect lots, tracts, and structures from geologic hazards, including, but not limited to, dipping bedrock, rockfall, potentially unstable slopes, swelling soils, and subsidence. Buildable areas within lots, tracts, and areas designated for streets/roads and drainage improvements shall be:

- Reasonably free from geologic hazards or adequately mitigated from geologic hazards.
- Free of adverse soil conditions, constructed away from adverse soil conditions, or constructed in areas where adverse soil conditions have been abated.

All areas which fall within the Dipping Bedrock Overlay District shall be subject to the restrictions in the Dipping Bedrock Overlay District of the Jefferson County Zoning Resolution.

Detailed grading plans shall be submitted which show overburden soil or fill at least ten (10) feet thick beneath the anticipated level of the bottom of the structure foundation(s) and the top of bedrock. If deep (pier) foundations are proposed, the Zoning Administrator may require review of such plans by the Engineering Advisory Board.

Or: If ten (10) feet of overburden or fill are not proposed, detailed engineering plans shall be submitted to the Engineering Advisory Board. The alternate mitigation plans shall contain the information necessary to determine that potential hazards can be adequately mitigated by other methods.

Land Disturbance Regulation – Section 16 of the Jefferson County Zoning Resolution

The purpose of the Land Disturbance Section is to:

- Enhance the quality of water in the County's drainageways and surface waters;
- Protect life, property, and the environment from loss, injury, and damage by stormwater runoff, erosion, sediment transport, ponding, flooding, landslides, accelerated soil creep, settlement and subsidence, excessive dust, and other potential hazards caused by grading, construction activities, and denuded soils;

- Allow a temporary land use for land disturbance activities; and
- Establish performance standards to:
 - Define grading, drainage, erosion and sediment control, and waste disposal requirements;
 - Ensure mitigation of adverse impacts; and (orig. 10-12-04)
 - Ensure the reclamation of disturbed land. (orig. 10-12-04)

All land disturbance activities must conform to the performance standards as detailed in this Section. These standards apply whether or not a grading permit or Notice of Intent is required.

It shall be unlawful for any person, firm or corporation to do or authorize any land disturbance in the unincorporated area of Jefferson County without first obtaining a grading permit from the County or submitting a Notice of Intent to the County to authorize temporary land disturbance activities unless specifically exempted by this section. The applicant, the landowner, and the contractor are responsible if a land disturbance activity is undertaken in contravention of the performance standards, or if a land disturbance activity is undertaken beyond the scope of the grading permit or Notice of Intent without County approval. Land disturbance activities must be completed in compliance with the approved plans.

Roadway Design and Construction Regulations

Jefferson County has adopted a Major Thoroughfare Plan based on traffic volumes, existing land use and anticipated growth. The Major Thoroughfare Plan designates streets/roads as freeway, parkway, arterial (principal and minor), or collector.

Jefferson County has also adopted a Roadway Design and Construction Manual (2009) that provides geometric standards for construction, reconstruction and rehabilitation of roadway and transportation facilities. The County also supplies AutoCAD format drawings for template examples on the County website.

4.4.2 Jefferson County Administrative/Technical Mitigation Capabilities

Table 4.3 identifies the County personnel responsible for activities related to mitigation and loss prevention in Jefferson County.

Table 4.3 Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Y		
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Y		

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer/scientist with an understanding of natural hazards	Y		
Personnel skilled in GIS	Y		
Full time building official	Y		
Floodplain manager	Y	Planning and Zoning Pat O'Connell poconnel@jeffco.us	
Emergency manager	Y	Clint Fey cfey@jeffco.us	
Grant writer	Y		
Other personnel	Y		
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	Y	Callie Broome CBroome@jeffco.us	
Warning Systems/Services (Reverse 9-11,	Y	Jefferson County Dispatch	

Source: Jefferson County

4.4.3 Jefferson County Fiscal Mitigation Capabilities

Table 4.4 identifies financial tools or resources that the County could potentially use to help fund mitigation activities.

Table 4.4 Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Y	
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	Y	
Incur debt through general obligation bonds	Y	
Incur debt through special tax bonds	Y	

Source: Jefferson County

4.4.4 Other Mitigation Efforts

In 2009 the Colorado State Legislature adopted Senate Bill 09-001, an act which amends Title 23, Article 31, Part 3, §1. This law requires Community Wildfire Protection Plans (CWPPs) for all unincorporated portions of a County where a fire hazard exists. According to the Colorado State Forest Service¹ (September, 2015) the jurisdictions of: Jefferson County, Golden, Coal Creek

¹ <http://csfs.colostate.edu/wildfire-mitigation/colorado-community-wildfire-protection-plans/#j>

Canyon FPD, Elk Creek FPD, Evergreen FPD, Fairmount FPD, Foothills FPD, Genesee FPD, Golden Gate FPD, Indian Hills FPD, Inter-Canyon FPD, Lower North Fork, North Fork FPD, South Platte and West Metro FPD have up to date CWPPs.

Flood and Wildfire Task Force

The Flood and Fire Task Force is attended by various agencies interested in a proactive look at flooding or wildfire. The Task Force meets on an as needed basis from April through September and otherwise coordinates via email. The discussion revolves around weather, staffing levels for wildfire, resources available, and criteria for fire restrictions and fire bans. The Task Force acts in an advisory capacity to the Sherriff for fire restrictions and fire bans.

Agencies regularly represented on the Task Force are:

- Jefferson County Emergency Management
- Jefferson County Sherriff's Office
- Jefferson County Open Space
- Jefferson County Road and Bridge
- Jefferson County Public Information
- The National Weather Service
- UDFCD
- Colorado State Forest Service
- US Forest Service
- Elk Creek Fire Department
- Jefferson County Fire Council
- West Metro Fire Department

Code RED

Jefferson County participates in the Code RED emergency communications network which is a service that places calls, texts and/or emails to subscribers within the direct path of the storm in the event of a severe weather alert from the National Weather Service. Messages provide residents extra time to prepare that could save lives. Types of alerts include tornado warnings, severe thunderstorm warnings, flash flood warnings, tsunami warnings and winter storm warnings.



5 MITIGATION STRATEGY

Requirement §201.6(c)(3): [The plan shall include] a mitigation strategy that provides the jurisdiction’s blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section describes the mitigation strategy process and mitigation action plan for the Jefferson County Multi-Hazard Mitigation Plan. This section describes how the County accomplished Phase 3 of FEMA’s 4-phase guidance - Develop the Mitigation Plan - and includes the following from the 10-step planning process:

- Planning Step 6: Set Goals
- Planning Step 7: Review Possible Activities
- Planning Step 8: Draft an Action Plan

5.1 Mitigation Strategy: Overview

The results of the planning process, the risk assessment, the goal setting, the identification of mitigation actions, and the hard work of the HMPC led to the mitigation strategy and mitigation action plan for this LHMP update. As part of the plan update process, a comprehensive review and update of the mitigation strategy portion of the plan was conducted by the HMPC. As part of this process the original goals and objectives from the 2010 Plan were reviewed and reaffirmed. While the goals were not changed, some objectives were modified to reflect current priorities. The mitigation actions from 2010 Plan were reviewed and assessed for progress and evaluated for their inclusion in this plan update. Section 5.1.1 below identifies the updated goals and objectives of this plan and Section 5.3.1 details the progress on 2010 mitigation actions and summarizes the updated mitigation action plan. Details on actions can be referenced in Appendix A and the jurisdictional annexes.

5.1.1 Goals and Objectives

Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Up to this point in the planning process, the Hazard Mitigation Planning Committee (HMPC) has organized resources, assessed natural hazards and risks, and documented mitigation capabilities. A profile of the County’s vulnerability to natural hazards resulted from this effort, which is documented in the preceding chapter. The resulting goals, objectives, and mitigation actions were developed based on this profile in 2010 and updated in 2015-2016. The HMPC developed the

updated mitigation strategy based on a series of meetings and worksheets designed to achieve a collaborative mitigation planning effort, as described further in this section.

Goals were defined for the purpose of this mitigation plan as broad-based public policy statements that:

- Represent basic desires of the community;
- Encompass all aspects of community, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- Are time-independent, in that they are not scheduled events.

Goals are stated without regard for implementation, that is, implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that the goals are not dependent on the means of achievement. Goal statements form the basis for objectives and actions that will be used as means to achieve the goals. Objectives define strategies to attain the goals and are more specific and measurable. Mitigation Actions are specific actions that help achieve goals and objectives.

To facilitate the goals update of this plan HMPC members were provided a breakdown of the list of goals from the 2010 Jefferson County Multi Hazard Multi Jurisdiction plan, along with goals and objectives from a number of related plans.

This review was to ensure that this plan's mitigation strategy was integrated with existing plans and policies. They were told that they could use, combine, or revise the statements provided or develop new ones, keeping the risk assessment in mind.

The team reaffirmed the three goal statements but suggested some changes to the supporting objectives. These were compiled into a document which was discussed and accepted with minor revisions and consensus of the HMPC at a follow-up mitigation planning meeting.

Based upon the risk assessment review and goal setting process, the HMPC refined the goals and objectives from the 2010 plan. These updated goals and objectives provide the direction for reducing future hazard-related losses within Jefferson County. They are listed below, with their objectives.

Goal 1: Increase awareness about natural hazards

- Create a public outreach effort on the hazards identified in this plan.
- Provide timely notification and direction to the public of imminent and potential hazards.
- Provide notification for properties within hazard areas.
- Provide education on hazard resistant construction techniques.
- Engage constituency to take personal responsibility for their own exposure and mitigation.

-
- Increase public awareness of the need for funding for disaster mitigation & preparedness.

Goal 2: Reduce impacts of natural hazards on life, property, and the environment

- Continue to manage development and placement of structures in hazard-prone areas.
- Protect existing property to the extent possible.
- Utilize the risk assessment as the basis for jurisdictional response and evacuation plans.
- Protect critical facilities and infrastructure to minimize loss of critical services following a hazard event.
- Create incentives for the public to mitigate hazards on their own property, including engagement with Homeowner's associations.
- Strongly communicate wildfire mitigation with all land use proposals and existing land uses.
- Continue CWPP efforts including periodic updates and implementation of wildfire mitigation including wildfire fuel breaks, wildfire safe zones and defensible space, fuels reduction and biomass use.
- Increase wildfire mitigation efforts specifically on public lands and open space.
- Reduce the economic impact to public and private entities from hazards.
- Enhance ability of businesses to mitigate and recover from disasters.
- Continue to reduce flood losses through compliance with National Flood Insurance Program requirements.
- Continue to participate with Community Rating System, where applicable (i.e., Jefferson County, Arvada, Golden, Wheat Ridge and Lakewood).
- Encourage measures to enable the County and jurisdictions to better withstand a multi-year drought.

Goal 3: Strengthen and develop partnerships in regards to mitigating hazard impacts

- Promote planning efforts that foster cooperation and coordination among jurisdictions, agencies, and community aid organizations involved in hazard mitigation and response.
- Maximize the use of shared resources to leverage funding for hazard mitigation projects between all levels of government and the private sector.
- Encourage coordination between mitigation efforts on public land and adjacent private properties.
- Develop links between emergency planning and land use planning.
- Strengthen community partnerships to enhance the ability of local government to mitigate and respond to hazard events.

5.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

In order to identify and select mitigation measures to support the mitigation goals, each hazard identified in Section 4.1: Identifying Hazards was evaluated in regards to the various options for mitigation. Hazards that pose a significant threat to the community were considered the priority in the development of hazard specific mitigation measures.

The HMPC considered the four primary natural hazard mitigation strategies: Alter, Avert, Adapt, and Avoid. A comprehensive hazard mitigation plan considers the options as applicable under each mitigation strategy. A matrix was prepared to assist the planning team with the analysis of the alternatives by hazard, which is shown in Table 5.1 Primary Mitigation Strategies by Hazard. The matrix indicates that the available options will typically vary by hazard, but the “Adapt” strategy can be applied to each hazard.

Table 5.1 Primary Mitigation Strategies by Hazard

Hazard	Primary Mitigation Strategies-the Four “A’s”			
	Alter-Reduce frequency or intensity of hazard	Avert-Redirect hazard impacts away from vulnerable areas	Adapt-Reduce vulnerability to hazard	Avoid-Remove or do not put people and structures in risky areas
Avalanche	X	X	X	X
Dam Failure			X	X
Drought			X	
Earthquake			X	
Erosion and Deposition	X		X	X
Expansive Soils			X	X
Extreme Temperatures			X	
Flood	X	X	X	X
Hailstorm			X	
Landslide/Debris Flow/Rock Falls	X	X	X	X
Lightning			X	
Severe Winter Storms		X	X	
Subsidence			X	X
Tornadoes			X	
Wildfire	X	X	X	X
Windstorms			X	

In addition to the “four A’s” each HMPC member was provided the following list of categories of mitigation measures, which originate from the National Flood Insurance Program’s Community Rating System:

- **Prevention:** Administrative or regulatory actions or processes that influence the way land and buildings are developed and built.
- **Property protection:** Actions that involve the modification of existing buildings or structures to protect them from a hazard or remove them from the hazard area.
- **Structural:** Actions that involve the construction of structures to reduce the impact of a hazard.
- **Natural resource protection:** Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems.
- **Emergency services:** Actions that protect people and property during and immediately after a disaster or hazard event.
- **Public information/education and awareness:** Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them.

The HMPC members were also provided with several lists of alternative multi-hazard mitigation actions for each of the above categories via email and at a mitigation strategy meeting in January 2016. To facilitate the brainstorming process, the HMPC referred to a matrix of typical mitigation alternatives organized by CRS category for the hazards identified in the plan, in addition to a handout that explains the categories and provided examples. These materials are included in Appendix F. Another reference document titled “Mitigation Ideas” developed by FEMA was distributed to the HMPC via an online link and a reference hardcopy brought to the HMPC mitigation strategy meeting in 2016. This reference lists the common alternatives for mitigation by hazard. A facilitated discussion then took place to examine and analyze the alternatives. With an understanding of the alternatives, a brainstorming session was conducted to generate a list of preferred mitigation actions, beginning with discussion regarding the priority hazards. HMPC members wrote project ideas on large sticky notes. Each proposed action was written on a large sticky note and posted on flip chart paper underneath the hazard it addressed. The result was a number of new project ideas with the intent of meeting the identified hazards.

Based upon the key issues identified in the risk assessment, including the existing capabilities of jurisdictions, and the overall political, technical, and financial feasibility of the potential actions, the HMPC came to consensus on new mitigation actions for each hazard. Certain hazards were best addressed through multi-hazard actions. A lead for each new action was identified. The leads were responsible for filling out worksheets with additional details on the project so they could be captured in the plan. Additional discussion on proposed mitigation actions took place within individual jurisdictional planning teams.

HMPC members considered actions that would mitigate impacts to both new and existing buildings and infrastructure. The HMPC noted that the Hazard section of the Jefferson County Comprehensive Land Use Plan and related Land Use Code is oriented towards reducing impacts

to future development and will be used as the primary implementation mechanism for ongoing land use planning related to hazards. This plan works in tandem with the Land Use Plan and puts forth recommendations that will reduce losses to both new and existing infrastructure, but can be viewed as having a primary focus on reducing impacts to existing buildings, populations, and infrastructure.

5.2.1 Prioritization Process

Once the new mitigation actions were identified, the HMPC members were provided with several sets of decision-making tools, including FEMA's recommended criteria, STAPLE/E (which considers social, technical, administrative, political, legal, economic, and environmental constraints and benefits).

- Social: Does the measure treat people fairly?
- Technical: Will it work? (Does it solve the problem? Is it feasible?)
- Administrative: Is there capacity to implement and manage the project?
- Political: Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support the project?
- Legal: Does your organization have the authority to implement? Is it legal? Are there liability implications?
- Economic: Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development? Does it reduce direct property losses or indirect economic losses?
- Environmental: Does it comply with environmental regulations or have adverse environmental impacts?

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining project priority (the 'economic' factor of STAPLE/E). Other criteria used to recommend what actions might be more important, more effective, or more likely to be implemented than another included:

- Does action protect lives?
- Does action address hazards or areas with the highest risk?
- Does action protect critical facilities, infrastructure or community assets?
- Does action meet multiple objectives (Multiple Objective Management)?

At the mitigation strategy meeting the HMPC used STAPLEE to determine which of the identified actions were most likely to be implemented and effective. With these criteria in mind, team members were given a set of six green sticky-dots. The team was asked to use the dots to prioritize projects with the above criteria in mind, essentially voting on the projects. The projects with the most dots became the higher priority projects. This process provided both consensus and priority for the recommendations. Follow-up meetings were held within each jurisdiction to finalize the actions that are part of this plan. Participating jurisdictions were given the leeway to prioritize the actions specific to them, using the previously mentioned criteria.

5.3 Mitigation Action Plan

Requirement §201.6(c)(3)(iii): [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This section outlines the development of the final mitigation action plan. The action plan consists of the specific projects, or actions, designed to meet the plan's goals. Over time the implementation of these projects will be tracked as a measure of demonstrated progress on meeting the plan's goals.

5.3.1 Progress on Previous Mitigation Actions

Jefferson County and the majority of the participating jurisdictions have been very successful in implementing actions identified in the 2010 LHMP Mitigation Strategy, thus, working steadily towards meeting the 2010 plan goals.

The 2010 mitigation strategy contained 15 separate mitigation actions led by Jefferson County. Of the County's 15 actions, six have been completed. Several others have had aspects implemented or are ongoing, such as 'Continued Compliance with the NFIP.' Table 5.2 provides a summary of the mitigation action projects completed from the 2010 Plan. More details on these completed actions are discussed in the County's Capability Assessment (Section 4.4), Appendix A County Mitigation Actions and jurisdictional annexes capability assessment and mitigation strategy sections. Actions identified in 2010 that are being continued are included in Table 5.3. Following the table are some highlights of implementation.

Table 5.2 2010 Plan Mitigation Actions Completed

Jurisdiction	Mitigation Action Title	Corresponding Hazard	Priority	Related Goals	Date Completed
Jefferson County (Appendix A)	Create a Community Wildfire Protection Plan (CWPP)	Wildfire	High	2	2012
	North Branch of Coon Creek Culvert at Miller Street	Flood	Medium	2	2010
	Provide National Oceanic Atmospheric Administration (NOAA) Radios to Facilities in Jefferson County	Multi-Hazard	High	1,2	2010
	Fire danger operating plan	Wildfire	Medium	2	2013
	Evaluate all power/backup power systems for police, fire (etc) and repeater tower sites	Multi-Hazard	Medium	2	2011/2012
	Evaluate Possible Mountain Pine Beetle Infestation	Wildfire	Medium	2	2015
City of Golden (Annex C)	Kenney's Run Culvert Improvements	Flood	High	2	2016
	Emergency Operations Plan Development	Multi-Hazard	High	2,3	2010, Update in 2015
	Winter Weather Citizen Shelter Facility Identification and Readiness	Severe Winter Weather	High	2	2015
Wheat Ridge (Annex E)	Emergency Warning System	Multi-Hazard	High	1,2	2010
	Emergency Operations Plan	Multi-Hazard	High	2	2014
	City of Wheat Ridge Open Space Wildfire Management Plan	Wildfire	High	2	2014
	Education and Ordinance's regarding the mitigation of trees as hazards in Natural Disaster	Multi-Hazard	High	1,3	2011
Town of Morrison (Annex G)	Emergency Warning System	Flood	High	1,2	2010
Pleasant View Metro District	Flood mitigation of Lena Gulch through Pleasant View Community Park at Camp George West	Flood	High	2	2014

Jefferson Conservation District (Annex K)	Sampson Road Wildfire Mitigation	Wildfire	High	2	2012
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The County and its jurisdictions have made progress on actions and strengthening its mitigation capabilities towards reducing future losses. Highlights of this include:

- Floodplain Management:
 - Improvements in the floodplain management efforts that are reflected in improved CRS ratings for the County, Wheat Ridge, Lakewood, Arvada and Golden. This has resulted in an estimated \$100,000 reduction flood insurance premiums for county residents and \$250,000 in flood insurance premiums collectively for residents of the municipalities.
 - Update of County floodplain ordinance to comply with State rule and to reflect adoption of new maps in 2014.
- Warning and notification improvements:
 - Morrison’s outdoor warning system is in operation and tested regularly.
 - Public warning notification improvements including a new policy with three different evacuation levels, which has been utilized during exercises and actual events including the 2013 floods and 2013 Blue Bell fire.
 - The CodeRed notification system is tied in with National Weather Service to broadcast information and messages related to natural disasters.
 - Provided NOAA All-Hazards radios to key facilities in Jefferson County
- Completion of the County-wide Community Wildfire Protection Plan in 2011
- Wildland fuels management projects by Jefferson County in cooperation with fire districts and:
 - Sampson Road wildfire mitigation in cooperation with Jefferson Conservation District
 - 220 acres of fuels treatment near the Brook Forest community south of evergreen by Jefferson Conservation District
- Significant outreach and education efforts regarding forest health and wildfire mitigation
- Lakewood and Wheat Ridge evaluated critical facility backup power capabilities and needs as part of the development of Local Energy Assurance Plans.

Some of the challenges of implementation of projects included:

- Lack of funding
- Difficulty passing benefit cost analysis required for certain FEMA grants.
- Public opposition to fire mitigation in JeffCo Open Space – specifically in Apex Open Space where there was public opposition to reducing fuel loads.

The results of the 2016 project identification and prioritization exercise are summarized below in Table 5.3. Included in the table are actions that are being carried forward from the 2010 plan, which are noted as continuing or deferred projects in the ‘project status’ column. Deferred projects are those that were identified in 2010 but not yet implemented. Continuing projects are

those identified in 2010 that may have been started but either more work remains, or they are annually ongoing projects such as continued compliance with the NFIP. The actions are grouped by jurisdiction and priority. Appendix A contains more detail about the actions identified for Jefferson County, including a description of the activity, the entity responsible for implementation, any other alternatives considered, cost estimate, and a schedule for implementation. The jurisdictional annexes contain the detailed action item descriptions respective to each jurisdiction. The summary table can be used for reference during future HMPC meetings to track progress moving forward.

Table 5.3 Mitigation Action Plan Summary

Mitigation Action Number (Corresponds to Annex or Appendix)	Mitigation Action Title	Corresponding Hazard	Priority	Related Goals	Action Status (New, Continuing, Deferred)
Jefferson County - 1	Massey Draw Floodplain Improvements	Flood	Medium	1,2,3	New
Jefferson County - 2	Major Drainageway Culvert Improvements with Urban Drainage and Flood Control District	Flood	Medium	2,3	New
Jefferson County - 3	Minor Culvert Improvements	Flood	Medium	2	New
Jefferson County - 4	Weaver Creek Major Drainageway Master Plan and FHAD	Flood	Medium	2,3	New
Jefferson County - 5	Notification Polygons for Dam Failure and Flash Flooding	Dam Failure and Flood	High	1,2	New
Jefferson County - 6	Update CWPPs to reflect changing conditions and new development	Wildfire	High	2,3	New
Jefferson County - 7	Mitigate wildfire hazards on public lands and open space properties	Wildfire	High	2	New
Jefferson County - 8	Develop partnerships and begin needs assessment for seismic mitigation of critical infrastructure within JeffCo	Earthquake	Low	2,3	New
Jefferson County - 9	Education and awareness of geologic hazards	Avalanche, Earthquake, Erosion and Deposition, Expansive Soils, Landslide/Debris Flow/Rockfall, Subsidence	Low	1	New

Mitigation Action Number (Corresponds to Annex or Appendix)	Mitigation Action Title	Corresponding Hazard	Priority	Related Goals	Action Status (New, Continuing, Deferred)
Jefferson County - 10	Flood education and outreach	Flood	High	1,3	New
Jefferson County - 11	Perform Hazard Fuel Mitigation in Areas Identified as High Hazard in Countywide and Individual CWPPs	Wildfire	High	2	New
Jefferson County - 12	Fairmount drainage improvement program	Flood	Medium	2	Deferred
Jefferson County - 13	Drake outfall	Flood	Medium	2	Deferred
Jefferson County - 14	Beer Sisters Reservoir Rehabilitation	Dam Failure and Flood	High	2	Continuing
Jefferson County - 15	South Weir Gulch Rehabilitation	Dam Failure	Medium	2	Deferred
Jefferson County - 16	National Flood Insurance Program (NFIP) and Community Rating System (CRS) Participation	Flood	Medium	1,2,3	Continuing
Jefferson County - 17	Multi-Jurisdictional Storm Ready Program Participation	Hailstorm, Extreme Temps, Severe Winter Storms, Lightning, Tornado and Windstorm	Low	1,2,3	Deferred
Jefferson County - 18	Bi-lingual publications for Jeffco Residents	Multi-Hazard: All	Medium	1	Continuing
Jefferson County - 19	Public Awareness for those in Dam Inundation Areas	Dam Failure	High	1,2	Continuing
Jefferson County - 20	Geographic Information System Layer Updates	Wildfire	Medium	2	Continuing
Arvada - 1	Leyden Creek Improvements	Flood	Medium	2	New

Mitigation Action Number (Corresponds to Annex or Appendix)	Mitigation Action Title	Corresponding Hazard	Priority	Related Goals	Action Status (New, Continuing, Deferred)
Arvada - 2	Multi-Jurisdictional Storm Ready Program Participation	Hailstorm, Extreme Temps, Severe Winter Storms, Lightning, Tornado and Windstorm	Medium	1,2,3	New
Arvada - 3	UDF Master Plan Implementation	Flood	Medium	2	New
Arvada - 4	Environmental damage protection	Erosion	Medium	2	Continuing
Arvada - 5	Road Weather Information System (RWIS)	Severe Winter Storms	High	2	Deferred
Arvada - 6	Continue to Implement Sound Floodplain Management Practices through Participation in the National Flood Insurance Program	Flood	Medium	2	Continuing
Edgewater - 1	Continue to Implement Sound Floodplain Management Practices through Participation in the National Flood Insurance Program	Flood	High	1,2	Continuing
Edgewater - 2	Coordinate Management with the Urban Drainage Flood Control District on the Storm Water Drainage Detention Basins	Flood	High	1,2	Continuing
Edgewater - 3	Continued Validation of Flood Response Protocol Identified in the NIMS Compliant Emergency Operations Plan of 2007 through Practical Training and Exercises Design.	Flood	High	1,2	Continuing
Golden - 1	Heritage Road culvert improvements	Flood	High	2	New

Mitigation Action Number (Corresponds to Annex or Appendix)	Mitigation Action Title	Corresponding Hazard	Priority	Related Goals	Action Status (New, Continuing, Deferred)
Golden - 2	Continue to Implement Sound Floodplain Management Practices through Participation in the National Flood Insurance Program	Flood	Medium	2	Continuing
Lakewood - 1	Expand the existing Flood Hazard Inventory Tool (FHIT) for Lakewood Gulch, Weir Gulch, Sanderson Gulch, Sloan's Lake Basin, Dry Gulch, Bear Creek Tributaries and small portions of drainages south of Bear Creek	Dam Failure and Flood	High	1,2	New
Lakewood - 2	Revise Emergency Operations Plan (EOP) for Maple Grove Reservoir	Dam Failure	High	2	New
Lakewood - 3	Lakewood Energy Assurance Plan Update	Multi-Hazard: All	Medium	2,3	New
Lakewood - 4	Multi-Jurisdictional Storm Ready Program Participation	Hailstorm, Extreme Temps, Severe Winter Storms, Lightning, Tornado and Windstorm	Low	1,2,3	New
Lakewood - 5	Burying Power Lines to Green Mountain Repeater Site	Windstorm, Severe Winter Storm, Tornadoes and Lightning	High	2	Deferred
Lakewood - 6	Continue to Implement Sound Floodplain Management Practices through Participation in the National Flood Insurance Program	Flood	Medium	2	Continuing
Wheat Ridge - 1	Maple Grove Dam operations plan	Flood	Medium	2	New
Wheat Ridge - 2	Clear Creek floodplain mapping and master plan	Flood	Medium	2	New

Mitigation Action Number (Corresponds to Annex or Appendix)	Mitigation Action Title	Corresponding Hazard	Priority	Related Goals	Action Status (New, Continuing, Deferred)
Wheat Ridge - 3	Sloan's Lake floodplain mapping and master plan	Flood	Low	2	New
Wheat Ridge - 4	Stormwater CIP - Wadsworth and 35th drainage improvements	Flood	Low	2	New
Wheat Ridge - 5	Improve Wheat Ridge CRS rating to a Class 4	Flood	Medium	2	New
Wheat Ridge - 6	Floodplain Projects – Clear Creek and Lena Gulch	Flood	Low	2	New
Wheat Ridge - 7	Multi-Jurisdictional Storm Ready Program Participation	Hailstorm, Extreme Temps, Severe Winter Storms, Lightning, Tornado and Windstorm	Low	1,2,3	New
Wheat Ridge - 8	Channel 8/Website Updates	Multi-Hazard: All	Medium	1	Continuing
Wheat Ridge - 9	NFIP/CRS/CIP/Stormwater Utility	Dam Failure and Flood	High	2	Continuing
Wheat Ridge - 10	Stormwater Program and Maintenance Operations	Erosion and Deposition	Medium	2	Continuing
Lakeside - 1	No action identified	-	-	-	-
Morrison - 1	Relocation of Town Shops	Flood	High	2	Deferred
Morrison - 2	Continue to Implement Sound Floodplain Management Practices through Participation in the National Flood Insurance Program	Flood	Medium	2	Continuing
Mountain View - 1	Storm Water Drainage	Flood	Low	2	Deferred

Mitigation Action Number (Corresponds to Annex or Appendix)	Mitigation Action Title	Corresponding Hazard	Priority	Related Goals	Action Status (New, Continuing, Deferred)
Denver Water - 1	Flood inundation maps	Flood	High	2	New
Denver Water - 2	Watershed protection	Wildfire	High	2	New
Denver Water - 3	Training/exercising at Foothills Treatment Plant	Wildfire	Medium	2	New
Denver Water - 4	Public education and outreach	Dam Failure and Drought	Low	1,3	New
Denver Water - 5	Sediment removal from Strontia Springs Dam	Dam Failure	Medium	2	New
Denver Water - 6	Defensible space in Waterton Canyon	Wildfire	Medium	2	New
Fairmount Fire - 1	Update Community Wildfire Protection Plan	Wildfire	Low	2	New
Fairmount Fire - 2	Standards of Cover	Wildfire, Severe Winter Storms, Lightning, Tornado and Windstorm	Medium	2,3	New
Jefferson Conservation Dist -1	Last Resort Creek and Kennedy Gulch Fuels Reduction	Wildfire	High	2	New
Jefferson Conservation Dist -2	Educate Homeowners on Wildfire Hazards and Mitigation	Wildfire	High	1,3	Deferred
Jefferson Conservation Dist -3	Doubleheader Ranch Hazardous Fuels Reduction	Wildfire	High	2	Continuing
Golden Gate Fire - 1	Public Education on Wildfire Mitigation and Firewise Workshop	Wildfire	Low	1,2	New
Golden Gate Fire - 2	Improve Wildland Fire Resources	Wildfire	Low	2,3	New

Mitigation Action Number (Corresponds to Annex or Appendix)	Mitigation Action Title	Corresponding Hazard	Priority	Related Goals	Action Status (New, Continuing, Deferred)
Pleasant View - 1	Flood mitigation of Lena Gulch through West Blade Park located at 16780 Mt Vernon Road.	Flood	High	2	Deferred
North Fork FPD - 1	Public Outreach and Education on Wildfire Mitigation	Wildfire	High	1,3	New
North Fork FPD - 2	Recruit & Retain additional Volunteer Firefighters	Wildfire	High	2,3	Continuing
Lookout Mountain Water - 1	Conduct a Leak Detection Survey	Drought	Medium	2	New
Lookout Mountain Water - 2	Modify or replace Lookout Mountain Dam	Drought and Flood	High	2	New
Lookout Mountain Water - 3	Expand storage capacity at upper Beaver Brook reservoir	Drought	High	2,3	New
Lookout Mountain Water - 4	Repair lower Beaver Brook Dam	Drought and Flood	High	2,3	New
Lookout Mountain Water - 5	Upgrade water distribution pipelines on Lookout Mountain to improve wildfire fighting capabilities	Wildfire	High	2	New
Lookout Mountain Water - 6	Partial Renovation and Improvement to Sections of the Main Pipeline	Drought	Medium	2	Continuing
Indian Hills FPD - 1	Update CWPP to reflect changing conditions and new development	Wildfire	Medium	1,2,3	New
Evergreen FPD - 1	Educate the Public on Wildfire Mitigation	Wildfire	High	1	Continuing
Evergreen FPD - 2	Wildfire Mitigation Projects	Wildfire	High	2,3	Continuing

Mitigation Action Number (Corresponds to Annex or Appendix)	Mitigation Action Title	Corresponding Hazard	Priority	Related Goals	Action Status (New, Continuing, Deferred)
West Metro FPD - 1	Wildfire Mitigation	Wildfire	High	2	New

Goal 1: Increase awareness about natural hazards;
 Goal 2: Reduce impacts of natural hazards on life, property, and the environment;
 Goal 3: Strengthen and develop partnerships in regards to mitigating hazard impacts



6 PLAN ADOPTION

Requirement §201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, county commissioner, Tribal Council).

The purpose of formally adopting this plan is to secure buy-in from Jefferson County and participating jurisdictions, raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes Planning Step 9 of the 10-step planning process: Adopt the Plan. The governing board for each participating jurisdiction has adopted this local hazard mitigation plan by passing a resolution. A copy of the generic resolution and the executed copies are included in Appendix C Plan Adoption. This plan will be re-adopted every five years in concurrence with the required DMA local plan update requirements.



7 PLAN IMPLEMENTATION AND MAINTENANCE

Requirement §201.6(c)(4): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process, and phase 4 of FEMA's 4 phase process. This chapter outlines how this plan will be implemented and updated.

7.1 Implementation

Once adopted, the plan faces the truest test of its worth: implementation. While this plan contains many worthwhile projects, the HMPC will need to decide which action(s) to undertake first. Two factors will help with making that decision: 1) the priority assigned the actions in the planning process; and 2) funding availability. Low or no-cost projects most easily demonstrate progress toward successful plan implementation.

Implementation will be accomplished by adhering to the schedules identified for each action (see Appendix A Mitigation Actions and the actions detailed in the jurisdictional annexes) and through constant, pervasive, and energetic efforts to network and highlight the multi-objective, win-win benefits of each project to the Jefferson County community and its stakeholders. These efforts include the routine actions of monitoring agendas, attending meetings, and promoting a safe, sustainable community. The three main components of implementation are:

- IMPLEMENT the action plan recommendations of this plan;
- UTILIZE existing rules, regulations, policies and procedures already in existence; and
- COMMUNICATE the hazard information collected and analyzed through this planning process so that the community better understands what can happen where, and what they can do themselves to be better prepared. Also, publicize the "success stories" that are achieved through the HMPC's ongoing efforts.

Simultaneously to these efforts, the HMPC will constantly monitor funding opportunities that could be leveraged to implement some of the more costly actions. This will include creating and maintaining a bank of ideas on how to meet required local match or participation requirements. When funding does become available, the HMPC will be in a position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, special district budgeted funds, state and federal earmarked funds, and other grant programs, including those that can serve or support multi-objective applications.

7.1.1 Role of Hazard Mitigation Planning Committee in Implementation and Maintenance

With adoption of this plan, the Hazard Mitigation Planning Committee (HMPC) will be tasked with plan implementation and maintenance. The HMPC will be led by the Jefferson County Office of Emergency Management (OEM). The HMPC will act as an advisory body. Its primary duty is to see the plan successfully carried out and to report to the community governing boards and the public on the status of plan implementation and mitigation opportunities. The HMPC agrees to:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of recommended actions;
- Keep the concept of mitigation in the forefront of community decision making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability to disasters;
- Maintain a vigilant monitoring of multi-objective cost-share opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Report on plan progress and recommended changes to the Jefferson Board of County Commissioners; and
- Inform and solicit input from the public.

Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on the County website and local newspapers.

7.2 Maintenance/Monitoring

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as required or as progress, roadblocks, or changing circumstances are recognized.

7.2.1 Maintenance/Monitoring Schedule

In order to track progress and update the mitigation strategies identified in the action plan, the HMPC will revisit this plan annually or after a significant hazard event or disaster declaration. Jefferson OEM is responsible for initiating this review and convening members of the HMPC on a once yearly basis, or more frequently as needed. The annual review will be held in January of each year, beginning in 2018.

This plan will be updated, approved and adopted within a five-year cycle as per Requirement §201.6(c)(4)(i) of the Disaster Mitigation Act of 2000. With the initial approval of this plan occurring in mid-2016, the plan will need to be updated, re-approved by the Colorado Division

of Homeland Security and Emergency Management (DHSEM) and FEMA Region VIII, and re-adopted by all participating jurisdictions no later than June of 2021. The County will monitor planning grant opportunities from DHSEM and FEMA for funds to assist with the update. These grants should be pursued as early as 2019, as some grants have a three year performance period to expend the funds, plus there is no guarantee that the grant will be awarded when initially submitted. This allows time to resubmit the grant in 2020 if needed.

7.2.2 Maintenance Evaluation Process

Updates to this plan will follow the latest FEMA and DHSEM planning guidance. Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions;
- Increased vulnerability as a result of failed or ineffective mitigation actions; and/or
- Increased vulnerability as a result of new development (and/or annexation).

The HMPC will use the following process to evaluate progress and any changes in vulnerability as a result of plan implementation.

- A representative from the responsible entity identified in each mitigation measure will be responsible for tracking and reporting on an annual basis to the HMPC on project status and provide input on whether the project as implemented meets the defined objectives and is likely to be successful in reducing vulnerabilities.
- If the project does not meet identified objectives, the HMPC will determine what alternate projects may be implemented
- New projects identified will require an individual assigned to be responsible for defining the project scope, implementing the project, and monitoring success of the project.
- Projects that were not ranked high priority but were identified as potential mitigation strategies will be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation.
- Changes will be made to the plan to accommodate for projects that have failed or are not considered feasible after a review for their consistency with established criteria, the time frame, priorities, and/or funding resources.

Updates to this plan will:

- Consider changes in vulnerability due to project implementation;
- Document success stories where mitigation efforts have been completed or proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Document hazard events and impacts that occurred within the five-year period;
- Incorporate new data or studies on hazards and risks;

-
- Incorporate new capabilities or changes in capabilities;
 - Incorporate documentation of continued public involvement;
 - Incorporate documentation to update the planning process that may include new or additional stakeholder involvement;
 - Incorporate growth and development-related changes to building inventories;
 - Incorporate new project recommendations or changes in project prioritization;
 - Include a public involvement process to receive public comment on the updated plan prior to submitting the updated plan to DHSEM/FEMA; and
 - Include re-adoption by all participating entities following DHSEM/FEMA approval.

7.2.3 Incorporation into Existing Planning Mechanisms

Another important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other existing or new County and city plans and mechanisms. Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. As stated in Section 7.1 of this plan, implementation through existing plans and/or programs is recommended, where possible. This point is re-emphasized here. The County and participating entities already have existing policies and programs to reduce losses to life and property from natural hazards. These are summarized in this plan's capability assessment. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing projects, where possible, through these other program mechanisms. These existing mechanisms include:

- Jefferson County Comprehensive Master Plan (CMP) 2013
- Jefferson County Open Space Master Plan 2014-2019
- Jefferson County Disaster Recovery Plan (in development 2016)
- Individual Community's Land Use Plans
- Community and Land Use Plans including:
 - Individual Community Land Use Plans
 - Conifer/285 Corridor Area Community Plan (secondary to CMP)
 - Central Plains Community Plan (integrated into CMP)
 - Central Mountains Community Plan (integrated into CMP)
 - Clear Creek/I-76 Plans (standalone)
 - Evergreen Area Community Plan (secondary to CMP)
 - Indian hills community plan (integrated into CMP)
 - South Plains Area Plan (integrated into CMP)
 - North Mountains Community plan (integrated into CMP)
 - The North Plains Community Plan (integrated into CMP)
 - Jefferson County Telecommunications Land use Plan (standalone)
- Jefferson County Open Space Master Plan and Municipal Park and Recreation Plans

-
- County Community Wildfire Protection Plan update
 - Community Wildfire Protection Plan updates
 - Jefferson County Capital Improvement Plan – 2010-2013
 - Municipal Master Drainage or Flood Mitigation Plans
 - Municipal Capital Improvement Plans
 - Arvada Flood Recovery Assistance Plan
 - Coal Creek and other Watershed Master Plans

HMPC members involved in the updates to these mechanisms will be responsible for integrating the findings and recommendations of this plan with these other plans, as appropriate. An example would be referencing the HMP in the County Disaster Recovery Plan that is being developed as of 2016, to leverage hazard mitigation opportunities post-disaster.

Examples of how the HMP was incorporated or cross-referenced in other planning mechanisms, is noted in Section 3.2.1. The Wheat Ridge Energy Assurance Plan heavily references the HMP as it relates to hazards, vulnerabilities, and critical infrastructure.

The initial development of this plan was coordinated with an update occurring with Jefferson County Comprehensive Land Use Plan in 2009. Jefferson County Planning and Development staff participated and contributed to the development of this mitigation plan. Both planning processes were discussed at a public meeting in Conifer in November 2009. As mentioned in Chapter 5: Mitigation Strategy the Hazard section of the Jefferson County Comprehensive Land Use Plan and related Land Use Code is oriented toward reducing impacts to future development and will be used as the primary implementation mechanism for ongoing land use planning related to hazards. This plan works in tandem with the Land Use Plan and puts forth recommendations that will reduce losses to both new and existing infrastructure, but can be viewed as having a primary focus on reducing impacts to existing and future buildings, populations and infrastructure.

7.2.4 Continued Public Involvement

Continued public involvement is also imperative to the overall success of the plan's implementation. The update process provides an opportunity to solicit participation from new and existing stakeholders and to publicize success stories from the plan implementation and seek additional public comment. The update process provides an opportunity to publicize success stories from the plan's implementation and seek additional public comment. A public hearing(s) or survey to receive public comment on the plan will be held during the update period. When the HMPC reconvenes for the update, they will coordinate with all stakeholders participating in the planning process, including those who joined the HMPC after the initial effort, to update and revise the plan. Public notice will be posted and public participation will be invited, at a minimum, through available website postings and press releases to the local media outlets as well as email and social media announcements. Continued public outreach and education is an

aspect of the mitigation strategy Chapter 5 of this plan. Activities related to public involvement during the 2015-2016 update are documented in Chapter 3 and Appendix E, F, and G.

1.3.2 Other Assets

Table 15 is a detailed inventory of assets identified by the City’s planning team. This inventory includes some critical facilities. For more information about how “critical facility” is defined in this plan, see Section 4.3 Vulnerability Assessment.

Table 15. Summary of Arvada’s Assets

Name of Asset	Type	Replacement Value (\$)	Occupancy/ Capacity #	Hazard Specific Info
Arvada City Hall 8101 Ralston Rd, Arvada, CO 80002	VF		Approx. 400	City, PW, and Police administration; EOC
Arvada Center for Performing Arts 6901 Wadsworth Blvd, Arvada, CO 80003	VF		Up to 5000	Mass Casualty
Arvada Fleet Maint. 6701 Indiana St., Arvada, CO 80007	VF		Approx. 100	Arvada fleet facilities;; alternate EOC
Ralston WTP, 18975 W. 66 th Ave., Arvada, CO 80007	EI		Approx. 4	Water treatment plant
Parks Maintenance Facility, 7800 W. 62 nd Ave, Arvada CO 80003	EI		Approx. 50	Maintenance Facility
Wastewater/Storm Water Facility, 5555 W. 56 th Ave, Arvada, CO 80002	EI		Approx. 25	Wastewater system maintenance facility
Hill Petroleum, 6291 Ralston Rd, Arvada, CO 80002	HM		Unknown	Hazardous materials
Industrial Chemical Corp., 4631 W, 58 th Ave., Arvada, CO 80002	HM		Unknown	Hazardous materials
Railroad Bridge, 56 th & Wadsworth, Arvada, CO 80002	EI			Railroad bridge
Railroad Lines, Arvada, CO	EI			Railroad lines
Olde Town Arvada, Arvada, CO 80002	VF		Up to 2500	City business center
Schools – see Jefferson County Schools submittal				
Fire Protection District Headquarters	EI	\$3.2 million		
Fire Station 1	EI	\$2 million		
Fire Station 2	EI	\$2 million		
Fire Station 3	EI	\$2 million		
Fire Station 4	EI	\$2 million		
Fire Station 5	EI	\$2 million		
Fire Station 6	EI	\$4 million		
Fire Station 7	EI	\$2 million		
Fire Station 8	EI	\$2 million		

Name of Asset	Type	Replacement Value (\$)	Occupancy/ Capacity #	Hazard Specific Info
Training/Maintenance	EI	\$9 million		
Special Needs Facilities – refer to Jefferson County				

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: natural assets

Many of the facilities listed above are also in GIS databases provided by the City of Arvada and Jefferson County. Critical facility counts and types are shown in Table 16 and on the map in Figure 1. Shelters may be in facilities such as schools or recreation centers and are not indicated on the map.

Table 16. Summary of Arvada’s Critical Facilities in GIS

Category	Facility Type	Facility Count
Essential Facilities	EOC	1
	Fire Station	8
	Law Enforcement	1
	Urgent Care Facility	1
	Total	11
High Potential Loss Facilities	College	2
	Dam	5
	Day Care Center	20
	Government Facility	4
	HAZMAT	15
	Long Term Care Facility	25
	PK-12 School	34
	Private School	3
Total	108	
Transportation and Lifelines	Aircraft Facility	1
	Bridge	82
	Communications	6
	Total	89
Grand Total		208

Source: Jefferson County Assessor (October 2015) HSIP Freedom 2015 and HAZUS 2.2

1.3.3 Natural, Cultural, and Historic Resources

Assessing the vulnerability of Arvada to disaster also involves an inventory of the natural, historical, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Natural Resources

The City of Arvada has an outstanding parks and recreation system, and over 2,175 acres of open space within the Planning Area boundaries, over 90 neighborhood parks, nine regional parks and open space areas, and vast protected areas of open space owned by Jefferson County, and cities of Boulder, Denver, and Westminster adjacent to the Planning Area boundaries. For information about natural resources in Jefferson County, which includes Arvada, see Section 4.3 Vulnerability Assessment.

Historic and Cultural Resources

Table 17 lists the properties in Arvada that are on the National Register of Historic Places and/or the Colorado State Register of Historic Properties (for more information about these registers, see Section 4.3 Vulnerability Assessment).

Table 17. City of Arvada’s Historic Properties/Districts in National and State Registers

Property	Address	Date Listed
Arvada Downtown (Olde Town)	5580-5773 Wadsworth Blvd., 7207-7612 Grandview Ave., 755 Grant Pl., 5690 Yukon St., and 7314-7510 W. 57th Ave.	7/15/1998
Arvada Flour Mill	5580 Wadsworth Blvd.	4/24/1975
Churches Ranch	17999 W. 60 th Ave	7/23/1998
Reno Park Addition Historic District	7799-7899 W. 57th Ave., 7801-7906 Grandview Ave., 7800 & 7884 Ralston Rd., 5603-5720 Yarrow St., 5701-5723 Yukon St., & 5604-5723 Zephyr St.	9/29/1999
Russell-Graves House	5605 Yukon St.	5/9/1983

Property	Address	Date Listed
Stocke, Walter Addition Historic District	6701-7014 Grandview Ave., 5708-7006 Ralston Rd., 5712-5724 Reed St. & 5705-5726 Saulsbury St.	9/24/1999
Enterprise Grange No. 15	7203 Simms St.	State Register 8/11/1999
Ralston Gold Discovery Site (Gold Strike Park)	56th Ave. & Fenton St.	State Register 12/13/1995

Sources: Directory of Colorado State Register Properties, <http://www.historycolorado.org/oahp/jefferson-county> ; National Register Information System, <http://www.nps.gov/nr/research/>

The National Park Service administers two programs that recognize the importance of historic resources, specifically those pertaining to architecture and engineering. While inclusion in these programs does not give these structures any sort of protection, they are valuable historic assets. There is currently 1 Historic American Building Survey (HABS) or Historic American Engineering Record (HAER) buildings in the City of Arvada.

Table 18. Architecturally Significant Buildings in Arvada

Property	Address
William Graves House	5250 Marshall St, Arvada Co

It should be noted that as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

1.4 Growth and Development Trends

Table 19 illustrates how Arvada has grown in terms of population and number of housing units between 2010 and 2014 (or the most recently available data). The table illustrates that Arvada is undergoing steady growth. Table 20 shows Arvada’s estimated population changes through 2030 assuming historic growth patterns.

Table 19. City of Arvada’s Change in Population and Housing Units, 2010-2014

2010 Population	2014 Population Estimate	Estimated Percent Change 2010-2014	2010 # of Housing Units	2013 Estimated # of Housing Units	Estimated Percent Change 2010-2013
106,474	113,574	6.7%	43,952	44,518	+1.28%

Source: <http://quickfacts.census.gov/qfd/states/08/0803455.html>

Table 20. City of Arvada’s Population Projections Through 2030

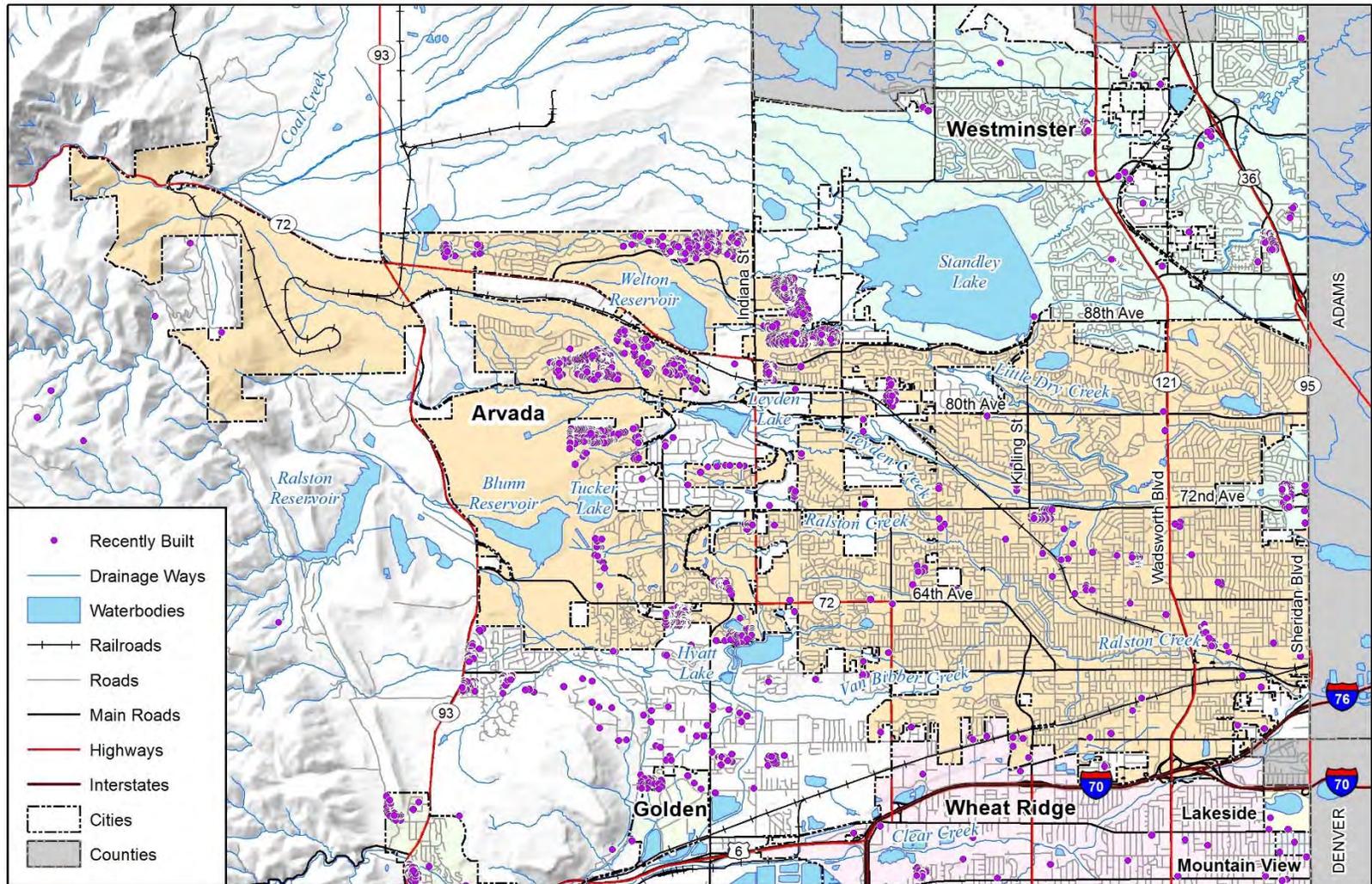
2010 Population	2020 Population Estimate	2030 Population Estimate	% Projected Yearly Growth Rate
106,474	124,308	145,130	1.675%

Source: <http://quickfacts.census.gov/qfd/states/08/0803455.html>

The City is undergoing rapid residential and commercial development in western and northwestern Arvada, see Figure 5. From 2009 to 2015, 2,016 parcels have been improved adding 2,178 buildings. Some of this development may be near or within the dam failure inundation zone of Welton Reservoir.

Also the proposed growth in the Candelas development near highways 93 and 72 is an area subject to high winds and brush fires and has mapped areas of subsidence and dipping bedrock.

Figure 5. City of Arvada Recently Developed Parcels 2009 to 2015




 Map compiled 10/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD

0 1 2 Miles



1.5 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes Arvada’s regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities and then discusses these capabilities in further detail along with other mitigation efforts as they pertain to the National Flood Insurance Program’s Community Rating System (CRS). Although the CRS is flood-focused, this discussion also incorporates activities related to other hazards into the categories established by the CRS.

1.5.1 Mitigation Capabilities Summary

Table 21 lists planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Arvada.

Table 21. City of Arvada’s Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General or Comprehensive plan (2014)	Yes	
Zoning ordinance	Yes	
Subdivision ordinance	Yes	
Growth management ordinance	Yes	Limited Building Permits
Floodplain ordinance	Yes	Updated January 2016
Other special purpose ordinance (stormwater, steep slope, wildfire)	Yes	Storm Water, EOP
Building code	Yes	
Fire department ISO rating (2008)	Yes	Class 3
Erosion or sediment control program	Yes	
Stormwater management program	Yes	
Site plan review requirements	Yes	
Capital improvements plan	Yes	
Economic development plan	Yes	
Local emergency operations plan	Yes	
Other special plans	Yes	Flood Recovery Assistance Plan
Flood insurance study or other engineering study for streams	Yes	February 2014
BCEGS Ratings (1-10, 1 being best)	Yes	Personal (1 and 2 family dwellings) 4 Commercial (all other buildings) 3 2012
Elevation certificates (for floodplain development)	Yes	

Table 22 identifies the personnel responsible for mitigation and loss prevention activities as well as related data and systems in Arvada.

Table 22. City of Arvada’s Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Yes	Public Works	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Public Works	
Planner/engineer/scientist with an understanding of natural hazards	Yes	Public Works	
Personnel skilled in GIS	Yes	Public Works	
Full time building official	Yes	Community Development	
Floodplain manager	Yes	Public Works	
Emergency manager	Yes	Police Dept.	
Grant writer	Yes	Finance Dept.	
Other personnel	Yes	Whole City Full	
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	Yes	Public Works	
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Yes	Police Communication Center	R 911 and cable override

Table 23 identifies financial tools or resources that Arvada could potentially use to help fund mitigation activities.

Table 23. City of Arvada’s Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Y	
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	Y	
Incur debt through general obligation bonds	Y	
Incur debt through special tax bonds	N	
Incur debt through private activities	N	
Withhold spending in hazard-prone areas	N	

1.5.2 Community Rating System Activities (All Hazards)

National Flood Insurance Program

The City of Arvada joined the National Flood Insurance Program (NFIP) on December 31, 1974 and the Community Rating System (CRS) on October 1, 1991. The NFIP allows private property owners to purchase affordable flood insurance and enables the community to retain its eligibility to receive certain federally backed monies and disaster relief funds. The CRS is a voluntary program for NFIP-participating communities. It provides flood insurance discounts to policyholders in communities that provide extra measures of flood above the minimum NFIP requirements. As of the CRS Current Effective Date of May 2010, Arvada had a CRS class rating of 5 (one a scale of 1-10, 1 being the best). This rating provides a 25 percent discount for policyholders within a special flood hazard area (SFHA) and a 10 percent discount for those outside of an SFHA. The City is undergoing a CRS verification review by ISO in September 2015 which will utilize the updated 2013 CRS Coordinator's Manual for the class rating determination.

NFIP insurance data indicates that as of September 2015, there were 484 (down from 521 in 2010) policies in force in Arvada, resulting in \$114,839,400 of insurance in force. In Arvada, there have been 68 (up from 50 in 2010) historical claims for flood losses totaling \$57,818. There were no repetitive or severe repetitive loss structures.

Mapping: Arvada's initial Flood Insurance Rate Map became effective on 12/31/74. The most current Digital Flood Insurance Rate Maps were updated and became effective on 2/5/14. A new floodplain ordinance has been developed to reflect the current mapping and is scheduled for adoption on 12/7/15. FEMA approved a limited number of new maps after a Big Dry Creek FHAD in Westminster was completed and FEMA reissued a new flood insurance study (FIS) with an updated effective date of 1/20/16. Only the revised FIRM panels received updated effective dates, the rest reflect the 2/5/14 date.

Incorporation into Local Planning Mechanisms

The 2010 Local Hazard Mitigation Plan has not been incorporated yet into existing planning mechanisms include but additional opportunities will be evaluated using the process identified in Chapter 7 of the base plan.

Community Rating System Categories

The Community Rating System (CRS) categorizes hazard mitigation activities into six categories. These categories, and applicable Arvada activities, are described below. Note: some of the activities are appropriate to multiple categories. For purposes of simplicity, they are only included in the category deemed most appropriate based on the definitions and examples provided in the *CRS Coordinator's Manual*.

Preventive

Preventive activities keep problems from getting worse. The use and development of hazard-prone areas is limited through planning, land acquisition, or regulation. They are usually administered by building, zoning, planning, and/or code enforcement offices.

City of Arvada Comprehensive Plan 2014

The City's comprehensive plan is a guide to help the City make decisions and establish its future direction. The goals and policies contained within the plan cover a broad range of subjects matter related to services, issues, and geographic areas within Arvada. Combined, these elements serve to direct future policy decisions to preserve vital community attributes and service levels and manage growth.

The following excerpts are goals and related polices that are relevant to this hazard mitigation plan.

Land Use and Redevelopment

- Goal L-1: Coordinate Arvada's planning internally and with that of adjacent jurisdictions and the Denver Regional Council of Governments (DRCOG).
 - L-1.1: Coordination with regional planning. Arvada will coordinate with Denver Regional Council of Governments (DRCOG) in implementing its Metro Vision Plan and regional initiatives.

Community Character, Urban Design and Historic Preservation

- Goal CC-2: Establish and maintain Arvada's distinct qualities and small-town identity.
 - CC-2.2: The City will promote high quality architecture, site planning, landscaping, signage, and lighting for new residential and commercial developments.
 - CC-3.3: Transitions for stable rural development. Place open space, trails, riparian and wildlife corridors, view corridors, wetlands, or landscaped buffers between developments.
 - CC-4.1/4: Historic preservation programs. The City will expand outreach and promotion of its historic preservation efforts including the use of the Olde Town Design Guidelines.

Transportation

- Goal T-4: Develop the transportation system in a manner that maintains the quality of life for residents and visitors.

-
- T-4.5: Air Quality. The City will consider the impacts that transportation decisions have on ozone-forming emissions and other pollutants in making transportation investments.

Neighborhoods and Housing

- Goal N-3: Maintain and improve the quality of the existing housing stock in Arvada and revitalize the physical and social fabric of neighborhoods that are in decline.
 - N-3.2: Improve Infrastructure in Older Neighborhoods. The City will analyze blighted conditions and invest in infrastructure, to the extent that funds are available.

Resource Conservation and Environment

- Goal R-1: Minimize the impact of new development on natural areas to allow continued cohabitation of people and wildlife.
 - R-1.1: Buffers and Setbacks. The City will require new developments to provide buffers for creeks, water bodies, existing wetlands, riparian areas, and wildlife corridors to retain water quality and environmental integrity.
 - R-1.2: Land Use and Infrastructure Decisions. All decisions involving infrastructure and land use should be reviewed in light of a changing climate that may have different and more erratic precipitation trends.
- Goal R-2: Promote improved water quality in stream corridors.
 - R-2.1: Water Quality Features. The City will require water quality features in new developments to minimize degradation of stream water quality.
 - R-2.2: Water Quality Education. The City will educate the public about how they can assist in water quality efforts.
 - R-2.3: Best Management Practices for Storm water Conveyance. The City will protect water quality through implementation of Best Management Practices in the design of storm water conveyance and detention facilities.
- Goal R-3: Improve flood control.
 - R-3.1: Flood Control Program. The City will continue to improve the flood control and drainage program to remove properties from the 100 year floodplain.
- Goal R-5: Conserve water resources.

-
- R-5.1: Water-Wise Landscaping Examine changes to the Land Development Code to further increase the use of water-wise landscaping and to ensure that plans were built and are operating to specifications.

Parks, Recreation and Open Space

- Goal P-1: Provide strategically placed parks, recreation centers, a well-connected trail system, and preserved open space to serve Arvada residents and visitors.
 - P-1.1: Parks and Open Space Master Plan. The Parks and Open Space Master Plan is part of the Comprehensive Plan. The City will continue to implement the Parks and Open Space Master Plan, as updated periodically.
- Goal P-3: Conserve and maintain important open space lands in and around Arvada to help define the character of the community.
 - P-3.1: Expanded and Maintained Open Space. The City will continue to expand and maintain the open space system. Open space will consist of park preserves, natural areas, and special resource areas as defines in the Open Space Master Plan.
- Goal P-4: Develop parks, trails, and outdoor recreational facilities in an environmentally sensitive manner to help protect and enhance the natural environment.
 - P-4.1: Include Natural Features in Parks. The City will develop new and existing parks and open space lands that include a wide range of natural features.\
 - P-4.2: Natural and Drought-Tolerant Landscape. The City will promote and educate the public about the use of xeriscape and “water-wise” landscaping for new parks. The City will also use drought-tolerant landscape materials and convert non-drought tolerant landscape turf wherever possible.

Public Safety

- Goal PS-1: Provide police services and facilities to meet the needs of Arvada residents and the business community.
 - PS-1.3: Refine and Improve Service Delivery. Continue the move to decentralized service delivery to better connect public safety services with communities of interest.

Utilities and Public Facilities

- Goal U-2: Ensure that adequate public facilities and utilities are available at the time of development, or within a reasonable period, as stipulated by the City, to serve new growth.

-
- U-2.1: Timing of Development Arvada will phase and locate future residential, commercial, and industrial growth in coordination with the City's ability to efficiently provide necessary services and utilities including but not limited to: water and sewer, storm sewer, transportation, parks, and public safety.

Municipal Code

Article 6.13: Floodplain Development Standards

This Section 6.13 is intended to provide the means and the guidelines to promote the public health, safety, and general welfare, to minimize public and private losses in areas subject to flood hazards, and to promote wise use of the Floodplain. This Section has been established with the following purposes intended:

- To reduce the hazards of flood to human life, health and property;
- To protect floodplain occupants from a flood which is or may be caused by their own, or other land use;
- To protect the public from the burden of avoidable financial expenditures for flood control and relief
- To protect the storage capacity of floodplains and to assure retention of sufficient floodway areas;
- To protect the hydraulic characteristics of the small watercourses, including gulches, sloughs and artificial water channels used for conveying flood waters; and
- To protect individuals from purchasing floodplain lands for purposes which are not, in fact, suitable.

In order to accomplish its purposes, this Section includes methods and provisions for:

- Restricting or prohibiting uses which are dangerous to public life, health or property due to flood waters or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;
- Restricting uses which are particularly susceptible to flood damage;
- Requiring permitted floodplain uses, including public facilities which serve such uses, to be protected against floods by flood-proofing and providing general flood protection at the time of initial construction or reconstruction;
- Regulating the manner in which a structure, may be constructed in floodplain areas.
- Regulating the method of construction of water supply and sanitation systems so as to prevent disease, contamination and unsanitary conditions;
- Delineating and describing areas that could be inundated by floods;

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- Regulating the method of construction and pattern of development within all uses in the floodplain;
 - Regulating the alteration of natural floodplains, stream channels and natural protective barriers which help accommodate or channel flood waters;
 - Regulating or prohibiting filling, grading, development, dredging and unnecessary encroachments which may increase flood damage or prevent water carrying capacity;
 - Encouraging uses such as greenbelt, open space, agricultural, recreation facilities and riding trails in floodplain areas.

6.13.6. Flood zone district regulations.

The Flood Zone District represents the area that is inundated in the 100-year flood that may serve as a temporary storage area for the flood waters and that lies landward of the floodway.

A. Special Provisions

1. No fill, structure, deposit or other floodplain uses shall be permitted that adversely affects the efficiency of any channels or floodways of any tributaries to the main stream or river; drainage ditches; or any other drainage facilities or systems.
2. If a property has been issued a Letter of Map Revision based on Fill (LOMR-F) from FEMA the property has been filled so as to remove it from the floodplain, no building permit shall be issued for a new structure to be constructed that would result in a finished floor elevation to be below the previously existing base flood elevation.
3. Residential Construction.
 - a. New construction and substantial improvement of any residential structure within or moved into the Flood Zone District, shall have the lowest floor (including basement), constructed at or above a point two (2) feet above the base flood elevation, or, if within Flood Zone AO, at or above a point three (3) feet above the depth number specified in feet on the Official Floodplain Maps (the depth number shall be at least two (2) feet if it is not specified on the maps). A residential structure shall be any structure which is designed for human habitation.
4. *Nonresidential Construction.* New construction and substantial improvements of any commercial, industrial, or other non-residential structure within or moved into the Flood Zone District shall either:
 - a. Have the lowest floor (including basement) constructed at or above the Flood Protection Elevation, or if within Flood Zone AO, at least one foot above the depth number

specified in feet on the Official Floodplain Map (at least three feet if no depth number is specified); or

- b. Together with attendant utility and sanitary facilities shall:
 - i. be flood-proofed to or above the Flood Protection Elevation; such that the structure is watertight with walls substantially impermeable to the passage of water;
 - ii. have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and
 - iii. be certified by a Colorado registered professional engineer that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions of this paragraph. Such certifications shall be provided to the Floodplain Administrator as set forth in §2.5.2.D.1 (Obtain and Maintain Floodplain Information).

5. *Critical Facilities.* New construction and substantial improvements of any facility classified as a critical facility within or moved into the Flood Zone District shall have the lowest floor (including basement) constructed at or above a point two (2) feet above the base flood elevation.

6. *Manufactured Homes.*

- a. Manufactured homes shall be anchored in accordance with §6.13.4.A (Anchoring)

7. All recreational vehicles shall either:

- a. Be on the site for fewer than 180 consecutive days;

8. The storage or processing of materials that are buoyant, flammable, explosive, or in times of flooding, could be injurious to human, animal or plant life, shall be at or above a point two (2) feet above the base flood elevation for a particular area, or adequately flood-proofed in accordance with provisions in this Section.

9. Building plans for any project or construction within the Flood Zone District must be submitted to the Floodplain Administrator, for approval, in accordance with [§3.16](#) (Floodplain Development Permit), to insure that said project or construction will not adversely affect the Flood Regulatory District.

10. Any structure permitted in the Flood Zone District pursuant to this Section shall be firmly anchored to prevent the structure or building from floating away thus threatening to further restrict bridge openings and other restricted sections of the stream or river.

B. Permitted Uses. Any uses permitted by the underlying Zoning District, in conformance with the preceding Special Provisions, may be permitted by the Floodplain Administrator, subject to the following conditions:

1. If the Floodplain Administrator disallows a requested use through a Floodplain Development Permit, that is permitted in the underlying Zoning district, the applicant may follow the procedures outlined in [§ 3.21](#) (Floodplain Variance) or [§ 3.2.3](#) (Appeals).
2. The Floodplain Administrator may also require the applicant to follow procedure outlined in [§ 3.16](#) (Floodplain Development Permit) for certain uses in the Flood Zone District when said action appears to be in the public interest, and where the health, safety, and welfare of the public may be in question.

Other Regulations

- **Article 6.4 Open Space** – This section addresses the character and design of those portions of the Standard Zoning Districts, PUD Zoning Districts, the CC Subdistricts, and the NC Subdistricts that are not occupied by platted lots or streets and that are reserved for parks, trails, landscaping, and open space uses. It does not address park and open space dedication requirements, which are described in detail in [§ 7.11](#) (Public Park and Trail Dedications). The requirements of this Section apply regardless of whether or not the land involved will be dedicated to Arvada, and regardless of whether or not such open space will be open to the public or to other residents of the development. For purposes of complying with the requirements of this Code, (a) driveways, sidewalks, parking areas, and designated outdoor storage areas shall not be counted as common open space, (b) land occupied by active recreational uses such as pools, playgrounds, tennis courts, jogging trails, and clubhouses used primarily for recreational purposes, may be counted as open space.
- **Article 6.12 Stormwater Drainage and Erosion Control** – Requirements for stormwater drainage in this article shall apply to all land in the City, except lands on which an approved subdivision plat existed within the City prior to January 1, 1971, that are improved or can be improved without a development plan or plat required by this Code. Requirements for erosion control shall apply to all parcels within the City. At a minimum, reasonable efforts to prevent, mitigate, and control accelerated soil erosion shall include the design, installation, and implementation or temporary erosion control measures prior to any earth disturbance activities.
- **Article 6.18 Construction Mitigation Standards** – This section of municipal code details the steps required to mitigate erosion, siltation, and dust during periods of construction. It also details how and what construction materials must be recycled.
- **Article 7 Subdivision Regulations and Improvements** - These regulations are enacted for the purposes of promoting the health, safety, convenience, order, prosperity, and welfare of

the present and future inhabitants of the City of Arvada; for adequate and convenient open spaces for traffic, utilities, access of firefighting apparatus, recreation, light, air, and solar access; and for the avoidance of congestion of population, and other public requirements.

Natural Resource Protection

Natural protection activities preserve or restore natural areas or their natural functions. They are usually implemented by parks, recreation, or conservation agencies or organizations.

2001 Parks, Trails, and Open Space Master Plan (Master Plan) - The Master Plan is intended to guide development of the parks, trails, and the open space system through the next decade. The mission is to “provide a high quality parks, trails, and open space system for citizens of the Arvada area.” The Master Plan defines policies and projects for the next ten years. The Parks, Trails, and Open Space Master Plan is a functional plan that covers the entire City. Arvada has many trail systems and parks in flood hazard areas, which is an appropriate and wise use of floodplain land. Examples of this are the Ralston Creek and Van Bibber Creek bike trails and neighborhood parks located along these drainages.

The City never had a formal open space plan before the 2001 Master Plan. This Master Plan identifies key areas to preserve as open space and establishes a classification system that can be used to designate parcels according to their preservation method, environmental sensitivity, and level of facility development for public use. It shows 3,800 acres of conceptual future open space for Arvada that is focused around drainage ways, water bodies, prominent ridges, expansions to existing open spaces, and wildlife habitat areas.

In early 2015 the City initiated a process to update its open space Master Plan. Public input, planning process and data collection is ongoing as of the drafting of this plan, however according to public input, the three most important open space amenities for Arvada residents include in descending order: urban trails, small neighborhood parks and open space trails².

Emergency Services

Emergency services measures are taken during an emergency to minimize its impacts. These measures are the responsibility of city or county emergency management staff and the owners or operators of major or critical facilities.

Arvada Police Department Strategic Plan (Strategic Plan) (2003-2007) - The Arvada Police Department Strategic Plan assists the Police Department with accomplishing its mission, which is: “to provide high quality police service in an objective and professional manner.” The

² Source: Arvada open space plan update 2015 – Pubic Input Summary.
http://static.arvada.org/docs/Parks_Master_Plan_Public_Input_Summary-1-201508131254.pdf

Strategic Plan is for police service for the entire Arvada community. It includes a vision statement and a series of goals and targets.

Arvada Fire Protection District Strategic Plan 2015-2020 - The Arvada Fire Protection District Strategic Plan is developed to provide the guidance and vision for the current and future delivery of essential emergency services to the Fire District's coverage area. This responsibility is accomplished through an aggressive program of diverse training and a continual commitment to customer care.

- Post-Flood Recovery Assistance Plan - City of Arvada, Colorado
- Ice and Snow Removal Plan
- Ralston Reservoir and Upper and Lower Long Lake Dams Emergency Preparedness Plan (Denver Water Department)
- Emergency Operations Plan: Utilities Department, Water Supply Annex

The Fire Protection District is in process of developing a CERT program

Flood Protection Handbook 2010– This is a publically available plan that helps Arvada residents with personal flood preparedness and management in case of emergency/flood event. It provides mitigation actions as well as adaptation suggestions along with information on flood assistance programs at the local and federal levels.

Post-Flood Recovery Assistance Plan

The City is in the process of updating this plan, which outlines short and long-term recovery roles and responsibilities in the event of a flood. The opportunities for pre and post-flood mitigation are also discussed.

Structural Projects

Structural projects keep hazards away from an area (e.g., levees, reservoirs, other flood control measures). They are usually designed by engineers and managed or maintained by public works staff.

- Van Bibber Flood Control Project
- Ralston Creek and Van Bibber Creek confluence flood control project.
- Garrison Bridge and Ralston Creek and re-channelization.

The City has received approval to use funding from Urban Drainage and Flood Control District to design and construct drainage improvements identified in the recent Leyden Creek Master Plan Update. This plan was completed after the 2013 flood to identify and prioritize capital drainage improvements on the Leyden Creek drainageway. The City is planning to design and construct improvements in 2016.

Public Information

Public information activities advise property owners, potential property owners, and visitors about the hazards, ways to protect people and property from the hazards, and the natural and beneficial functions of natural resources (e.g., local floodplains). They are usually implemented by a public information office.

The City of Arvada's public information is provided by the Assistant to the City Manager for Public Information (City PIO). This position is the interface between the city and all media sources as well as being the director of Arvada's public television network, KATV Arvada (Channel 8). The City PIO also maintains public information on the city's web site, www.arvada.org. Postings at this site can also be sent as tweets on Twitter and postings on Face Book. The City PIO is also a member of the Emergency Service Public Information Officers Colorado (ESPIOC).

Hazard awareness information is provided in the monthly Arvada Report that is distributed to every mailing address in Arvada. Also, the city's Emergency Management Coordinator (EMC) provides public outreach to citizens with hazard awareness and preparedness information and presentations. Hazard awareness information is also posted on the city web site.

Ongoing public outreach through:

- water bill flyers;
- city web site (Arvada.org);
- public education outreach on emergency planning, hazard awareness, and preparedness;
- Flood Protection Handbook for citizens
- employee safety training through Risk Management

1.6 Mitigation Actions

This section of the Jefferson County Hazard Mitigation Plan provides updates on the actions originally identified in the 2010 plan and actions identified during the 2015-2016 update.

1. Leyden Creek Improvements

Issue/Background: The 2013 flood inundated homes and private property along Leyden Creek. A drainage master plan has since been completed to identify strategies and drainage improvements to reduce the risk from future floods.

Other Alternatives: None

Responsible Office: City of Arvada Public Works

Priority (High, Medium, Low): Medium

Cost Estimate: \$12,000,000 to implement the entire master plan. It can be broken into various phases, which can be completed as funding becomes available.

Benefits (Avoided Losses): Reduction in flood losses

Potential Funding: Jefferson County, UDFCD, Farmers Reservoir and Irrigation Company, and Arvada

Schedule: Phase I implementation in late 2016 or early 2017

STATUS: New in 2015

2. Multi-Jurisdictional StormReady Program Participation

Issue/Background: StormReady recognizes communities with the communication and safety skills needed to save lives and property--before, during and after the event. StormReady helps community leaders and emergency managers strengthen local safety programs (NWS). This is an accredited program through the National Oceanic & Atmospheric Administration & the National Weather Service.

Other Alternatives: None

Responsible Office: City of Arvada Office of Emergency Management

Priority (High, Medium, Low): Medium

Cost Estimate: None (Unless upgrades to Emergency Preparedness infrastructure is needed to qualify as a Storm Ready Community). \$5,000, if it is necessary to upgrade equipment, training, staff hours, OT hours, and/or host trainings

Benefits (Avoided Losses): More resilient, informed and prepared community. The program also earns credit under the Community Rating System which ultimately reduces flood insurance costs in the community.

Potential Funding: EMPG

Schedule: Completion by December 31, 2016

STATUS: New in 2015

3. Urban Drainage Flood Master Plan Update and Implementation

Issue/Background: In the early 1970s a drainage master plan was generated that identified drainage needs in the city not along the major creeks. Over the years numerous projects have been completed. This project would entail updating the Master Plan and continuing with implementing the master plan improvements.

Other Alternatives: No action

Responsible Office: City of Arvada Public Works

Priority (High, Medium, Low): Medium

Cost Estimate: \$20,000,000 to implement the entire master plan. It can be broken into various phases, which can be completed as funding becomes available. **Benefits (Avoided Losses):** Reduced flood risks

Potential Funding: UDFCD and City of Arvada

Schedule: Have Master Plan updated in 2017

STATUS: New in 2015

4. Environmental Damage Protection

Issue/Background: Areas in the northwest and western portions of Arvada are made up of open space, lakes and recreational attributes. These areas are exposed to high winds and blowing snow and precipitation. While wind shields and sandbags are deployed by Arvada Traffic and Transportation Division of Public Works-Maintenance during adverse weather to these key areas, engineered infrastructure investments are necessary for long term solutions. Without a permanent barrier solution to shield properties and roadways, Arvada and Jefferson County residents living along this Front Range area as well as the traveling public, will continue to be

affected by the rapidly changing weather conditions. This project mitigates impacts from windstorms and winter storms.

Other Alternatives: Maintenance is currently using snow/wind shields and sandbags as a short term solution.

Responsible Office: City of Arvada – Traffic and Transportation Division of Public Works

Priority (High, Medium, Low): Medium

Cost Estimate: The City would need an engineered study on potential alternatives with the highest benefit to cost ratio for consideration.

Benefits (Avoided Losses): Reduction in soil erosion, transportation accidents, stranded travelers needing shelter during blizzard conditions and road closure, enhanced protection for railway transportation.

Potential Funding: To be determined.

Schedule: To be determined and contingent on schedule

STATUS: Implemented and ongoing

5. Road Weather Information System (RWIS)

Issue/Background: To reduce congestion and enhance roadway operational safety, the City of Arvada is interested in placing data stations on high volume arterials that are most vulnerable to adverse weather conditions and traffic collisions. Data Stations, similar to those operated by CDOT, will provide Street Maintenance and the Transportation Division with information pertaining to traffic flow, pavement condition, and weather temperatures to better manage City resources and communicate with roadway travelers. Each station will be equipped with the following elements:

- *Traffic Cameras:* will be used to visually verify traffic incidents, debris/blocked roadways, and pavement surface.
- *Maintenance Decision Support System (MDSS):* will be used to notify plow trucks of pavement conditions and determine amount of resources necessary to mitigate ice and snow.
- *Traffic Data Collection Device:* used to calculate volumes, speed, and lane occupancy that can be mapped and communicated to the traveling public.
- *Communication Device:* fiber or radio connection to TMC and Street Maintenance.
- *Power:* photovoltaic equipment and batteries, or metered electric power.

Other Alternatives: To be determined

Responsible Office: City of Arvada – Traffic and Transportation Division of Public Works

Priority (High, Medium, Low): High

Cost Estimate: \$50,000 X 5 (Stations: West 86th Pkwy, West 58th Ave, Kipling Pkwy, West 64th Avenue, and West 72nd Avenue corridors).

Benefits (Avoided Losses): The City of Arvada manages 1,500 miles of pavement surface. The selected arterial corridors have an AADT higher than 9,000 vehicles and connect Arvada collector streets (neighborhoods) to State Highways in northwest metro area. The City can enhance roadway operations and improve regional trips by monitoring traffic and weather data to reduce the impact of incidents and weather related delays.

Project Benefits*

- 1) *Data Analysis:* the computerized system will extensively collect traffic data, allowing City Staff to measure volumes, speeds, and develop traffic models. Traffic Operations and Street Maintenance would share real-time data to monitor road conditions during adverse weather.
- 2) *Maintenance Operations:* based on pavement and weather information, Snow Dispatch would direct maintenance crews to respond more effectively to trouble areas for snow and ice removal, lessening pollutant emissions and energy consumption.
- 3) *Traffic Operation:* early response to collisions and adverse weather will result in travel-time savings and increased traffic flow. Monitoring roadways will allow the traffic team to implement safety and operational adjustments, maximizing person throughput for greater roadway efficiency.

* DRCOG measurement format will be used to calculate: travel-time savings (hours/day), fuel economy (gal/day), emission reductions (lb/day), and user savings (dollars/day).

Potential Funding: To be determined

Schedule: To be determined

STATUS: This project has been deferred due to other priorities and the need to identify funding. The City of Arvada closely monitors weather information from various sources and our Public Works Department aggressively maintains Arvada streets during inclement weather.

6. Continue to Implement Sound Floodplain Management Practices through Participation in the National Flood Insurance Program

Hazards Addressed: Flood

Issue/Background: The City of Arvada participates in the National Flood Insurance Program. The city also participates in the Community Rating System and is a CRS Class 5. This project restates the commitment of the City of Arvada to implement sound floodplain management

practices, as stated in the floodplain ordinance. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits for appropriate development in Special Flood Hazard Areas and ensuring that this development is elevated to or above the base flood elevation. This project also includes periodic reviews of the floodplain ordinance to ensure that it is clear and up to date. Floodplain managers will remain current on NFIP policies, and are encouraged to attend appropriate training and consider achieving Certified Floodplain Manager (CFM) status. Currently three staff members have their CFM.

Other activities that could be included in this effort are:

- Ensure that stop work orders and other means of compliance are being used as authorized by each ordinance;
- Suggest changes to improve enforcement of and compliance with regulations and programs;
- Participate in Flood Insurance Rate Map updates by adopting new maps or amendments to maps;
- Utilize recently completed Digital Flood Insurance Rate maps in conjunction with GIS to improve floodplain management, such as improved risk assessment and tracking of floodplain permits;
- Promote and disperse information on the benefits of flood insurance, with assistance from partners such as the County, Urban Drainage and Flood Control District, and Colorado Water Conservation Board;
- Evaluate activities that will improve Community Rating System ratings that may further lower the cost of flood insurance for residents.

Other Alternatives: No action

Responsible Office: Engineering Division

Priority (High, Medium, Low):

Cost Estimate: Low

Potential Funding: Covered in existing budget

Benefits (avoided losses): Reduced property loss from floods and continued availability of flood insurance for residents; as a CRS participant residents will have lowered flood insurance rates.

Schedule: Continuing as an ongoing initiative

STATUS: In 2015, the City of Arvada updated its flood plain regulation ordinance in the NFIP CRS Program. Arvada continues its Class 5 ranking which puts it in one of the top 5% of cities nationwide.

1.1 Community Profile

1.1.1 History

The City of Edgewater is a Home Rule Municipality located in Jefferson County, Colorado, United States. Edgewater is located immediately west of Denver, in the Denver-Aurora-Lakewood, CO Metropolitan Statistical Area. In 1861, Thomas Sloan decided to dig a well on his land in the Colorado Territory. Sloan came to Arapahoe County (now Denver County) with aspirations of farming. The spot he chose was about two miles west of the growing settlement of Denver where he proceeded to dig a well for the irrigation of his farm and tapped into a warm water spring. Overnight his well filled and continued flowing until nearly 200 acres were flooded and the resulting lake became known as Sloan's Lake, the name it bears today.

Ruth Wiberg recounts in Rediscovering Northwest Denver, "Word of the gushing well spread to the fledgling town of Denver. People rode out on horseback to see the phenomenon of farmer Sloan's well and talked as they watched the water spread." George F. Turner, an old stage driver for the C.O.C. & P.P.E., states in the Denver Post (October 20, 1908) that the lake's formation occurred between June 1861 (when he left the area) and early 1863 (when he returned). E. J. Stanton a reputable engineer drove by the Sloan farm and viewed the formation of the lake. Further verification of the lake was by Mayor Sopris and Alderman Gove. They stated they had been out to the lake and saw the well was overflowing.

The area just west of Sloan's Lake soon became known as "Edgewater" due to its close proximity to the lake. At the time, however, there was nothing in the Edgewater area but a few fishing shacks. According to the Western History Department of the Denver Public Library, the county line between Jefferson and Arapahoe Counties (later to become Denver County) became known as Sheridan Boulevard and was developed as a route to Fort Sheridan, which subsequently became known as Fort Logan. In 1887 President Cleveland signed a bill to provide a military post on a tract of land in the Denver area. Eleven sites were approved for the consideration of General Sheridan. The preference of Denverites was a section of land adjacent to Sloan's Lake as it was pointed out it would be easier to "keep away the saloons and other nuisances" if the camp was close to Denver. General Sheridan and his party came to Denver and spent four days touring proposed tracts. His selection was the Johnson Tract, located about eight and half miles from Union Station. At this time the post was officially labeled "Camp Near the City of Denver", later called Sheridan Post or Fort Sheridan. On April 8, 1889 the post was officially named Fort Logan, which it remains to this day.

Edgewater incorporated as a City on August 17, 1901.

1.1.2 Population

The U. S. Census Bureau’s estimated 2014 population of Edgewater was 5,289. Select Census demographic and social characteristics for Edgewater are shown in Table 1. The City of Edgewater has a senior citizen complex at Edgewater Plaza.

Table 1. Edgewater’s Demographic and Social Characteristics

Characteristic	
Gender/Age	
Male (%)	48.5
Female (%)	51.5
Under 5 Years (%)	8.1
65 Years and Over (%)	9.8
Race/Ethnicity (one race)	
White (%)	75.6
Hispanic or Latino (Of Any Race) (%)	44.7
Other	
Average Household Size	2.11
High School Graduate or Higher (%)	87.9

Source: U.S. Census Bureau, www.census.gov/

1.1.3 Economy

According to the 2013 American Community Survey, the industries that employed most of Edgewater’s labor force were: educational, health, and social services (20.2%); arts, recreation and accommodation (17.5%) and professional scientific management, and administrative waste management services (13.6%). Select economic characteristics for Edgewater from the 2013 American Community Survey are shown in Table 2.

Table 2. Edgewater’s Economic Characteristics

Characteristic	
Families below Poverty Level, 2013	11.1%
Individuals below Poverty Level, 2013	16.0%
Median Value of Owner Occupied Units (2009-2013)	\$202,100
Median Household Income, 2013	\$43,594
Per Capita Income, 2013	\$23,988
Population in Labor Force 2013	3,229
Unemployment (%)*	12.3%

Source: U.S. Census Bureau, FactFinder.census.gov

1.2 Hazard Summary

A hazard identification and vulnerability analysis was completed for the City of Edgewater using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County. Information from the Data Collection Guide is summarized in Table 3 with all the hazards listed that could impact anywhere in Jefferson County. The purpose of this exercise was to identify and rank the hazards and vulnerabilities unique to the jurisdiction.

For this plan update, the City of Edgewater's planning team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the City of Edgewater.

The data in Table 3 reflect the most significant hazards for the City of Edgewater. These fall into the 'medium' category. They are: dam failure, earthquake, extreme temperatures, flood, severe winter storms and tornadoes.

The hazard significance listed is based on City of Edgewater's HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (refer to Chapter 4 of the base plan). The risk assessment was a more detailed qualitative analysis with better available data that varied.

Table 3. City of Edgewater – Hazard Summaries

Hazard	Potential of Occurrence	Geographic Extent	Potential Magnitude	Overall Significance	Hazard Map? (Paper/GIS/ Source)
Avalanche	Unlikely	Extensive	Negligible	Low	N
Dam Failure	Occasional	Extensive	Catastrophic	Medium	N
Drought	Occasional	Extensive	Negligible	Low	N
Earthquake	Unlikely	Extensive	Critical	Medium	N
Erosion and Deposition	Likely	Extensive	Limited	Low	N
Expansive Soils	Unlikely	Extensive	Negligible	Low	N
Extreme Temperatures	Occasional	Extensive	Critical	Medium	N
Flood	Highly Likely	Extensive	Critical	High	N
Hailstorm	Likely	Extensive	Negligible	Low	N
Landslide, Debris flow, Rockfall	Unlikely	Extensive	Negligible	Low	N
Lightning	Unlikely	Extensive	Negligible	Low	N
Severe Winter Storms	Likely	Extensive	Limited	Medium	N
Subsidence	Unlikely	Extensive	Negligible	Low	N
Tornado	Occasional	Extensive	Negligible	Medium	N
Wildfire	Unlikely	Extensive	Negligible	Low	N
Windstorm	Occasional	Extensive	Limited	Low	N
Frequency of Occurrence: Highly Likely: Near 100% probability in next year. Likely: Between 10 and 100% probability in next year or at least one chance in ten years. Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years. Unlikely: Less than 1% probability in next 100 years.		Potential Magnitude: Catastrophic: Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50% of property is severely damaged Critical: Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 25% of property is severely damaged Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged Negligible: Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.			
Spatial Extent: Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		Significance: Low, Medium, High			

Previous Hazard Events

Through the Data Collection Guide, the City of Edgewater noted specific historic hazard events to include in the community profile. These events have been incorporated into the appropriate hazard chapters in the base plan. These events had a particular impact on the community beyond the impacts and events recorded in the Jefferson County Hazard Mitigation Plan. This is not a comprehensive summary of past incidents, as the hazard profiles collected in the main Mitigation Plan include other events that may have historically impacted the jurisdiction.

The events noted by this jurisdiction in the Data Collection Guide include:

1974 Flood

The Edgewater Four Score History Book records the events of the 1974 flood that struck Edgewater. Extensive flooding struck the city, with the worst damage at 20th and Harlan. Two deaths were reported as a result of this flood.

1999 Flood

Flooding and flash flooding problems developed over portions of the Urban Corridor as slow moving thunderstorms dumped anywhere from 2 to 3.5 inches of rainfall in approximately 3 hours. The 1700 block of Sheridan was extensively flooded. Power outages were reported. No injuries or deaths occurred in Edgewater.

March 2003 Blizzard

A very moist, intense and slow moving Pacific storm system made its way across the four corners area and into southeastern Colorado from March 17th to the 19th, allowing for a deep easterly upslope flow to form along the Front Range. Up to three feet of snow fell. The heavy wet snow caused roofs of homes and businesses to collapse across the Urban Corridor. The snow also downed trees, branches and power lines. Up to 135,000 people lost power at some point during the storms and it took several days, in some areas, to restore power. Most businesses were completely shut down for several days during the busy holiday season. In fact, there was a near shutdown of the entire city for several days.

December 2006 Blizzards

Back to back blizzards struck the city a week apart in late December of 2006. The first blizzard, on December 20, struck as a result of a slow moving low pressure system that moved from the Desert Southwest into Southeastern Colorado. As a result, a deep upslope flow developed along the Front Range and Northeast Plains of Colorado. One to two feet of snow were recorded. On December 28, another slow moving storm system moved from the Desert Southwest and into the Texas Panhandle. As it did, a deep easterly upslope flow occurred along the Front Range, with blizzard conditions developing over portions of the Northeast Plains of Colorado, mainly south of Interstate 76. The heaviest snow fell along east facing slopes with storm totals up to 2 1/2 feet in the North Central Mountains and Front Range Foothills.

October 1994 Hailstorm

A band of hail struck Edgewater on October 1, 1994. 1.5" diameter hail struck the entire City. Extensive damage was done to automobiles and homes in the Edgewater area. This storm caused \$225 million in damages in Edgewater and the surrounding area. At the time, this was the third most costly storm in Colorado history.

Vulnerability to Specific Hazards

This section details vulnerability to specific hazards, where quantifiable, and where it differs from that of the overall County. The results of detailed GIS analyses used to estimate potential for future losses are presented here, in addition to maps of hazard areas. For a discussion of the methodology used to develop the loss estimates refer to Section 4.3 of the Base Plan.

Flood

According to the GIS vulnerability assessment conducted for this plan update, Edgewater has some risk of economic losses due to flooding. Note that this is based on computer modeling that may not reflect site specific mitigation activities.

According to the analysis Edgewater has a mix of residential and commercial structures potentially at-risk. Figure 1 depicts the FEMA flood zones (1% annual chance and 0.2% annual chance) as well as all the at-risk properties in Edgewater.

Table 4 shows the parcels and buildings at risk to the 1% annual chance flood and Table 5 shows the values at risk in the same flood scenario. For this analysis, content values were estimated based on prevailing land use and a multiplier was applied to building and content values to estimate losses to each. See Section 4 Hazard Profiles for details on methodology. According to the analysis, 64 buildings (58 of which are residential) are at risk, totaling \$9.4M of damage to buildings and contents.

According to this analysis, there are no improved parcels at risk to the 0.2% annual chance flood.

Table 4. City of Edgewater Buildings At-Risk to 1% Annual Chance Flood

Jurisdiction	Property Type	Improved Parcels	Building Count
Edgewater	Exempt	3	2
	Mixed Use	2	7
	Residential	53	55
	Total	58	64

Source: Jefferson County Assessor (October 2015)

Table 5. City of Edgewater Values At-Risk to 1% Annual Chance Flood

Property Type	Improved Value	Content Value	Total Value	Structure Loss	Content Loss	Total Loss Estimate
Exempt	\$8,174,500	\$8,174,500	\$16,349,000	\$1,961,880	\$3,433,290	\$5,395,170
Mixed Use	\$732,200	\$732,200	\$1,464,400	\$175,728	\$307,524	\$483,252
Residential	\$9,162,880	\$4,581,440	\$13,744,320	\$2,748,864	\$778,845	\$3,527,709
Total	\$18,069,580	\$13,488,140	\$31,557,720	\$4,886,472	\$4,519,659	\$9,406,131

Source: Jefferson County Assessor¹ (October 2015)

GIS analysis showed that there is 1 critical facility in the 1% annual chance flood zone and no critical facilities in the 0.2% annual chance flood zone, see Table 6.

Table 6. City of Edgewater Critical Facilities in 1% Annual Chance Floodplain

Jurisdiction	Category	Facility Type	Facility Count
Edgewater	High Potential Loss Facilities	Government Facility	1
	Total		1

Source: Jefferson County Assessor (October 2015) HSIP Freedom 2015 and HAZUS 2.2

¹ The Assessor's Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values. The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values (typically 50% for residential structures, 100% for commercial, 100% for agricultural, 150% for industrial, 100% for mixed use and 100% for exempt.)

Figure 1. City of Edgewater Flood Hazard and At-Risk Properties

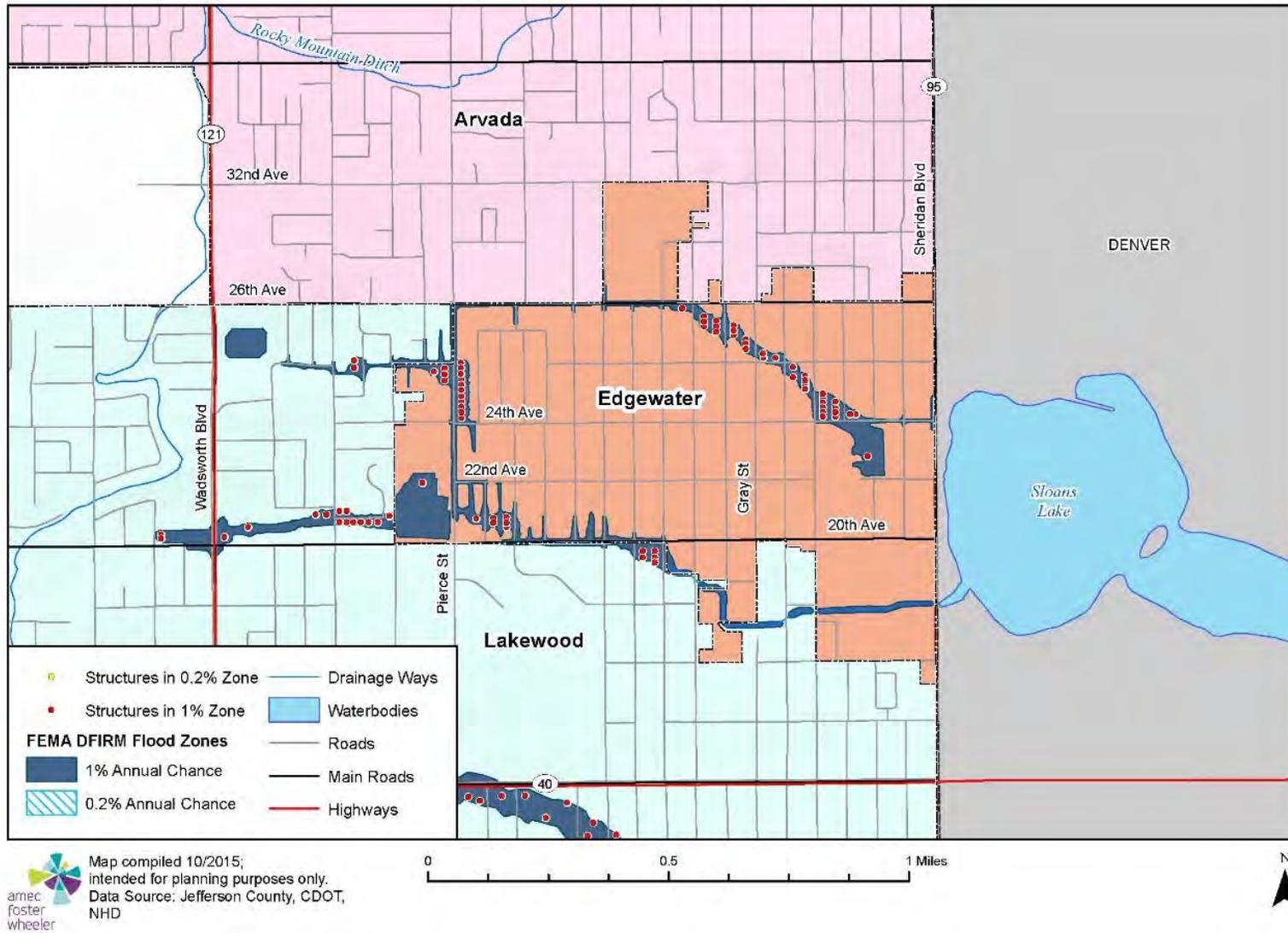
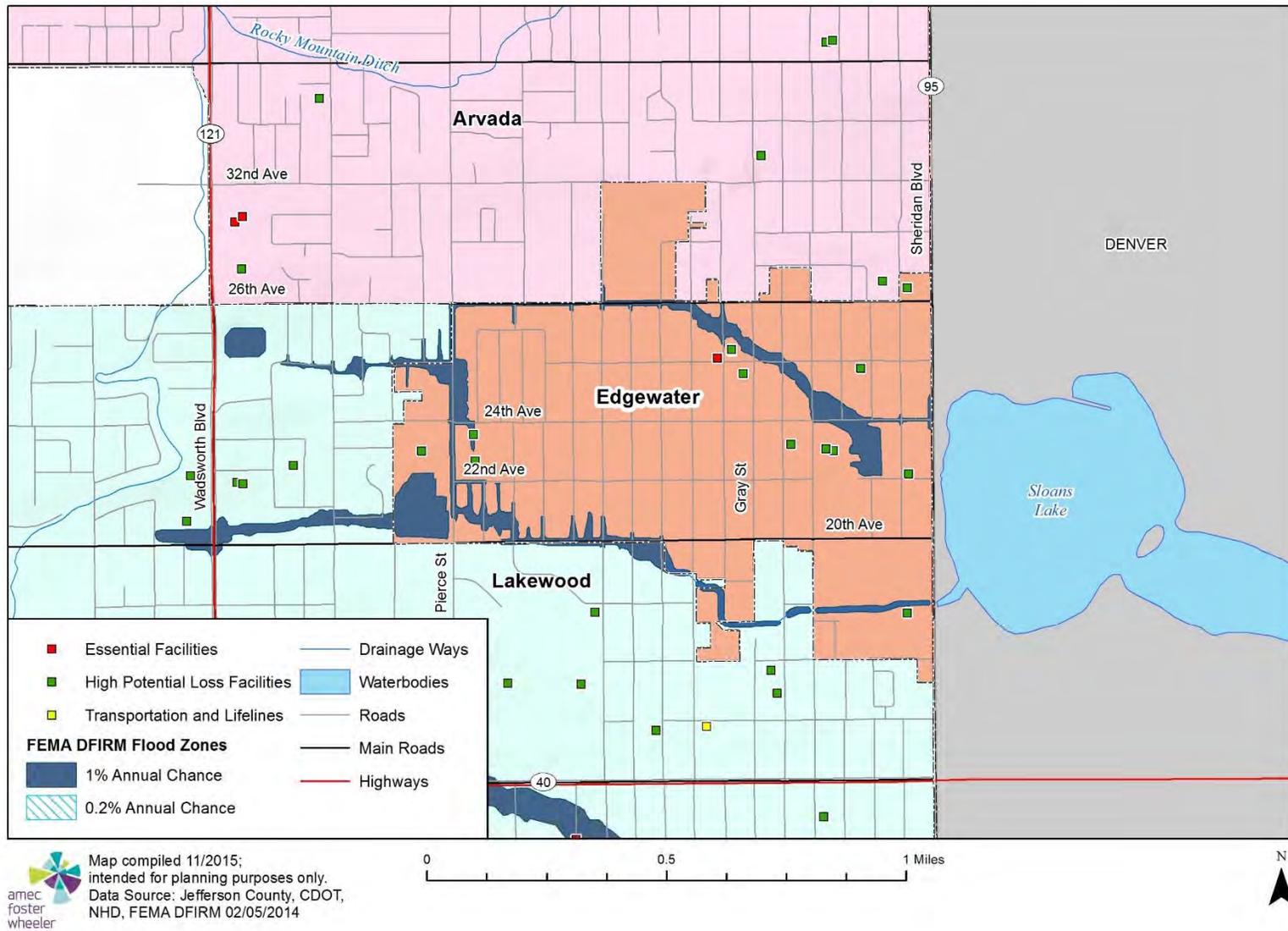


Figure 2. City of Edgewater Flood Hazard and Critical Facilities



Wildfire

There is no wildfire risk in Edgewater.

Other Hazards

The city of Edgewater is not at risk to dam failure or other geologic hazards such as rockfall, subsidence or dipping bedrock.

In the case of other hazards that are not specific to geography such as drought, hailstorms, winter storms, lightning, tornado, and windstorm the entire building inventory and population in the City is potentially exposed. That is the reason for the asset inventory provided in Section 1.3. It should be noted that no hazard in this plan is expected to cause widespread impacts to this inventory.

1.3 Asset Inventory

1.3.1 Property Inventory

Table 7 represents an inventory of property in Edgewater based on the Jefferson County Assessor’s data as of October 2015.

Table 7. City of Edgewater’s Property Inventory

Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Commercial	39	62	\$30,995,000	\$30,995,000	\$61,990,000
Exempt	28	34	\$23,784,800	\$23,784,800	\$47,569,600
Industrial	1	1	\$298,500	\$447,750	\$746,250
Mixed Use	35	230	\$46,015,190	\$46,015,190	\$92,030,380
Residential	1,342	1,456	\$240,894,880	\$120,447,440	\$361,342,320
Total	1,445	1,783	\$341,988,370	\$221,690,180	\$563,678,550

Source: Jefferson County Assessor

*The Assessor's Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values.

**The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values (typically 50% for residential structures and 100% for commercial/industrial)

1.3.2 Other Assets

Table 8 is a detailed inventory of assets identified by the City’s planning team. This inventory includes critical facilities. For more information about how “critical facility” is defined in this plan, see Section 4.3 Vulnerability Assessment.

Table 8. City of Edgewater's Assets

Name of Asset	Type	Replacement Value (\$)	Occupancy/ Capacity #	Hazard Specific Info
Edgewater PD	E/EF	\$700,000	20	
Edgewater Municipal Building	E/EF	\$1,400,000	50	
Edgewater PD Investigations	E/EF	\$1,000,000	15	
Edgewater FD	E/EF	\$700,000	15	
Edgewater Public Works	E/EF	\$400,000	10	
Jefferson High School	VF/HPLF	\$5,000,000	1000	
Edgewater Elementary	VF/HPLF	\$5,000,000	700	
Lumberg Elementary	VF/HPLF	\$5,000,000	700	
Edgewater Plaza	VF/HPLF	\$15,000,000	500	
Tiny Hearts. Daycare	VF/HPLF	\$200,000	40	
Lightway at Sloans Daycare	VF/HPLF	\$200,000	25	
Edgewater Marketplace	VF/HPLF, EF	\$20,000,000	1500	Flooding
Edgewater Heritage Center	HA	\$750,000	100	

*EI: Essential Infrastructure; EF: Essential Facilities; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: natural assets

Many of the facilities listed above are also in GIS databases provided by the City of Edgewater and Jefferson County. Critical facility counts and types are shown in Table 9 and in the map in Figure 1. Shelters may be in facilities such as schools or recreation centers and are not indicated on the map.

Table 9. Summary of Edgewater's Critical Facilities in GIS

Category	Facility Type	Facility Count
Essential Facilities	Fire Station	1
	Law Enforcement	1
	Total	2
High Potential Loss Facilities	Day Care Center	3
	Government Facility	4
	Long Term Care Facility	2
	PK-12 School	3
	Total	12
	Grand Total	14

Source: Jefferson County

1.3.3 Natural, Cultural, and Historic Resources

Assessing the vulnerability of Edgewater to disaster also involves inventory of the natural, historical, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Natural Resources

The City of Edgewater operates four community parks throughout Edgewater. Citizen's Park is a five acre multi-use park located eastern portion of the city. Amenities located in Citizen's Park include a ball field, picnic pavilion, horse-shoe courts and a small playground. Walker Branch Park is a 13-acre park located on the southern border of Edgewater. This park is shared with the City of Lakewood. Memorial Park is a small pocket park approximately a quarter of an acre in size with picnic areas. Heritage Center Park is located to the north of the Heritage Center. For information about natural resources in Jefferson County, which includes Edgewater, see Section 4.3 Vulnerability Assessment.

Historic and Cultural Resources

There are no properties in Edgewater that are on the National Register of Historic Places and/or the Colorado State Register of Historic Properties (for more information about these registers, see Section 4.3 Vulnerability Assessment).

The National Park Service administers two programs that recognize the importance of historic resources, specifically those pertaining to architecture and engineering. While inclusion in these programs does not give these structures any sort of protection, they are valuable historic assets. There are currently no Historic American Building Survey (HABS) or Historic American Engineering Record (HAER) buildings in the City of Edgewater.

The City of Edgewater currently has 2 designated historic structures located in the City. A structure may be designated for preservation if it has historical, architectural, or geographical importance to the community. Table 10 lists Edgewater's designated historic landmarks.

Table 10. Additional Historic Landmarks in Edgewater

Property	Address
Orum House	2444 Depew Street
Edgewater Heritage Center	W. 25 th and Chase Street

Source: City of Edgewater

It should be noted that as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

1.4 Growth and Development Trends

Table 11 illustrates how Edgewater has grown in terms of population and number of housing units between 2010 and 2014 (or the most recently available data). The table illustrates that while Edgewater’s population is not growing very much, there is some housing construction and infill development.

Table 11. City of Edgewater’s Change in Population and Housing Units, 2010-2014

2010 Population	2014 Population Estimate	Estimated Percent Change 2010-2014	2010 # of Housing Units	2013 Estimated # of Housing Units	Estimated Percent Change 2010-2014
5,159	5,289	+2.5%	2,436	2,592	+6.4%

Source: <http://factfinder.census.gov/>

1.5 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes Edgewater’s regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities and then discusses these capabilities in further detail along with other mitigation efforts as they pertain to the National Flood Insurance Program’s Community Rating System (CRS). Although the CRS is flood-focused, this discussion also incorporates activities related to other hazards into the categories established by the CRS.

1.5.1 Mitigation Capabilities Summary

Table 12 lists planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Edgewater.

Table 12. City of Edgewater’s Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General or Comprehensive plan	Y	2013
Zoning ordinance	Y	Chapter 16
Subdivision ordinance	Y	Chapter 17
Growth management ordinance	N	
Floodplain ordinance	Y	Chapter 16 (Updated 2/15)
Other special purpose ordinance (steep slope, wildfire)	N	Section 16, art. 29
Building code	Y	IBC 2009, Article 2
Fire department ISO rating	Y	Class 2
Erosion or sediment control program	Y	Article 16, Section 23
Stormwater management program	Y	Article 29
Site plan review requirements	Y	Ongoing
Capital improvements plan	Y	Ongoing
Economic development plan	N	Part of comp. plan (Economic Plan of 2012)
Local emergency operations plan	Y	Police Department has a disaster plan-2007 ; Part of CodeRED in JeffCo
Other special plans	N	
Flood insurance study or other engineering study for streams	Y	February 2014
Elevation certificates (for floodplain development)	N	
BCEGS Ratings (1-10, 1 being best)	Y	Personal (1 and 2 family dwellings) 99 Commercial (all other buildings) 99 99 = Not Rated (2006)
Other	N	

Source: www.municode.com/library/co/edgewater, <http://ngazette.com/index.php/latest-issue/edgewater-city-news/1025-outstanding-performance>

Table 13 identifies the personnel responsible for mitigation and loss prevention activities as well as related data and systems in Edgewater.

Table 13. City of Edgewater’s Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Y	Part-time City Planner Contract Labor: Diamond Back Engineering	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Y	Contract Labor: Diamond Back Engineering	
Planner/engineer/scientist with an understanding of natural hazards	Y	Part-time City Planner Contract Labor: Diamond Back Engineering	
Personnel skilled in GIS	Y	Contract GIS through Diamond Back	
Full time building official	N		
Floodplain manager	N		
Emergency manager	N		
Grant writer	N		
Other personnel	N		
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	N		
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	N		
Other	N		
Planner/engineer with knowledge of land development/land management practices	Y	Part-time City Planner Contract Labor: Diamond Back Engineering	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Y	Contract Labor: Diamond Back Engineering	

Table 14 identifies financial tools or resources that Edgewater could potentially use to help fund mitigation activities.

Table 14. City of Edgewater’s Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Y	
Capital improvements project funding	N	
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	N	
Incur debt through general obligation bonds	Y	
Incur debt through special tax bonds	Y	
Incur debt through private activities	N	
Withhold spending in hazard-prone areas	N	

1.5.2 Additional Capabilities

- Prior pandemic preparedness (Police Department)
- Police Department has done disaster plans/planning

1.5.3 Community Rating System Activities (All Hazards)

National Flood Insurance Program

The City of Edgewater joined the National Flood Insurance Program (NFIP) on August 15, 1989. The NFIP allows private property owners to purchase affordable flood insurance and enables the community to retain its eligibility to receive certain federally backed monies and disaster relief funds. The Community Rating System CRS is a voluntary program for NFIP-participating communities. It provides flood insurance discounts to policyholders in communities that provide extra measures of flood above the minimum NFIP requirements. As of September 2015, Edgewater does not participate in the CRS.

NFIP insurance data indicates that as of September 2015, there were 42 (up from 35 in 2009) policies in force in Edgewater, resulting in \$8,859,200 (was \$7.7M in 2009) of insurance in force. In Edgewater, there have been 25 (up from 23 in 2009) historical claims for flood losses totaling \$51,637. There are no repetitive or severe repetitive loss structures as defined by the NFIP.

Mapping: Edgewater’s initial Flood Insurance Rate Map became effective on 8/15/89. The most current Digital Flood Insurance Rate Maps were updated and became effective on 2/5/14.

The municipal code has been updated to reflect the current mapping. Digital map products are used for floodplain management.

The Edgewater Comprehensive Plan 2013

The City of Edgewater has published a comprehensive plan to guide the City in making decisions and to establish its future direction. The goals and policies contained within the plan cover a broad range of subject matter related to services, issues, and geographic areas within the community. Combined, these elements serve to direct future policy decisions to preserve vital community attributes and service levels and manage growth.

The following excerpts are goals and related policies that are relevant to this hazard mitigation plan.

Community Character and Design: Goal 3 – *Enhance the sustainability and appearance of the community through natural amenities in neighborhoods and commercial corridors.*

- Increase tree canopy cover
- Encourage landscaping that improves storm water management through low impact design

Public Services and Infrastructure: Goal 2 – *Ensure that adequate infrastructure and public services are available.*

- Accommodate future growth and redevelopment without burdening the existing infrastructure system

Public Services and Infrastructure: Goal 3 – *Promote and support programs and investments that increase sustainability.*

- Reduce the impact of storm runoff and water quality within city neighborhoods and adjacent communities
- Create a storm water management plan that establishes guidelines for on-site treatment of storm water

1.6 Mitigation Actions

This section of provides updates on the actions identified in the 2010 Jefferson County Hazard Mitigation Plan and any new actions identified in 2015.

1. Continue to Implement Sound Floodplain Management Practices through Participation in the National Flood Insurance Program

Hazards Addressed: Flood

Issue/Background: The City of Edgewater participates in the National Flood Insurance Program. This project restates the commitment of City of Edgewater to implement sound floodplain management practices, as stated in the flood damage prevention ordinance. This includes ongoing activities such as enforcing local floodplain development regulations. This project also includes periodic reviews of the floodplain ordinance to ensure that it is clear and up to date.

Other Alternatives: No action

Responsible Office: City Engineer's Office

Priority (High, Medium, Low): High

Cost Estimate: Low

Potential Funding: Covered in existing budget

Benefits (avoided losses): Reduced property loss from floods, continued availability of flood insurance for residents.

Schedule: Ongoing with activities implemented annually or as needed during development review.

STATUS: The City of Edgewater updated its municipal code (Section 16-23-10) to reflect the information on the updated (2/5/14) flood maps.

2. Coordinate Management with the Urban Drainage Flood Control District on the Storm Water Drainage Detention Basins

Hazards Addressed: Flood

Issue/Background: The City of Edgewater has, over the past 20 years, mitigated flooding by a drainage project that includes holding areas for water and a drainage canal. This is part of a larger project run by the Urban Drainage and Flood Control District.

Other Alternatives: No action.

Responsible Office: City Engineer's Office

Priority (High, Medium, Low): High

Cost Estimate: Low

Potential Funding: Covered in existing budget.

Benefits (Losses Avoided): Reduced property loss from floods.

Schedule: Ongoing

STATUS: Ongoing with more improvements in 2016-2020

3. Continued Validation of Flood Response Protocol Identified in the NIMS Compliant Emergency Operations Plan of 2007 through Practical Training and Exercises Design.

Hazards Addressed: Flood

Issue/Background: The city also adopted a NIMS compliant emergency operations plan in 2007 that specifically addresses the City's response to flooding.

Other Alternatives: No action.

Responsible Office: City Engineer's Office

Priority (High, Medium, Low): High

Cost Estimate: Low

Potential Funding: Covered in existing budget.

Benefits (Losses Avoided): Reduced property loss from floods.

Schedule: Ongoing

STATUS: Ongoing



1.1 Community Profile

1.1.1 History

The historic City of Golden is the Home Rule Municipality that is the county seat of Jefferson County, Colorado, United States. Golden lies along Clear Creek at the base of the Front Range of the Rocky Mountains.

Established as a gold rush town, Golden quickly became a leading economic and political center of the region, being a center of trade between the gold fields and the east, a crossroads and gateway of important roads leading to the mountains, and a center of area industry. By the close of 1860, Golden City had been popularly elected the seat of Jefferson County and was the capital of the provisional Jefferson Territory. While the town lost much of its populace and leading citizenry during the American Civil War for several reasons ranging from military to economic, Golden became capital of the federally recognized Colorado Territory in 1862, continuing as such until 1867. Golden became the “Lowell of the West”, a regional center of trade and industry that boasted at certain points in time three flour mills, five smelters, the first railroad into the Colorado mountains, the Coors Brewery, brick works, the only paper mill west of Missouri, clay and coal mines, and more. During the 1870s it became home to three institutions of higher education, the Colorado University Schools of which the Colorado School of Mines remains today. Golden was also home to an opera house and seven churches including Colorado’s third (Methodist) church, oldest Baptist church, likely oldest Christian (Disciples of Christ) church, and first Swedish immigrant (Lutheran) church. The town was home to sizable populations of German, Swedish, Italian and Chinese immigrants; five immigrants became mayors of Golden.

Until the early 20th century Golden maintained a small town population of around 2,500 people. Several industries faded or were destroyed by tragic events, but others flourished to continue Golden’s industrial legacy including its brewing, brickmaking, clay mining and porcelain industries. Golden became even more connected through mass transit, with two trolley lines extending to Denver, while the movie theater gradually took the place of the opera house for downtown entertainment. Downtown revitalization efforts began in the 1920s with its first streetscape and ornamental lighting project and urban renewal on its north and east, anchored by new senior high and grade schools. The historic cultural tension between the city’s north and south sides gradually eased, and the town successfully endured additional major economic depressions including the Silver Crash of 1893 and the Great Depression. The School of Mines gained a worldwide academic reputation, Coors rapidly came to the forefront of the national and international brewing and ceramics industries, and the city modernized with a recreation center, paved streets and more.

After World War II Golden boomed, rapidly gaining population, size and economy. In 1959 the town nearly tripled in geographic size overnight when it annexed large properties to the south including the new Magic Mountain theme park, one of the earliest entertainment attractions of its kind. A number of new subdivisions were built and public infrastructure was modernized including new buildings for the senior high school, city hall, recreation center, library, museum and central fire and police stations. Also built were new downtown anchors including department stores and grocery stores, several new church buildings, new county offices, and the Horizon Plan which transformed the School of Mines. The oil crash and near simultaneous failure of several downtown anchors placed its central business district into recession by the 1980s, and the downtown was revitalized again through various initiatives including its second streetscaping project in 1992. In 1993 the old Golden High School building was converted into the American Mountaineering Center making Golden a premier research and education hub for mountaineering. The Coors Brewery had become the largest single site brewery in the world, its Porcelain subsidiary among the foremost of its kind in the world, and Golden became home to the National Renewable Energy Laboratory. Today Golden has a population of over 17,000 people and is home to more people and businesses of national and international influence than ever before, yet maintains a small town historic identity.

1.1.2 Population

The U. S Census Bureau’s estimated 2014 population of Golden was 20,201. Select Census and American Community Survey demographic and social characteristics for Golden are shown in Table 1.

Table 1. Golden’s Demographic and Social Characteristics

Characteristic	
Gender/Age	
Male (%)	56.7
Female (%)	43.3
Under 5 Years (%)	5
65 Years and Over (%)	9.1
Race/Ethnicity (one race)	
White (%)	90.2
Hispanic or Latino (Of Any Race) (%)	9.7
Other	
Average Household Size	2.28
High School Graduate or Higher (%)	94.5

Source: U.S. Census Bureau, www.census.gov/

1.1.3 Economy

According to the 2013 American Community Survey, the industries that employed most of Golden’s labor force were educational, health, and social services (27%); professional, scientific, management, administrative, and waste management services (15.8%); and arts, entertainment, recreation and accommodation (9.2%). Select economic characteristics for Golden from the 2013 American Community Survey are shown in Table 2.

Table 2. Golden’s Economic Characteristics

Characteristic	
Families below Poverty Level, 2013	6.6%
Individuals below Poverty Level, 2013	15.5%
Median Home Value, 2013	\$353,600
Median Household Income, 2013	\$57,883
Per Capita Income, 2013	\$35,465
Population in Labor Force 2013	10,040
Unemployment (%)*	7.6%

Source: U.S. Census Bureau, www.census.gov/

1.2 Hazard Summary

A hazard identification and vulnerability analysis was completed for the City of Golden using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County. Information from the Data Collection Guide is summarized in Table 3 with all the hazards listed that could impact anywhere in Jefferson County. The purpose of this exercise was to identify and rank the hazards and vulnerabilities unique to the jurisdiction.

For this plan update, the City of Golden’s planning team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the City of Golden.

The data in Table 3 reflect the most significant hazards for the City of Golden. They are: drought, extreme temperatures, flood, hailstorm, tornado, wildfire and windstorm.

The hazard significance listed is based on City of Golden HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (refer to Chapter 4 of the base plan). The risk assessment was a more detailed qualitative analysis with better available data that varied.

Table 3. City of Golden – Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance	Hazard Map? (Paper/GIS/Source)
Avalanche	Unlikely	Limited	Negligible	Low	
Dam Failure	Unlikely	Limited	Limited	Medium	Paper/GIS
Drought	Occasional	Extensive	Limited	Low	
Earthquake	Occasional	Extensive	Limited	Low	USGS
Erosion and Deposition	Likely	Limited	Negligible	Low	
Expansive Soils	Likely	Extensive	Negligible	Low	Paper
Extreme Temperatures	Unlikely	Extensive	Negligible	Low	
Flood	Occasional	Limited	Catastrophic	High	Paper/GIS
Hailstorm	Likely	Extensive	Limited	Medium	
Landslide, Debris flow, Rockfall	Likely	Limited	Limited	Low	
Lightning	Highly Likely	Limited	Negligible	Low	
Severe Winter Storms	Highly Likely	Extensive	Limited	High	Paper
Subsidence	Unlikely	Limited	Negligible	Low	Paper
Tornado	Unlikely	Significant	Catastrophic	Low	
Wildfire	Likely	Significant	Limited	High	Paper
Windstorm	Highly Likely	Extensive	Limited	High	
Frequency of Occurrence: Highly Likely: Near 100% probability in next year. Likely: Between 10 and 100% probability in next year or at least one chance in ten years. Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years. Unlikely: Less than 1% probability in next 100 years.		Potential Magnitude: Catastrophic: Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50% of property is severely damaged Critical: Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 25% of property is severely damaged Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged Negligible: Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.			
Spatial Extent: Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		Significance: Low, Medium, High			

Previous Hazard Events

The City of Golden was provided a Data Collection Guide, to note specific historic hazard events to include in the community profile. These events have been incorporated into the appropriate hazard chapters in the base plan. These events had a particular impact on the community beyond the impacts and events recorded in the Jefferson County Hazard Mitigation Plan. This is not a comprehensive summary of past incidents, as the hazard profiles collected in the main Mitigation Plan include other events that may have historically impacted the jurisdiction.

1896 Flood – A flood, profiled in the base plan, struck the towns of Morrison, Golden, and Mt. Vernon. The *Golden Globe* reported “*Great cloud bursts came down from Mt. Lookout, Mt. Zion, North Table Mountain and from the steeps that enclose Tucker's Gulch. What is a cloud burst? you ask. It is a quick release by two clouds meeting, of every drop of water they contain, as sudden as if they had been emptied from a pail. Imagine a volume of water perhaps twenty feet high hundreds of feet long, and wide, suddenly emptied on a mountain slope. To those who saw the rush of waters, the sight will forever remain. Over the crest of North Table Mountain the water poured as it pours over Niagara Falls. Down the slopes of the mountains came the great wave looking like a giant roll of white mist, rolling boulders that weighed tons, as if they were spools of thread. The mighty roar as these huge monsters hurried down after their victims, was a sound besides which the roar of the Niagara Falls was dwarfed. Every reader of the newspapers knows the rest. It was awful, majestic, unreasoning and un pitying power before which human strength and human ingenuity was as a straw before the cyclone.*”

On Tucker Gulch where the western houses of Garden Street stand today Laura Edwards, 34 and a mother of two small children, had gone out to milk the cows at the family’s barn, and had no chance to escape. Downstream Andrew and Anna Johnson, a Swedish immigrant couple in their early 70s, had sat down to supper at their little cottage overlooking the gulch just back of the Treffeisen Building at the northeast corner of 10th and Ford. They too never had a chance. The photo in Figure 1 from shortly after showed no sign any house had ever been there where 3 maps had shown it before, one from earlier that same year.

Figure 1. The destruction of the 1896 Flood at 10th Street and Tucker Gulch



Source: Golden Pioneer Museum

Elsewhere in Golden, Clear Creek took out the Ford Street Bridge which had been inundated by many houses on lower 11th Street, after it had already twisted apart miles of railroad track in the canyon upstream. Between it and the waters of Tucker Gulch diverted by the Glass Works down Washington Avenue, Golden's first building, the Boston Building at today's Parfet Park, was dislodged. From here the immense storm wreaked havoc upon the South Platte, Arkansas and Rio Grande rivers, where it caused more flooding and destruction in Denver and elsewhere but fortunately claimed no more lives. At Golden the flooding continued a second day, but all escaped that too.

2011 Indian Gulch Fire – The Indian Gulch Fire, although not within the city limits of Golden had a significant impact on the Mountain Ridge neighborhood in Golden.

The fire was reported to the Golden Fire Department on March 20, 2011. The fire was originally reported as a 5-acre wildfire. Due to the rapid increasing size of the fire, direction of travel, wind and other weather conditions it was decided by the Golden fire Department that a prepare to

evacuate notice be communicated to the residents of Mountain Ridge. The fire was finally contained on March 25, 2011 after consuming nearly 2,000 acres on Mount Galbraith.

Figure 2. Indian Gulch Fire from Downtown Golden



2013 Floods – On November 12, 2013 Golden Police received a weather alert from the National Weather Service concerning a flood warning. The alert described flood stage as 10 feet with an expectation for water to rise to 11.5 feet by the next morning. It mentioned water overflowing into the “RV Park near highways 6 and 58.”

Decisions were made to close and evacuate the Clear Creek RV Park, prepare to sandbag or create a berm to protect the city water treatment plant and to move police department vehicles from the city hall lot, dispersing them to separate sides of Clear Creek.

After the RV Park notifications were made, police dispatch sent out a CodeRED notification alerting citizens about possible flooding. The notification was sent to registered houses and numbers from the north side of 10th Street to the south side of 9th Street between Washington Avenue and Maple Streets. The event was short lived; water did rise into the RV Park but caused no damage

On December 10, 2013 city officials ordered a number of residents along Clear Creek to evacuate amid fears of flooding. Mandatory evacuations were ordered after melting ice dams unleashed a

wall of water estimated at 4-feet high. Video taken of the initial break showed the rushing water carrying logs and large chunks of ice. Water began rising Tuesday as ice dams broke due to warmer weather. Officials at the National Weather Service in Boulder said the waters of Clear Creek rose 3 feet in 15 minutes. Evacuations were ordered for the Clear Creek RV Park and residents of a condominium complex on 6th Avenue along the creek. Evacuees were sent to the Golden Community Center.

The RV park is at the end of 10th Street and is open year-round, with 22 full hook-ups and about 12 people may have been at the park at the time of the evacuation.

Authorities contacted residents, including the MillerCoors brewery, via a CodeRed warning, sent to condominiums on 6th Avenue along the creek. The rushing waters dissipated as they left the steeper part of the canyon and caused no damage to the City of Golden.

2015 Mudslide – In May 2015, a significant sized mudslide came off the west side of North Table Mesa and into the backyard of a home on in the Mesa Meadows neighborhood. Golden Fire, Golden PD, Golden Utilities, and Coors all worked together in the recovery effort. The water came from an old irrigation type ditch that runs along the west side of the hill a short distance away from the residences. The ditch along the hill was saturated from the heavy rains and a sizeable part of the mountain slid down the hill, taking out the fence, landscaping and a basketball hoop in the backyard.

Golden Fire was able to stem the flow of water to keep it out of the house and direct it between the house to the street. They were also able to shore up and partially dig out the problem area of the ditch which prevented any more mud from sloughing off.

Coors supplied a semi-truck filled with pre-made sandbags delivered right to the driveway. Utilities came out and assisted with a front end loader to haul sandbags up the hill and do some additional mitigation to the ditch.

Figure 3. Mudslide Damage to Home in Mesa Meadows Neighborhood



Vulnerability to Specific Hazards

This section details vulnerability to specific hazards, where quantifiable, and where it differs from that of the overall County. The results of detailed GIS analyses used to estimate potential for future losses are presented here, in addition to maps of hazard areas. For a discussion of the methodology used to develop the loss estimates refer to Section 4.3 of the Base Plan.

Flood

According to the vulnerability assessment conducted using GIS, Golden has one of the higher potentials for economic loss from flooding in the County. Clear Creek flows through downtown Golden, but there is also risk from smaller drainages that cross the City. Note that this is based on computer modeling that may not reflect specific mitigation activities. Displaced populations from flooding, found in Section 4.3 are estimated at 504 individuals.

Figure 4 depicts the FEMA flood zones (1% annual chance and 0.2% annual chance) as well as all the at-risk properties in Golden.

Table 4 shows the parcels and buildings at risk to the 1% annual chance flood and Table 5 shows the values at risk in the same flood scenario. For this analysis, content values were estimated based on prevailing land use and a multiplier was applied to building and content values to estimate losses to each. See Section 4 Hazard Profiles for details on methodology. According to the analysis, 204 buildings (71 of which are residential) are at risk, totaling \$27.5 million of damage to buildings and contents.

Table 4. City of Golden Buildings At-Risk to 1% Annual Chance Flood

Property Type	Improved Parcels	Building Count
Commercial	23	25
Exempt	8	12
Industrial	5	6
Mixed Use	9	90
Residential	69	71
Total	114	204

Source: Jefferson County Assessor, October 2015

Table 5. City of Golden Values At-Risk to 1% Annual Chance Flood

Property Type	Improved Value	Content Value	Total Value	Structure Loss	Content Loss	Total Loss Estimate
Commercial	\$7,378,464	\$7,378,464	\$14,756,928	\$1,770,831	\$3,098,955	\$4,869,786
Exempt	\$18,223,400	\$18,223,400	\$36,446,800	\$4,373,616	\$7,653,828	\$12,027,444
Industrial	\$1,102,700	\$1,654,050	\$2,756,750	\$264,648	\$694,701	\$959,349
Mixed Use	\$4,542,090	\$4,542,090	\$9,084,180	\$1,090,102	\$1,907,678	\$2,997,779
Residential	\$17,482,530	\$8,741,265	\$26,223,795	\$5,244,759	\$1,486,015	\$6,730,774
Total	\$48,729,184	\$40,539,269	\$89,268,453	\$12,743,956	\$14,841,177	\$27,585,133

Source: Jefferson County Assessor, October 2015

Table 6 shows the parcels and buildings at risk to the 0.2% annual chance flood and Table 7 shows the values at risk in the same flood scenario. According to the analysis, 167 buildings (148 of which are residential) are at risk, totaling \$33.4 million of damage to buildings and contents over and above the 1% scenario.

Table 6. City of Golden Buildings At-Risk to 0.2% Annual Chance Flood

Property Type	Improved Parcels	Building Count
Commercial	6	6
Exempt	5	4
Industrial	1	5
Mixed Use	4	4
Residential	52	148
Total	68	167

Source: Jefferson County Assessor, October 2015

Table 7. City of Golden Values At-Risk to 0.2% Annual Chance Flood

Property Type	Improved Value	Content Value	Total Value	Structure Loss	Content Loss	Total Loss Estimate
Commercial	\$16,766,100	\$16,766,100	\$33,532,200	\$4,023,864	\$7,041,762	\$11,065,626
Exempt	\$5,123,800	\$5,123,800	\$10,247,600	\$1,229,712	\$2,151,996	\$3,381,708
Industrial	\$9,031,118	\$9,031,118	\$18,062,236	\$2,167,468	\$3,793,070	\$5,960,538
Mixed Use	\$9,484,000	\$9,484,000	\$18,968,000	\$2,276,160	\$3,983,280	\$6,259,440
Residential	\$14,325,570	\$14,325,570	\$28,651,140	\$4,297,671	\$2,435,347	\$6,733,018
Total	\$54,730,588	\$54,730,588	\$109,461,176	\$13,994,875	\$19,405,454	\$33,400,330

Source: Jefferson County Assessor¹, October 2015

To create the most accurate representation of critical facilities in the County, a composite of 3 different data sources were compiled: Jefferson County Assessor data, HSIP Freedom Data and HAZUS 2.2. This new data later was then cross referenced in GIS with the FEMA flood zone inundation maps. See Figure 5.

For the City of Golden, this analysis showed that there are 10 critical facilities in the 1% annual chance flood zone (Table 8). The analysis also showed that there are 4 additional critical facilities in the 0.2% annual chance flood zone (Table 9), including the City Police Department and EOC.

¹ The Assessor's Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values. The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values (typically 50% for residential structures, 100% for commercial, 100% for agricultural, 150% for industrial, 100% for mixed use and 100% for exempt.)

Table 8. City of Golden Critical Facilities in the 1% Annual Chance Floodplain

Category	Facility Type	Facility Count
High Potential Loss Facilities	Day Care Center	1
High Potential Loss Facilities	Government Facility	1
High Potential Loss Facilities	HAZMAT	3
High Potential Loss Facilities	Powerplant	1
Transportation and Lifelines	Bridge	3
Transportation and Lifelines	Water Facility	1
Total		10

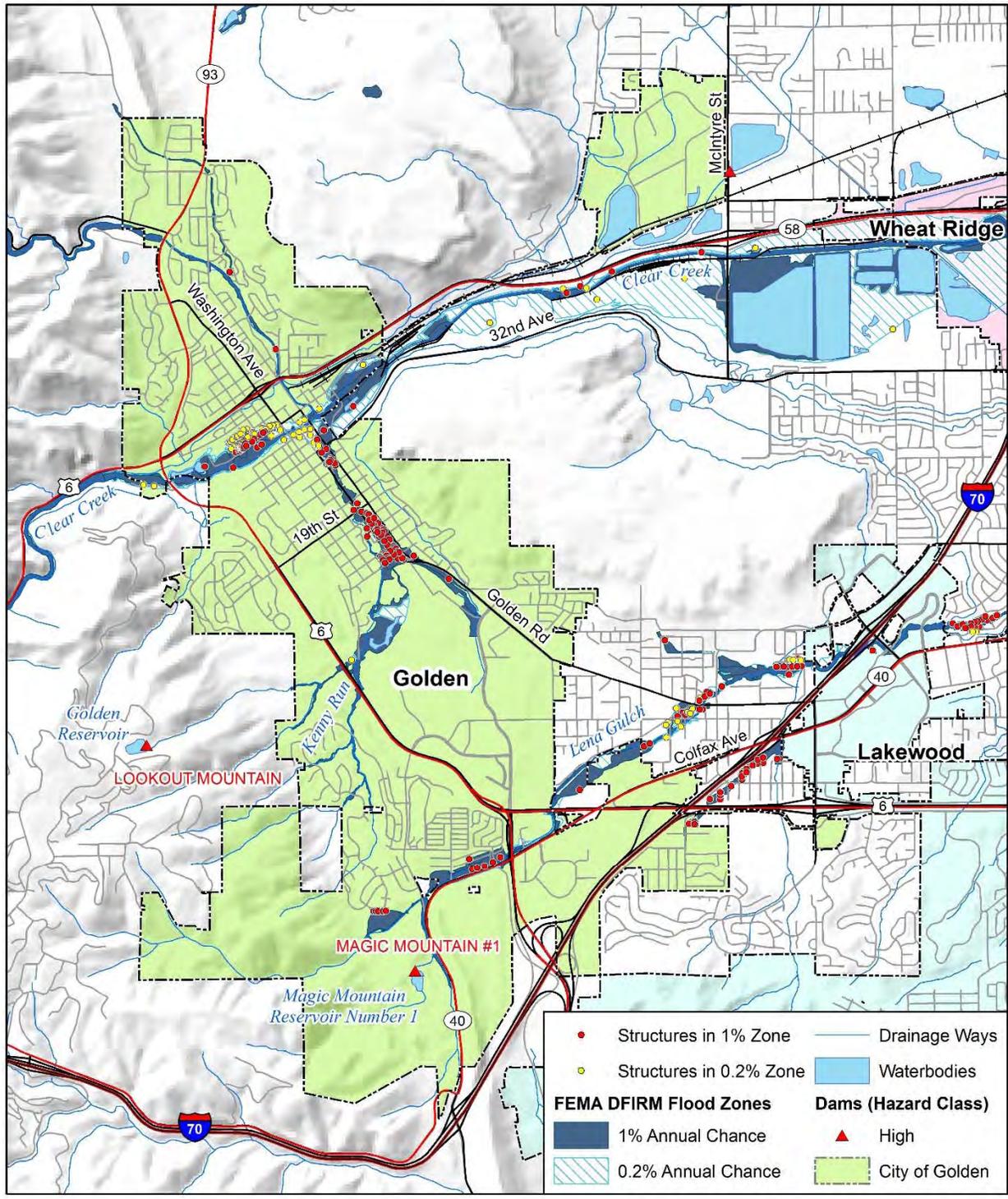
Source: Jefferson County Assessor, October 2015

Table 9. City of Golden Critical Facilities in the 0.2% Annual Chance Floodplain

Category	Facility Type	Facility Count
Essential Facilities	EOC	1
Essential Facilities	Fire Station	1
Essential Facilities	Law Enforcement	1
Transportation and Lifelines	Bridge	1
Total		4

Source: Jefferson County Assessor, October 2015

Figure 4. City of Golden Flood Hazards and At-Risk Properties



Map compiled 10/2015; intended for planning purposes only.
 Data Source: Jefferson County, CDOT, NHD, FEMA DFIRM 02/05/2014

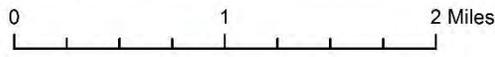
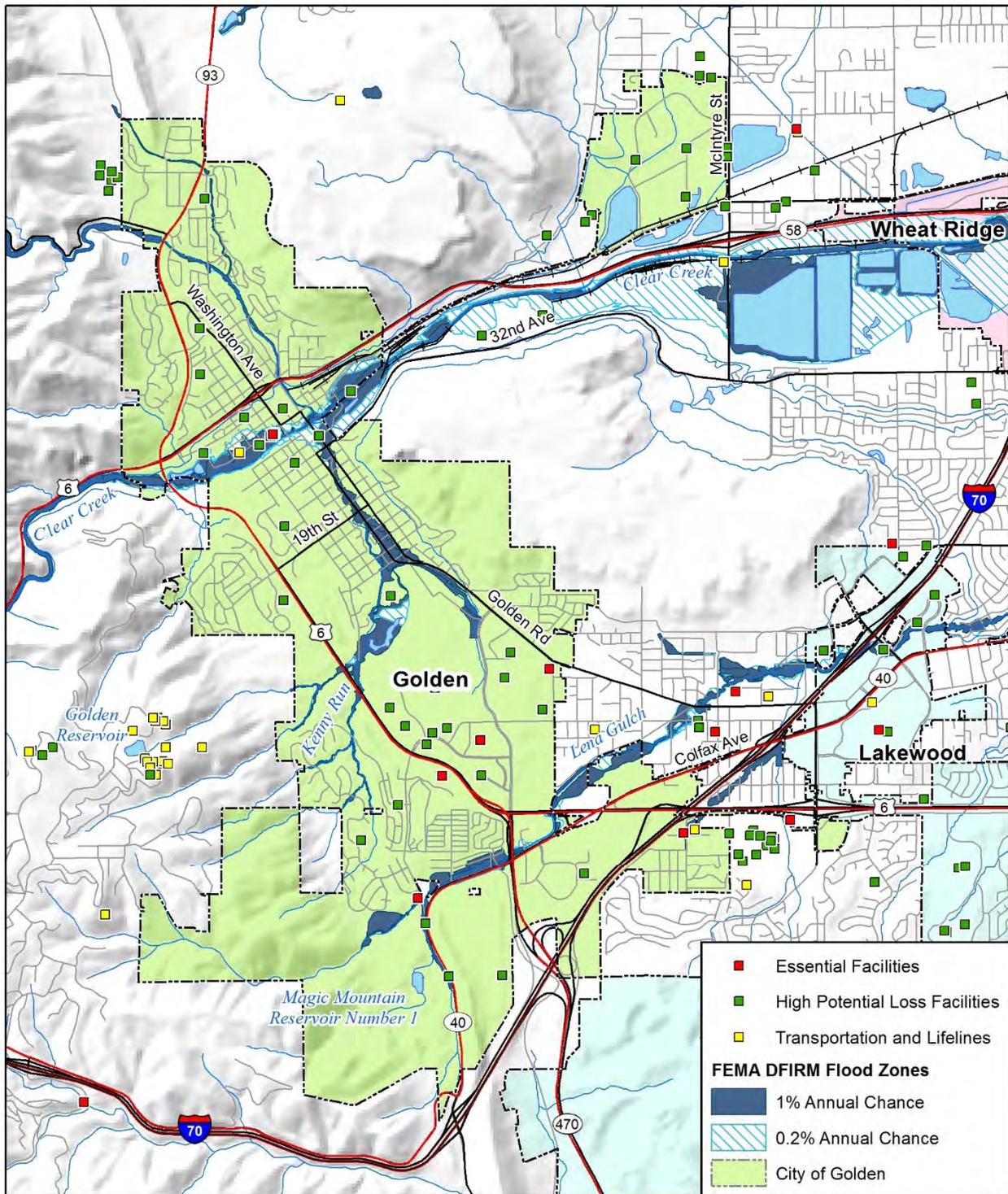


Figure 5. City of Golden Flood Hazard Map and Critical Facilities



Map compiled 11/2015;
intended for planning purposes only.
Data Source: Jefferson County, CDOT,
NHD, FEMA DFIRM 02/05/2014

0 1 2 Miles



Dam Failure

According to this analysis, Golden has 2 upstream high hazard dams within the County (Magic Mountain and Golden Reservoir), see Figure 4. However, it should be noted that there are 8 high hazard and 6 significant hazard dams outside of the County whose failure would have impacts in the City of Golden. See discussion the Section 4 of the Base Plan.

Note: Hazard class does not indicate dam condition, it merely indicates risks in case of failure. A high hazard dam poses risk to both life and property, a significant hazard dam only poses a risk to property.

Geologic Hazards

Golden has some exposure to geologic hazards including subsidence, slope failure, and dipping bedrock. Some of these areas are presently undeveloped and on the western limits of the City. Rockfall areas are around the slopes of North and South Table Mountains which have some residential development potentially at risk. See the map in Figure 6. Specific structures at risk from specific geologic hazards are detailed in the following tables. Methodology for this table can be found in Section 4.

Table 10. City of Golden Subsidence Risk

Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Commercial	7	7	\$6,594,500	\$6,594,500	\$13,189,000
Exempt	10	37	\$112,967,500	\$112,967,500	\$225,935,000
Industrial	15	15	\$8,465,000	\$12,697,500	\$21,162,500
Mixed Use	5	14	\$15,594,700	\$15,594,700	\$31,189,400
Residential	325	332	\$119,742,430	\$59,871,215	\$179,613,645
Total	362	405	\$263,364,130	\$207,725,415	\$471,089,545

Source: Jefferson County

Table 11. City of Golden Slope Failure Risk

Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Exempt	3	5	\$41,292,700	\$41,292,700	\$82,585,400
Residential	291	291	\$129,238,960	\$64,619,480	\$193,858,440
Total	294	296	\$170,531,660	\$105,912,180	\$276,443,840

Source: Jefferson County Assessor (October 2015)

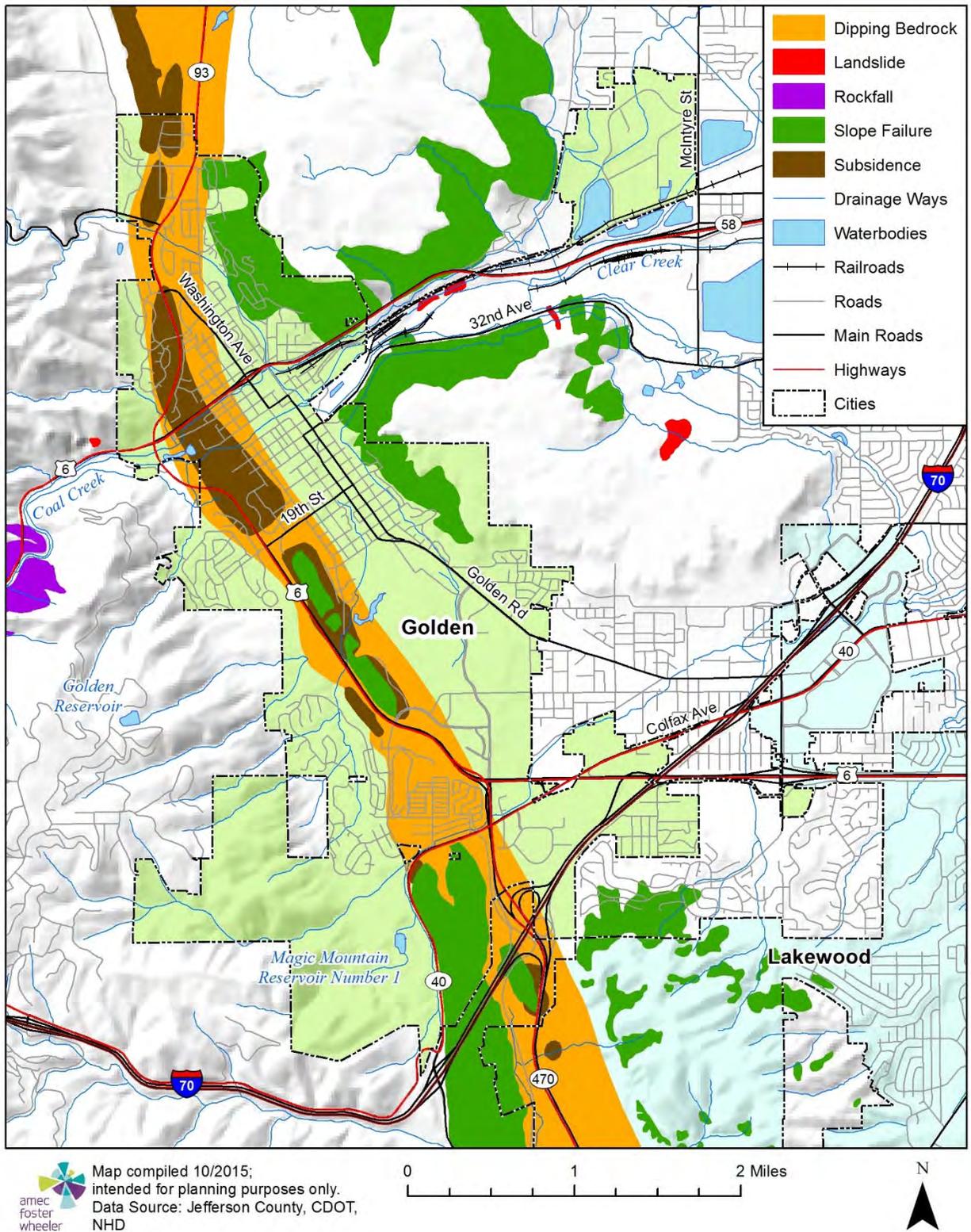
Table 12. City of Golden Dipping Bedrock Risk

Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Commercial	42	42	\$49,745,900	\$49,745,900	\$99,491,800
Exempt	32	59	\$320,827,500	\$320,827,500	\$641,655,000
Industrial	33	31	\$24,274,100	\$36,411,150	\$60,685,250
Mixed Use	51	205	\$64,743,900	\$64,743,900	\$129,487,800
Residential	1,295	2,330	\$434,549,680	\$217,274,840	\$651,824,520
Total	1,453	2,667	\$894,141,080	\$689,003,290	\$1,583,144,370

Source: Jefferson County Assessor (October 2015)

Golden's proximity to the Golden Fault as a potential, though unlikely, earthquake source make it more vulnerable to earthquake damage. Golden's downtown historic district has a number of un-reinforced masonry buildings that are particularly vulnerable to earthquake shaking.

Figure 6. City of Golden Geologic Hazards Map



Wildfire

With its location at the Rocky Mountain foothills, Golden does have risk to wildfires, both from grass fires on the open spaces at the western edge of the City and along the flanks of the Table Mountains, and from forest fires in the foothills, see Figure 7.

According to the GIS based analysis of wildfire, Golden has a total of 10 critical facilities at risk to wildfire and 1,351 improved parcels in the WUI community of North and Southwest Assessment Area totaling over \$846 million in value at risk.

Table 13. City of Golden Critical Facilities At-Risk to Wildfire by Type

Category	Facility Type	Facility Count Active Crown Fire	Facility Count Passive Crown Fire	Facility Count Surface Fire
High Potential Loss Facilities	College	0	0	0
High Potential Loss Facilities	HAZMAT	1	0	1
Transportation and Lifelines	Aircraft Facility	0	0	1
High Potential Loss Facilities	Government Facility	0	0	1
High Potential Loss Facilities	Powerplant	1	0	0
Transportation and Lifelines	Bridge	3	0	1
High Potential Loss Facilities	Long Term Care Facility	0	0	1
Total		5	0	5

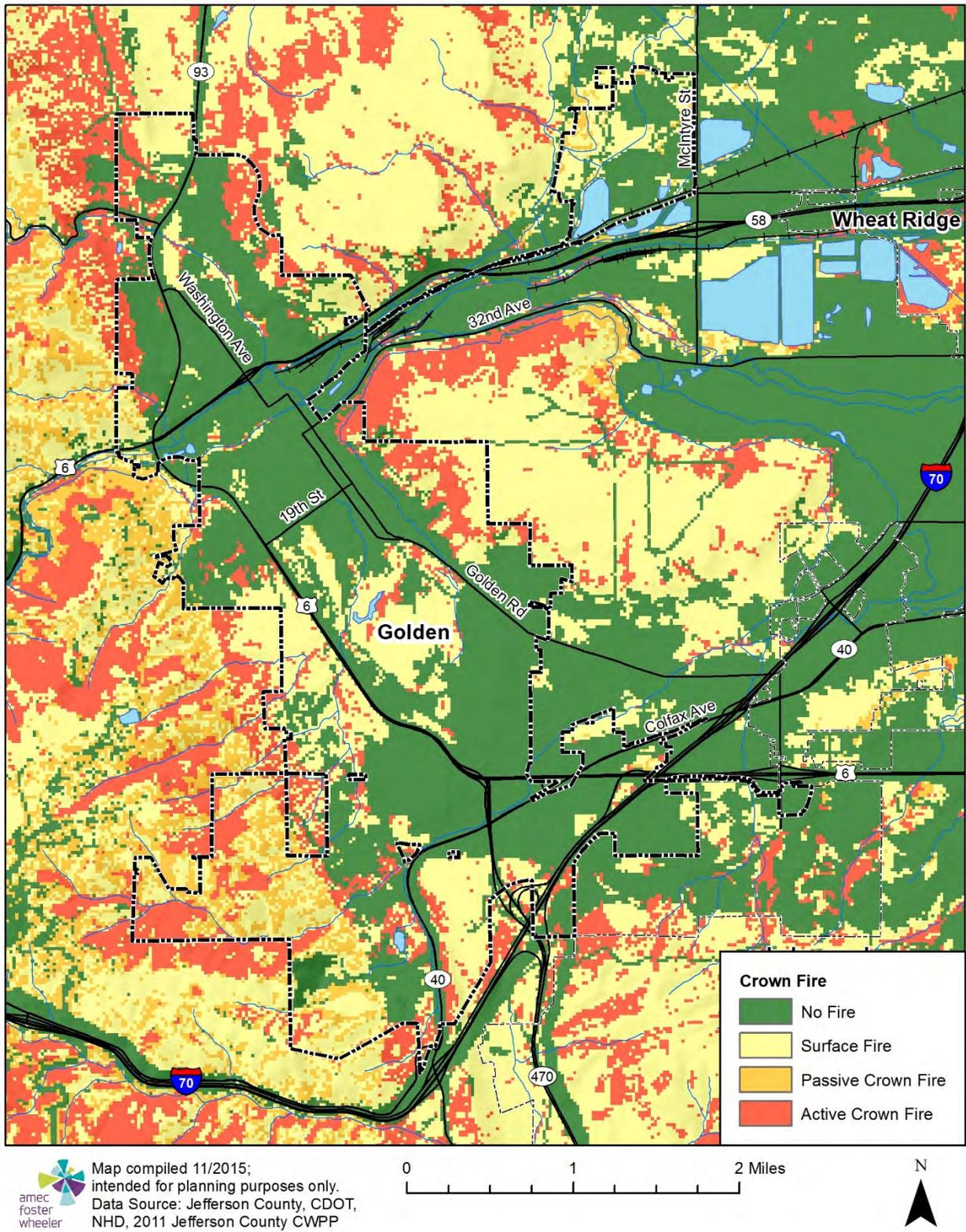
Source: Amec Foster Wheeler analysis on data provided by Jefferson County, City of Golden CWPP

Table 14. City of Golden Parcels and Values At-Risk to Wildfire

WUI Name	Hazard Class	Improved Parcels	Improved Value	Content Value	Total Value
North & Southwest Assessment Area	Moderate	1,351	\$564,461,620	\$282,230,810	\$846,692,430
Total		1,351	\$564,461,620	\$282,230,810	\$846,692,430

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, City of Golden CWPP

Figure 7. City of Golden Crown Fire Potential Map



Other Hazards

In the case of other hazards that are not specific to geography such as drought, hailstorms, winter storms, lightning, tornado, and windstorm, the entire building inventory and population in the City is potentially exposed. That is the reason for the asset inventory provided in Section 1.3. It should be noted that no hazard in this plan is expected to cause widespread impacts to this inventory. Golden’s location at the base of the foothills makes it more prone to high wind events than most other communities in this plan.

1.3 Asset Inventory

1.3.1 Property Inventory

Table 15 represents an inventory of property in Golden based on the Jefferson County Assessor’s data as of October 2015.

Table 15. Golden’s Property Inventory

Property Type	Improved Parcels	Building Count	Improve Value	Content Value	Total Value
Agriculture	2	2	\$740,700	\$740,700	\$1,481,400
Commercial	219	343	\$242,578,204	\$242,578,204	\$485,156,408
Exempt	108	176	\$854,930,230	\$854,930,230	\$1,709,860,460
Industrial	135	161	\$250,348,671	\$375,523,007	\$625,871,678
Mixed Use	138	343	\$146,657,360	\$146,657,360	\$293,314,720
Residential	4,419	5,609	\$1,412,927,120	\$706,463,560	\$2,119,390,680
Total	5,021	6,634	\$2,908,182,285	\$2,326,893,061	\$5,235,075,346

Source: Jefferson County Assessor’s Office
*The Assessor’s Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values.
**The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values (typically 50% for residential structures and 100% for commercial/industrial)

1.3.2 Other Assets

Table 16 is a detailed inventory of assets identified by the City’s planning team. This inventory includes some critical facilities. For more information about how “critical facility” is defined in this plan, see Section 4.3 Vulnerability Assessment.

Table 16. Summary of Golden's Assets

Name of Asset	Type	Replacement Value (\$)	Occupancy/Capacity #	Hazard Specific Info
City Hall, Police and Fire Station	EI	\$9,536,000	≈375	Flooding
Station 2, 1201 Ulysses St	EI	\$114,000	Minimal	
Station 3, 16023 W. 5th Ave.	EI	\$94,600	Minimal	
Station 4, 151 Heritage Rd	EI	\$1,349,500	Varies	
Xcel Energy Substation	EI/VF	Unknown	Unknown	Fire, explosion
Rooney Road Hazardous Materials Facility	HM	Unknown	Unknown	Fire, explosion, contamination
Bulk Oil Storage	VF	Unknown	Unknown	Fire, explosion, contamination; flooding
Mitchell Elementary School, 200 Rubey Dr.	VF	Unknown	≈600	
Shelton Elementary School, 420 Crawford St.	VF	Unknown	≈500	
Bell Middle School	VF	Unknown	≈650	
Golden High School, 70124th St.	VF	Unknown	≈1800	Flooding
The Johnson Program, 1200 Johnson Rd.	VF	Unknown	≈100	
Cogwheel Kids Preschool, 610 22nd St	VF	Unknown	≈50	
Discover Child Care Center, 17602 W. 14th Ave.	VF	Unknown	≈150	
Golden Independent School, 1280 Golden Cir.	VF	Unknown	≈50	
Kindercare Learning Center, 107 N. Rubey Dr.	VF	Unknown	≈160	
South Table Mountain Preschool, 17701 W. 16th Ave.	VF	Unknown	≈80	
Free Horizon Montessori Charter School, 581 Conference Place	VF	Unknown	≈300	
Cradle to Crayons Learning Center, 18301 W. Colfax Ave.	VF	Unknown	≈50	
US Post Office 17451 S Golden Rd.	VF	Unknown	Unknown	
US Post Office, 619 12th St.	VF	Unknown	Unknown	Flooding
Wells Fargo Service Company, 1220 Ford St.	VF	Unknown	Unknown	Flooding
Panorama Medical, 660 Golden Ridge Rd.	VF	Unknown	Unknown	
Coors	VF	Unknown	Multiple Buildings	Flooding
Colorado School of Mines	VF	Unknown	Multiple Buildings	Flooding
Water Treatment Plant (multiple buildings)	EI/VF	\$15.545 million	Unknown	Flooding

Name of Asset	Type	Replacement Value (\$)	Occupancy/Capacity #	Hazard Specific Info
Pylons at Lookout Mountain Road	NA	Unknown	None	
Golden Arch	NA	Unknown	None	Flooding
12th Street Historic District	NA	Unknown	Multiple Buildings	Flooding
822 12th St. Astor House	NA	\$806,700	Unknown	Flooding
805 13th St. Quaintance Block	NA	Unknown	Unknown	Flooding
809 15th St. Foothills Art Center (First Presbyterian Church of Golden)	NA	Unknown	Unknown	
509 18th St. James Cuyler Miller House	NA	Unknown	Residential	
1301 Arapahoe St. Colorado National Guard Armory	NA	Unknown	Multi-Residential	Flooding
714 Cheyenne St. Oscar Barber House/Montessori School of Golden	NA/VF	Unknown	≈100	Flooding
Heritage Road (Magic Mountain Archeological Site)	NA	Unknown	None	
622 Water St. Peery House	NA	Unknown	Residential	Flooding
6th Avenue	EI	Unknown	None	
I-70	EI	Unknown	None	
Highway 58	EI	Unknown	None	Flooding
C-470	EI	Unknown	None	
Burlington Northern Santa Fe Railroad	EI	Unknown	None	Flooding
Jefferson County Government Complex	EI/VF	Unknown	Multiple Buildings	
Planning/Public Works	EI	\$1,292,717		Flooding
Public Works – Shops	EI	\$6,273,100	Multiple Buildings	Main concern is wildfire
Clear Creek Corridor – Threatened plant species: Ute Ladies Tresses Orchid	NA	Unknown	None	Flooding, wildfire
Clear Creek History Park	NA	\$318,987		Exterior area Flooding

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: natural assets

Many of the facilities listed above are also in GIS databases provided by the City of Golden and Jefferson County. Critical facility counts and types are shown in Table 17 and in the map in Figure 5. Shelters may be in facilities such as schools or recreation centers and are not indicated on the map.

Table 17. Summary of Golden’s Critical Facilities in GIS

Category	Facility Type	Facility Count
Essential Facilities	EOC	2
	Fire Station	4
	Law Enforcement	2
	Urgent Care Facility	1
	Total	9
High Potential Loss Facilities	College	1
	Dam	1
	Day Care Center	6
	Dept of Public Health	1
	Government Facility	10
	HAZMAT	12
	Long Term Care Facility	2
	PK-12 School	6
	Powerplant	1
	Private School	2
Total	42	
Transportation and Lifelines	Aircraft Facility	1
	Bridge	18
	Communications	1
	Water Facility	1
	Total	21
Grand Total		72

Source: Jefferson County Assessor (October 2015) HSIP Freedom 2015 and HAZUS 2.2

1.3.3 Natural, Cultural, and Historic Resources

Assessing the vulnerability of Golden to disaster also involves inventorying the natural, historical, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Natural Resources

The City of Golden owns and maintains 402 acres of open space as well as 24 miles of multi-use trails. Within Golden itself, there are 22 city parks totaling 253 acres including a recreational vehicle park, 3 sports complexes, a white water river park and a community center. On the outskirts of the City are many Jefferson County Open Space parks, as well as North and South Table Mountain. For information about natural resources in Jefferson County, which includes Golden, see Section 4.3 Vulnerability Assessment.

Historic and Cultural Resources

Table 18 lists the properties in Golden that are on the National Register of Historic Places and/or the Colorado State Register of Historic Properties (for more information about these registers, see Section 4.3 Vulnerability Assessment).

Table 18. Golden’s Historic Properties/Districts in National and State Registers

Property	Address	Date Listed
Ammunition Igloo	15001 Denver W. Pkwy.	5/20/93
Astor House Hotel	822 12th St.	03/01/1973
Barnes--Peery House	622 Water St.	10/12/2001
Calvary Episcopal Church	1300 Arapahoe St.	03/03/1995
Camp George West Historic District	15000 S. Golden Rd.	2/11/93
Colorado Amphitheater	15001 Denver W. Pkwy.	5/20/93
Colorow Point Park	900 Colorow Rd.	11/15/1990
Colorado National Guard Armory	1301 Arapahoe St.	12/18/1978
Coors, Herman, House	1817 Arapahoe St.	10/17/1997
Deaton Sculptured House	24501 Ski Hill Dr.	2/24/04

Property	Address	Date Listed
Denver and Rio Grande Western Railroad Caboose No. 0578	17155 W. 44th Ave.	11/4/2003
First Presbyterian Church of Golden--Unger House	809 15th St.	03/14/1991
Genesee Park	26771 Genesee Ln.	11/15/1990
Golden Cemetery	755 Ulysses St.	4/18/2012
Golden High School	710 10 th St.	03/14/1997
Lariat Trail Scenic Mountain Drive	Lookout Mountain Rd. S of US 6 to Golden Reservoir	11/15/1990
Lookout Mountain Park	987 1/2 Lookout Mountain Rd.	11/15/1990
Lorraine Lodge	SW of Golden	1/18/1984
Loveland Building and Coors Building	1122 and 1120 Washington Ave.	05/16/1996
Magic Mountain Site	Heritage Square	08/21/1980
Mount Vernon House	About 1 mi. S of Golden city limits at jct. of I-70, CO 26 and Mount Vernon Canyon Rd.	11/20/1970
Quaintance Block	805 13th St.	03/25/1994
Queen of Heaven Orphanage Summer Camp	20189 Cabrini Blvd.	1/14/2000
Rio Grande Southern Railroad, Motors and Engine	17155 W. 44th Ave.	2/28/1997
Rockland Community Church and Cemetery	24225 Rockland Rd.	8/5/2009
Rocky Flats Plant	Approximately 2 mi. SE of jct. of CO 93 and CO 198	5/19/1997
Rooney Ranch	S of Golden, jct. of Rooney Rd. and Alameda Pkwy.	2/13/75
Thiede Ranch	22258 Shingle Creek Rd.	1/11/96
Oscar Barber House	714 Cheyenne St.	State Register 7/13/1994
Golden Welcome Arch	1100 block of Washington Ave.	State Register 6/14/2000,

Sources: Directory of Colorado State Register Properties, <http://www.historycolorado.org/oahp/listings-county>
National Register Information System, <http://www.nps.gov/nr/>

The National Park Service administers two programs that recognize the importance of historic resources, specifically those pertaining to architecture and engineering. While inclusion in these programs does not give these structures any sort of protection, they are valuable historic assets. There are currently 36 Historic American Building Survey (HABS) or Historic American Engineering Record (HAER) buildings in the vicinity of the City of Golden, however there are none inside the City limits (all of these are located at Rocky Flats).

It should be noted that as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

1.4 Growth and Development Trends

Table 19 illustrates how Golden has grown in terms of population and number of housing units between 2010 and 2014 (or the most recently available data). The table illustrates that Golden is undergoing moderate growth.

Table 19. City of Golden’s Change in Population and Housing Units, 2010-2014

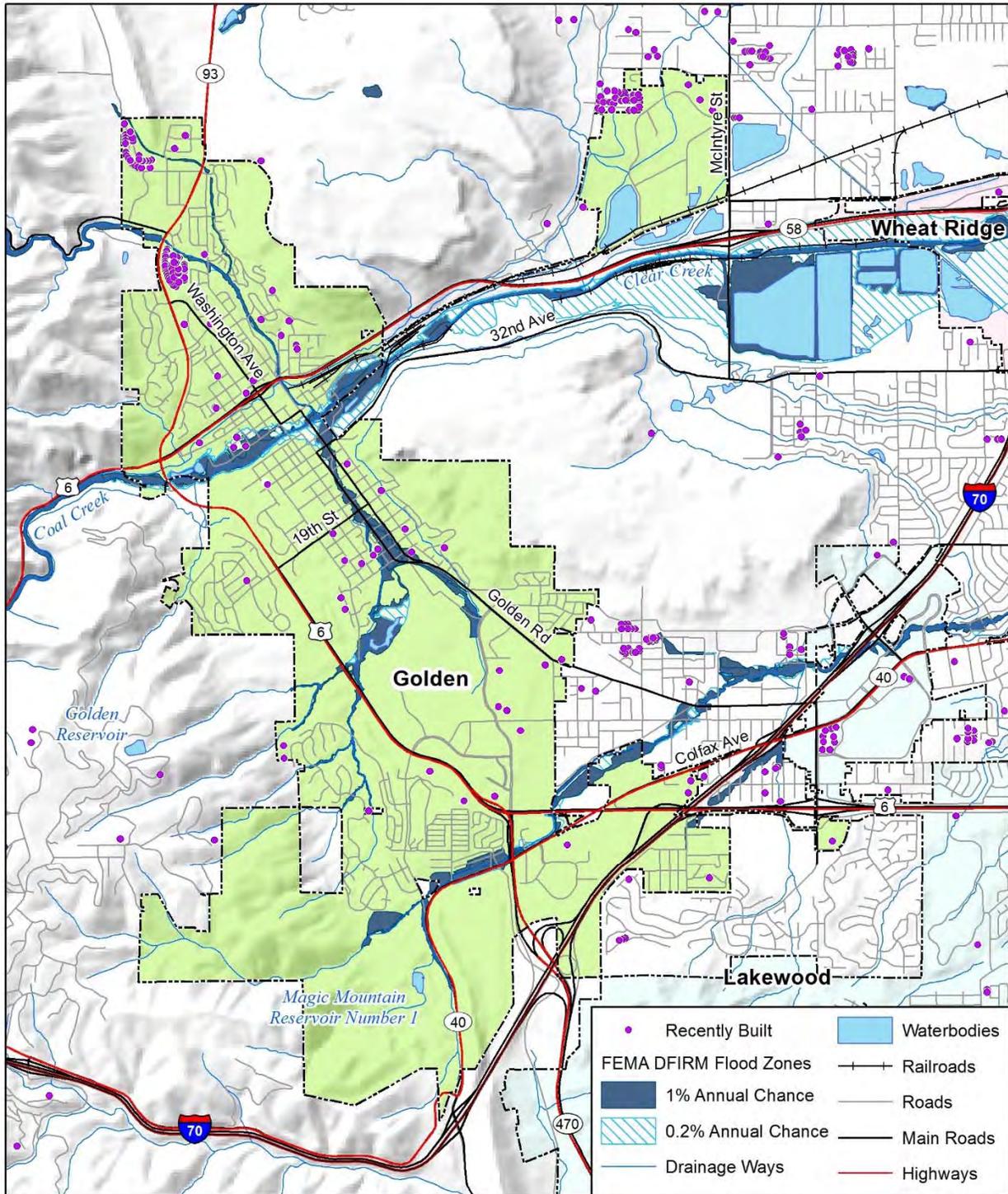
2010 Population	2014 Population Estimate	Estimated Percent Change 2010-2014	2010 # of Housing Units	2013 Estimated # of Housing Units	Estimated Percent Change 2010-2013
18,905	20,201	6.9	7,748	7,859	1.43%

Source: US Census, American Community Survey, <http://factfinder.census.gov>

Some of the growth in Golden in the mid to late 1990’s occurred on the northwestern edge of the City, near the Golden fault and adjacent to a mitigated landslide area at the junction of Highways 93 and 6. Other commercial growth has occurred in east Golden with the development of Colorado Mills Mall in the late 1990’s. See Figure 8. From 2009 to 2015, 130 parcels have been improved adding 151 buildings.

Gateway development — this is the largest private development going on in the City currently, near the intersection of Colfax Avenue and I-70, south of Lockheed Martin’s aggregate mine. The 21-acre site will contain a mix of office and retail uses.

Figure 8. City of Golden Recently Built 2009 to 2015




 Map compiled 10/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD, FEMA DFIRM 02/05/2014

0 1 2 Miles



1.5 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes Golden’s regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities and then discusses these capabilities in further detail along with other mitigation efforts as they pertain to the National Flood Insurance Program’s Community Rating System (CRS). Although the CRS is flood-focused, this discussion also incorporates activities related to other hazards into the categories established by the CRS.

1.5.1 Mitigation Capabilities Summary

Table 20 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Golden.

Table 20. City of Golden’s Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General or Comprehensive plan	Yes	Available through the Planning Department, updated 2011
Zoning ordinance	Yes	Title 18, Chapter 40, Golden Municipal Code
Subdivision ordinance	Yes	Title 17 Golden Municipal Code
Growth management ordinance	Yes	Title 18, Chapter 700, Golden Municipal Code
Floodplain ordinance	Yes	Title 15, Chapter 60
Other special purpose ordinance (stormwater, steep slope, wildfire)	Yes	Title 13, Chapter 30 Golden Municipal Code for stormwater Chapter 18, Section 050 for slope/grading (Slope/grading)
Building code	Yes	Title 15.08, Golden Municipal Code
Fire department ISO rating	Yes	The Fire department Has an ISO rating of 4 (2015)
Erosion or sediment control program	Yes	Title 18, Chapter 40, Section 100, Golden Municipal Code Site Inspection Forms for Erosion, Sediment Control measures site development standards
Stormwater management program	Yes	Stormwater Maintenance Program and Stormwater Program/Permits
Site plan review requirements	Yes	Title 18, Chapter 40, Golden Municipal Code: Site development regulations
Capital improvements plan	Yes	Chapter 2.40
Economic development plan	Yes	Economic development division and in comp. plan
Local emergency operations plan	Yes	Emergency Operations Plan and Crisis Action Guide Both drafted in 2010, undergoing update in 2015
Flood insurance study or other engineering study for streams	Yes	Flood plain studies of all drainage basins greater than 1 square mile, as well as Arapaho Gulch. We also have FEMA mapping of all drainages greater than one square mile. Study information can be found at http://www.udfcd.org/downloads/down_pub_mdp.htm (reference Clear Creek and Golden); Stormwater Drainage Maintenance Plan, problem sites mapped on page 8.

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
Elevation certificates(for floodplain development)	Yes	
BCEGS Ratings (1-10, 1 being best)	Yes	Personal (1 and 2 family dwellings) 4 Commercial (all other buildings) 4 2013
Dam Failure Plans	Yes	For the three regulatory dams we operate. Plans are available through Public Works and City Hall but cannot be used as an attachment to any plan.

Table 21 identifies the personnel responsible for mitigation and loss prevention activities as well as related data and systems in Golden.

Table 21. City of Golden’s Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Yes	Planning/City Planner	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Public Works/City Engineer Public Works/Civil Engineer	
Planner/engineer/scientist with an understanding of natural hazards	Yes	Public Works/Environmental Manager	
Personnel skilled in GIS	Yes	Public Works/GIS Coordinator	
Full-time building official	Yes	Public Works/Chief Building Official	
Floodplain manager	Yes	Chief Executive Office or his/her appointed designee	Certified
Emergency manager	Yes	Fire Department/Fire Chief	
Grant writer	No	N/A	
Other personnel			
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	Yes	Public Works/GIS Coordinator	There are flood plains, hazardous slopes, subsidence areas and expansive soils
Warning systems/services (Reverse 9-11, cable override, outdoor warning signals)	Yes	Police Department/ Communications & Records Manager	Target Notification System only (reverse 911)

Table 22 identifies financial tools or resources that Golden could potentially use to help fund mitigation activities.

Table 22. City of Golden’s Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	Only if hazard mitigation relates to the purpose of the block grant.
Capital improvements project funding	Yes	Only if hazard mitigation is deemed a capital improvement
Authority to levy taxes for specific purposes	Yes	Would need to be approved by the voters
Fees for water, sewer, gas, or electric services	Yes	The City only has fees for water and sewer. The hazard mitigation would need to be related to those services.
Impact fees for new development	Yes	Our impact fees are water, sewer, school land, and park land (unless the developer donates the appropriate amount of land). The fees can be used only if the hazard mitigation is related to those areas.
Incur debt through general obligation bonds	Yes	Requires voter approval
Incur debt through special tax bonds	Yes	Requires voter approval
Incur debt through private activities	Yes	Requires City Council approval
Withhold spending in hazard-prone areas	Yes	A political decision, but it can be done.
Other – Available General Fund resources	Yes	

1.5.2 Community Rating System Activities (All Hazards)

National Flood Insurance Program

The City of Golden joined the National Flood Insurance Program (NFIP) on May 15, 1985, and the Community Rating System (CRS) on October 1, 1996. The NFIP allows private property owners to purchase affordable flood insurance and enables the community to retain its eligibility to receive certain federally backed monies and disaster relief funds. The CRS is a voluntary program for NFIP-participating communities. It provides flood insurance discounts to policyholders in communities that provide extra measures of flood above the minimum NFIP requirements.

As of September 2015, Golden had a CRS class rating of 7 (one a scale of 1-10, 1 being the best). This is an improvement over the previous class rating of 9 in 2009. This rating provides a 15 (previously 5) percent discount for policyholders within a special flood hazard area (SFHA) and a 5 percent discount for those outside of an SFHA.

NFIP insurance data indicates that as of September 2015, there were 93 (up from 87 in 2009) policies in force in Golden, resulting in \$25,629,000 (\$23.4K in 2009) of insurance in force. In Golden, there have been 18 (up from 13 in 2009) historical claims for flood losses totaling \$70,608. At the time this plan was developed there were no repetitive or severe repetitive loss structures as defined by the NFIP.

Mapping: Golden's initial Flood Insurance Rate Map became effective on 5/15/85. The most current Digital Flood Insurance Rate Maps were updated and became effective on 2/5/14.

Golden's municipal code has been updated to reflect this change (Title 15, Chapter 60). The DFIRMS have been used for floodplain management and risk assessment by the City.

Incorporation into Local Planning Mechanisms

This 2015 Hazard Mitigation Plan will be used in all subsequent updates to the City of Golden's comprehensive plan and any other related planning efforts.

Community Rating System Categories

The Community Rating System (CRS) categorizes hazard mitigation activities into six categories. These categories, and applicable Golden activities, are described below. Note: some of the activities are appropriate to multiple categories. For purposes of simplicity, they are only included in the category deemed most appropriate based on the definitions and examples provided in the *CRS Coordinator's Manual*.

Preventive

Preventive activities keep problems from getting worse. The use and development of hazard-prone areas is limited through planning, land acquisition, or regulation. They are usually administered by building, zoning, planning, and/or code enforcement offices.

City of Golden Comprehensive Plan 2011

The City's comprehensive plan is a guide to help the City make decisions and establish its future direction. The goals, policies, and strategies and actions contained within the plan cover a broad range of subjects matter related to services, issues, and geographic areas within Golden. Combined, these elements serve to direct future policy decisions to preserve vital community attributes and service levels and manage growth.

The following goals policies, and strategies and actions are most relevant to hazard mitigation.

Value Theme B – Active outdoors and entertainment

Goal 1: Protect the natural beauty of Golden, located in a valley bounded by the foothills and two scenic mesas.

- Strategy 1.1: Identify any areas, especially on the hills, unique geologic formations and mesas, which could be threatened with unsuitable land uses.

Goal 2: Maintain proximity to open space and natural beauty and preserve access opportunities to experience these.

- Strategy 2.1: Work with Jefferson County and other partners to identify and acquire additional open space to serve the needs of the community.
- Strategy 2.3: Identify opportunities to create additional public open spaces in the urban environment, such as City and neighborhood parks, plazas, pocket parks, courtyards and “parklets.” If well designed, these spaces can become “places” that function like urban living rooms where the community meets.
- Strategy 2.4: Incorporate urban open space, such as plazas and courtyards, into land use and transportation decisions, plans and processes.

Goal 4: Protect Clear Creek as a heart & soul element of Golden and actively preserve and enhance its character for future generations.

- Strategy 4.2: Refine and implement the Clear Creek Corridor Master Plan to enhance recreational opportunities and preserve the creek for future generations.
- Strategy 4.3: Consider the effects on Clear Creek of any adjacent project, development or neighborhood planning effort that could impact the character of the corridor.

Goal 6: Preserve the natural beauty of unique geologic features, extended stretches of the foothills, riparian corridors throughout the community, and unbroken stretches of natural environments that define Golden.

- Strategy 6.3: Identify features in Golden that should be protected. Features to be protected and preserved include geological formations, plants and wildlife, waterways, quiet soundscapes and the night sky.

Value Theme C – Safe, clean and quiet neighborhoods

Goal 1: Golden will be a place where we can go anywhere at any time and feel safe.

-
- Strategy 1.6: Improve the water quality entering waterways and reduce the amount of runoff through use of bio-swales, rain gardens, porous pavement and other techniques approved by Urban Drainage and allowed by Municipal Code.

Value Theme E – Convenience and amenities

Goal 1: Value the proximity to Denver and the mountains, while maintaining our geographic separateness.

- Strategy 1.1: Continue working to acquire open space around the edges of the City to create a buffer between Golden and other communities and preserve easy access to surrounding nature.

Municipal Code – All sections adopted in the City of Golden

Title 15 Building and Construction

Chapter 15.60 – Floodplain Standards and Regulations (Ord. 1968, 2014)

Findings of fact.

(1)

The flood hazard areas of the City of Golden are subject to periodic inundation, which can result in loss of life and property, health and safety hazards, disruption of commerce and governmental services, and extraordinary public expenditures for flood protection and relief, all of which adversely affect the health, safety and general welfare of the public.

(2)

These flood losses are created by the cumulative effect of obstructions in floodplains which cause an increase in flood heights and velocities, and by the occupancy of flood hazard areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, flood proofed or otherwise protected from flood damage.

15.60.030 - General provisions.

- (a) *Lands to which this chapter applies.* The chapter shall apply to all special flood hazard areas and areas removed from the floodplain by the issuance of a FEMA Letter of Map Revision Based on Fill (LOMR-F) within the jurisdiction of the City of Golden, Colorado.

15.60.040 - Administration.

- (a) *Designation of the floodplain administrator.* The city engineer or his/her designee is hereby appointed as floodplain administrator to administer, implement and enforce the provisions of this chapter

and other appropriate sections of 44 CFR (National Flood Insurance Program Regulations) pertaining to floodplain management.

15.60.050 - Provisions for flood hazard reduction.

(a) *General standards.* In all special flood hazard areas the following provisions are required for all new construction and substantial improvements:

(b) *Specific standards.* In all special flood hazard areas where base flood elevation data has been provided as set forth in: subsection [15.60.030\(b\)](#), Golden Municipal Code; subsection [15.60.040\(b\)\(7\)](#), Golden Municipal Code; or subsection (g) of this section, the following provisions are required:

(1)

Residential construction. New construction and substantial improvement of any residential structure shall have the lowest floor (including basement), electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities (including ductwork), elevated to one foot above the base flood elevation. Upon completion of the structure, the elevation of the lowest floor, including basement, shall be certified by a registered Colorado professional engineer, architect, or land surveyor. such certification shall be submitted to the floodplain administrator.

(2)

Nonresidential construction. With the exception of critical facilities, outlined in subsection (h) of this section, new construction and substantial improvements of any commercial, industrial, or other nonresidential structure shall either have the lowest floor (including basement), electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities (including ductwork), elevated to one foot above the base flood elevation or, together with attendant utility and sanitary facilities, be designed so that at one foot above the base flood elevation the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.

(3)

Enclosures. New construction and substantial improvements, with fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access, or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters.

(4)

Manufactured homes. All manufactured homes that are placed or substantially improved within zones A1-30, AH, and AE on the community's FIRM on sites: Outside of a manufactured home park or subdivision; in a new manufactured home park or subdivision; in an expansion to an existing manufactured home park or subdivision; or in an existing manufactured home park or subdivision on which manufactured home has incurred "substantial damage" as a result of a flood, be elevated on a permanent foundation such that the lowest floor of the manufactured home, electrical, heating, ventilation, plumbing, and air conditioning equipment and other service

facilities (including ductwork), are elevated to one foot above the base flood elevation and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

(c)

Standards for areas of shallow flooding (AO/AH zones). Located within the special flood hazard area established in subsection [15.60.030\(b\)](#) Golden Municipal Code, are areas designated as shallow flooding. These areas have special flood hazards associated with base flood depths of one to three feet where a clearly defined channel does not exist and where the path of flooding is unpredictable and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow; therefore, the following provisions apply:

(1)

Residential construction. All new construction and substantial improvements of residential structures must have the lowest floor (including basement), electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities (including ductwork), elevated above the highest adjacent grade at least one foot above the depth number specified in feet on the community's FIRM (at least three feet if no depth number is specified). Upon completion of the structure, the elevation of the lowest floor, including basement, shall be certified by a registered Colorado Professional Engineer, architect, or land surveyor. Such certification shall be submitted to the floodplain administrator.

(2)

Nonresidential construction. With the exception of critical facilities, outlined in subsection [15.60.050\(h\)](#), Golden Municipal Code, all new construction and substantial improvements of nonresidential structures, must have the lowest floor (including basement), electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities (including ductwork), elevated above the highest adjacent grade at least one foot above the depth number specified in feet on the community's FIRM (at least three feet if no depth number is specified), or together with attendant utility and sanitary facilities, be designed so that the structure is watertight to at least one foot above the base flood level one foot above the depth number specified in feet on the community's FIRM (at least three feet if no depth number is specified) with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads of effects of buoyancy. A registered Colorado Professional Engineer or architect shall submit a certification to the floodplain administrator that the standards of this section, as set forth in subsection [15.60.040\(c\)](#), Golden Municipal Code, are satisfied.

Within zones AH or AO, adequate drainage paths around structures on slopes are required to guide floodwaters around and away from proposed structures.

(d)

Floodways. Floodways are administrative limits and tools used to regulate existing and future floodplain development. The State of Colorado has adopted floodway standards that are more stringent than the FEMA minimum standard (see definition of floodway in [section 15.60.020](#), Golden Municipal Code).

Located within special flood hazard area established in subsection [15.60.030\(b\)](#), Golden Municipal Code, are areas designated as floodways. Since the floodway is an extremely hazardous area due to the velocity of floodwaters which carry debris, potential projectiles and erosion potential, the following provisions shall apply:

(1)

Encroachments are prohibited, including fill, new construction, substantial improvements and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed by a licensed Colorado Professional Engineer and in accordance with standard engineering practice that the proposed encroachment would not result in any increase (requires a no-rise certification) in flood levels within the community during the occurrence of the base flood discharge.

(2)

If subsection [15.60.050\(d\)\(1\)](#), Golden Municipal Code is satisfied, all new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of this section.

(3)

Under the provisions of 44 CFR Chapter 1, Section 65.12, of the National Flood Insurance Regulations, a community may permit encroachments within the adopted regulatory floodway that would result in an increase in base flood elevations, provided that the community first applies for a CLOMR and floodway revision through FEMA.

(g) *Standards for subdivision proposals.*

(1)

All subdivision proposals including the placement of manufactured home parks and subdivisions shall be reasonably safe from flooding. If a subdivision or other development proposal is in a floodprone area, the proposal shall minimize flood damage.

(2)

All proposals for the development of subdivisions including the placement of manufactured home parks and subdivisions shall meet floodplain development permit requirements of subsection [15.60.030\(c\)](#), Golden Municipal Code; and the provisions of subsection [15.60.040\(c\)](#) of the Golden Municipal Code.

(3)

Base flood elevation data shall be generated for subdivision proposals and other proposed development including the placement of manufactured home parks and subdivisions which is greater than 50 lots or five acres, whichever is lesser, if not otherwise provided pursuant to subsection [15.60.030\(b\)](#), Golden Municipal Code or subsection [15.60.040\(b\)](#) Golden Municipal Code.

(4)

All subdivision proposals including the placement of manufactured home parks and subdivisions shall have adequate drainage provided to reduce exposure to flood hazards.

(5)

All subdivision proposals including the placement of manufactured home parks and subdivisions shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize or eliminate flood damage.

(h) *Standards for critical facilities.* A critical facility is a structure or related infrastructure, but not the land on which it is situated, as specified in Rule 6 of the Rules and Regulations for Regulatory Floodplains in Colorado, that if flooded may result in significant hazards to public health and safety or interrupt essential services and operations for the community at any time before, during and after a flood.

(2)

Protection for critical facilities. All new and substantially improved critical facilities and new additions to critical facilities located within the special flood hazard area shall be regulated to a higher standard than structures not determined to be critical facilities. For the purposes of this chapter, protection shall include one of the following:

a.

Location outside the special flood hazard area; or

b.

Elevation of the lowest floor or floodproofing of the structure, together with attendant utility and sanitary facilities, to at least two feet above the base flood elevation.

(3)

Ingress and egress for new critical facilities. New critical facilities shall, when practicable as determined by the City of Golden Public Works Department have continuous non-inundated access (ingress and egress for evacuation and emergency services) during a 100-year flood event.

Residential Code Chapter 15.40.080 - IRC Section R403.1.9.

(Ord. 1931, 2013; Ord. 1855, 2009; Ord. 1754, § 11, 2006)

IRC Section R403.1.9 (Designated Dipping Bedrock Area) is enacted to read as follows:

Designs of foundations required to be designed by a registered design professional and to be installed in the designated Dipping Bedrock areas, as identified by the Jefferson County Colorado "Designated Dipping Bedrock Area" map dated October 20, 1999, shall consider and incorporate accepted engineering practices and procedures so as to mitigate the potential adverse effects of such Dipping Bedrock on structures, as determined necessary by a registered design professional.

Title 17 Subdivisions – The Subdivision Ordinance of the City of Golden, Colorado is adopted to:

- Protect and provide for the health, safety, and general welfare of the City of Golden;
- Promote the orderly growth of the city in concert with the comprehensive master plan;
- Provide adequate and effective public utility systems;
- Provide for the proper distribution of population and supportive land uses;
- Provide for the proper design and construction of the transportation system consistent with the adopted Thoroughfare Plan;
- Establish standards for design and set forth the procedures for the subdivision and resubdivision of land in property relation to the type of land use and population to be served;
- Ensure the use of proper legal descriptions, surveying, and monument of subdivided land.

This Subdivision Ordinance is to be enforced and interpreted in concert with the zoning ordinance of the City of Golden and other applicable regulations, ordinances, codes and rules. All plats and plans submitted shall be in a form which satisfies this ordinance, the zoning ordinance, and all other applicable ordinances and regulations. (Ord. 1152, 1992; Ord. 676 § 2 (1-3), 1973).

Title 18 Planning and Zoning - These regulations are enacted for the purposes of promoting the health, safety, convenience, order, prosperity, and welfare of the present and future inhabitants of the City of Golden through growth management; for adequate and convenient open spaces for traffic, utilities, access of fire fighting apparatus, recreation, light, air, and solar access; and for the avoidance of congestion of population, and other public requirements. This section also includes criteria for expansion or inclusion of public parks and trails for new or expanded development.

Natural Resource Protection

Natural protection activities preserve or restore natural areas or their natural functions. They are usually implemented by parks, recreation, or conservation agencies or organizations.

2008 City of Golden Parks and Recreation Department Master Plan – The City of Golden Parks and Recreation Master Plan is a guiding document used by elected and appointed officials to determine potential actions. The Master Plan documents, classifies, and inventories the parks, trails, and recreation facilities currently owned and maintained by the City of Golden Parks and Recreation Department. The Master Plan also lays out standards for future developments' inclusion of open space and public recreation areas.

Bicycle Planning – Integrated into the Comprehensive Plan 2011 - The City of Golden's bicycle mobility strategy is integrated into the multi-modal transportation section of the City's Comprehensive plan, updated in 2011.

Emergency Services

Emergency services measures are taken during an emergency to minimize its impacts. These measures are the responsibility of city or county emergency management staff and the owners or operators of major or critical facilities.

Snow removal - The Street Division is responsible for snow and ice control maintenance of approximately 230 lane miles of asphalt pavement. All city streets are maintained during each storm as required. Snow and ice control services are provided for community safety purposes first and for convenience secondarily. The snow and ice control plan is revised annually.

Fire plans - The City of Golden has a Community Wildfire Protection Plan (CWPP) last updated in 2007. The CWPP was developed for the City of Golden with guidance and support from Jefferson County Division of Emergency Management, Colorado State Forest Service and the United States Forest Service. This CWPP supplements the Jefferson County Annual Operation Plan and the Jefferson County Fire Plan. Initial response to all fire and medical and associated emergencies is the responsibility of the City of Golden. The CWPP profiles the City of Golden by outlining its specific risks and then provides a number of suggested actions (Section 5.2) to achieve reduction of vulnerabilities.

Structural Projects

Structural projects keep hazards away from an area (e.g., levees, reservoirs, other flood control measures). They are usually designed by engineers and managed or maintained by public works staff.

Replacement of the Lena Gulch culvert under Heritage Road. The old 60-inch diameter metal pipe was significantly undersized—it would not pass even the “5-year storm” and thus the potential for even a modest rainfall event to overtop Heritage Road was very real. The undersized pipe was replaced with an 8-foot by 8-foot concrete box culvert, which will safely pass flows from the “100-year storm.” This will reduce flood impacts on the upstream property owner and help protect Heritage Road from overtopping during small rain events.

The current Capital Improvements Plan shows \$200,000 budgeted in 2016 and 2017 to replace the failing culvert under Heritage Road at Apex Gulch. The new culvert will also be sized to pass the 100-year flow and reduce flood hazards in the area. Drainage improvements on the Kenney’s Run watercourse are nearly complete, with expected completion in February 2016. See Figure 11.

Current Capital Improvements Plan shows \$200,000 budgeted in 2016 and 2017 to replace the failing culvert under Heritage Road at Apex Gulch. The new culvert will also be sized to pass the 100-year flow and reduce flood hazards in the area.

Figure 9. Lena Gulch pipe under Heritage Road almost at capacity



Figure 10. New box culvert and erosion protection in Lena Gulch at Heritage Road



Figure 11. Drainage Improvements at Kenney's Run Draw



Public Information

Public information activities advise property owners, potential property owners, and visitors about the hazards, ways to protect people and property from the hazards, and the natural and beneficial functions of natural resources (e.g., local floodplains). They are usually implemented by a public information office.

The City's Communication Manager is responsible for all aspects of the City's public communications activities and operations, including strategic and crisis communications, public relations, marketing, audio-visual production, publications production and event planning. The Communications Manager directs and develops programs to increase citizen understanding of municipal operations and that deliver effective two-way communications, including citizen, media relations, public relations, marketing, intergovernmental and interdepartmental relations. The Communications Manager serves as advisor to the City Manager, Council and staff in developing and fostering successful relationships with the community, media and other governments via effective day-to-day communications.

Other Capabilities

Golden has links on its website to real-time flood gauge information at the Urban Drainage District; no changes planned.

Golden sends an annual Flood Protection Brochure to properties near and in the floodplain as part of our participation in the CRS program; no changes planned.

Golden has placed FEMA Technical Bulletins in the Golden Library—these bulletins cover flood protection techniques and flood resistant construction; required by CRS, no changes planned.

Golden's 2014 Flood Protection Ordinance prohibits development in the floodway and provides strict guidelines for floodplain development; no changes planned.

Per Golden's ordinance, any changes to Critical facilities must result in protection to the 500-year storm level; no changes planned.

Golden continues its participation in the NFIP; we just had our ISO audit in October 2015 to verify compliance; no changes planned.

Golden continues its participation in the CRS; we just had our ISO audit in October 2015 to verify compliance and anticipate retaining our CRS rating of "7"; plan on continuing participation in CRS.

Golden is entering into a 50/50 cost share agreement to fund the replace of the culvert under Heritage Road at Apex Gulch; this is a \$400,000 investment, budgeted in 2017, that will mitigate flood hazards in that location.

1.6 Mitigation Actions

This section of provides updates on the actions identified in the 2010 Jefferson County Hazard Mitigation Plan and new actions identified in 2015-2016.

1. Apex Gulch at Heritage Road Culvert Replacement

Issue/Background: This project would involve replacement of undersized, failing culvert under Heritage Rd that was built in the 1940s. The new culvert will be designed to pass the 100-year flood under the road, reducing the potential for property and road damage, and keeping access to City Fire Station open at all times.

Other Alternatives:

Responsible Office: City of Golden Public Works

Priority (High, Medium, Low): High

Cost Estimate: \$800,000

Benefits (Losses Avoided): Flooding of property and structures, road damage including access to City Fire Station.

Potential Funding: Cost to be shared 50/50 with Urban Drainage. City has \$200,000 budgeted in 2016 and \$200,000 in 2017.

Schedule: Design in 2016, begin construction 2016, complete in 2017

STATUS: New in 2016

2. Continue to Implement Sound Floodplain Management Practices through Participation in the National Flood Insurance Program

Issue/Background: The City of Golden participates in the National Flood Insurance Program. The City also participates in the Community Rating System and is a CRS Class 7 (up from 9 in 2010). This project restates the commitment of the City of Golden to implement sound floodplain management practices, as stated in the flood damage prevention ordinance. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits for appropriate development in Special Flood Hazard Areas and ensuring that this development is elevated to or above the base flood elevation. This project also includes periodic reviews of the floodplain ordinance to ensure that it is clear and up to date.

Floodplain managers will remain current on NFIP policies. The City of Golden's City Engineer and Civil Engineer are both Certified Floodplain Managers (CFMs) in good standing with the Association of State Floodplain Managers. The City also distributes the enclosed brochure each Spring to all properties in the floodplain.

Other activities that could be included in this effort are:

- Ensure that stop work orders and other means of compliance are being used as authorized by each ordinance;
- Suggest changes to improve enforcement of and compliance with regulations and programs;
- Participate in Flood Insurance Rate Map updates by adopting new maps or amendments to maps;
- Utilize recently completed Digital Flood Insurance Rate maps in conjunction with GIS to improve floodplain management, such as improved risk assessment and tracking of floodplain permits;
- Promote and disperse information on the benefits of flood insurance, with assistance from partners such as the County, Urban Drainage and Flood Control District, and Colorado Water Conservation Board.
- Evaluate activities that will improve Community Rating System ratings that may further lower the cost of flood insurance for residents

Other Alternatives: No action

Responsible Office: City of Golden Public Works

Priority (High, Medium, Low): Medium

Cost Estimate: Low

Potential Funding: Covered in existing budget

Benefits (avoided losses): Reduced property loss from floods, continued availability of flood insurance for residents; as a CRS participant residents will have lowered flood insurance rates.

Schedule: Ongoing

STATUS: Continuing efforts and activities on an annual basis has resulted in an improvement in the classification from a 9 to a 7, which now provides a 15% discount on flood insurance for residents. Drainage improvements in the Kenney Run draw and others were key in the reclassification effort.

Projects Completed Since 2010

Kenney's Run Culvert Improvements

Issue/Background: Between 24th and 23rd, the existing drainage channel has an 823 cubic feet per second (cfs) capacity. This is very undersized compared to the 100-year 1,550 cfs calculated by Urban Drainage. The City's Kenney Run Drainage Project description. This project is co-funded by the City and the Urban Drainage and Flood Control District, with the City's contribution totaling \$950,000. The project includes channel improvements and replacement of the pipes under 23rd and 24th Street with concrete box culverts that will pass the 100-year storm flows. The flood modeling shows 47 structures removed from the floodplain once construction is complete, which is anticipated to be in February 2016.

Emergency Operations Plan Development

Issue/Background: Current City of Golden Emergency Operations Plan (EOP) is out of date and is not functionally responsive to current emergency operations requirements. The plan was created and implemented in October of 2010. The plan was updated as of October 2015 at a cost of \$30,000 and will be periodically exercised.

Winter Weather Citizen Shelter Facility Identification and Readiness

Issue/Background: When the Golden area experiences severe winter weather, the surrounding highways such as I-70, C-470, Highway 93, and Highway 58 often are impassable and are completely shut down. With I-70 being the major East/West highway for the Denver Metro area and the State of Colorado, severe winter weather causes large numbers of travelers to be stranded in the Golden area and they require warm and safe shelter facilities with appropriate accommodations. In addition, it is also possible that local Golden citizens could also be stranded or unable to occupy their normal residential shelters or employees are unable to return to their home location. Winter weather shelter facilities need to be identified and plans put in place to ensure they are opened up and appropriate staffing and accommodations are available to support stranded citizens in the event of severe winter weather. The plan needs to confirm availability of appropriate facilities and get permission agreements in place, obtain and update current contact information and procedures for key-holder response, provide for keeping street access open, provide for appropriate accommodations (cots, blankets, water, etc.), provide for appropriate security, EMS, safety, and communications.

Shelters have been identified and are part of the City's Emergency Operations Plan and Crisis Guide. The primary shelter is Golden High School and the secondary shelter is Bell Middle School. We identified the shelters in conjunction with Jefferson County Emergency Management, R1 School District, the American Red Cross and the Salvation Army.

The shelters are available for any significant event, not just winter weather.



ANNEX D

CITY OF LAKEWOOD

1.1 Community Profile

1.1.1 History

The City of Lakewood is a home rule municipality located in eastern Jefferson County and is the most populous city in the County.

Earliest settlement of the community that is now Lakewood occurred just prior to 1860 as a result of gold-seekers. Notable early developments still standing include the Stone House at South Garrison and Estes streets, and the Rooney Ranch at West Alameda Avenue and C-470.

In the late 1800s, there were a few subsistence farms, small dairies and orchards. Families slowly settled into the area. Entrepreneurs began to build businesses to serve the new residents and those traveling through the area. The highest concentration of commercial and residential uses occurred along the West Colfax Avenue and Wadsworth Boulevard corridors. In 1890, Jefferson County had a population of 8,450. At that time, the City of Denver had about 100,000 residents.

The name Lakewood was commonly used long before the City was incorporated in 1969. The first known use of the name was when the Loveland and Welch families created the Lakewood Subdivision in 1899. The Jefferson County Board of Commissioners awarded the Loveland and Welch families the right to build and operate a railroad on east-west streets, through the Lakewood Subdivision, from what is now Sheridan Boulevard to the City of Golden. The Denver, Lakewood and Golden Railroad was formed. The railroad right of way was established toward the end of the 19th century. The expansion of the railroad and development of a network of irrigation ditches made it possible for farms and businesses to prosper.

Roadway improvements set the stage for continued growth in the early to mid-20th century. By 1939, businesses and neighborhoods were linked by a thousand miles of county roads. In 1941, 6,000 workers labored eight months to open the Remington Arms Company, an ammunition factory on what is now the Denver Federal Center at Kipling Street and West Alameda Avenue. As workers and their families moved into the area, demand increased for housing, schools and services.

During the 1950s, people began to move to Jefferson County for its rural character. The county had more horses per person than any other county in the United States. One of the largest growth spurts in county history occurred during this time when the population increased by 130 percent from 1950 to 1960.

Several issues led to Lakewood seeking incorporation, most significantly was public safety. Busing to Denver public schools and possible annexation into Denver were additional concerns for residents in the late 1960s. There were several attempts at incorporation. These efforts were

successful in 1969. At a population of 70,000, Lakewood was the largest municipal incorporation in the nation at the time.

Since 1970, Lakewood has doubled in population. At 149,643 people, Lakewood is the most populous jurisdiction in Jefferson County. Lakewood also houses the prestigious Lakewood High School, ranked number one in the state by Newsweek, and the only International Baccalaureate School in Jefferson County. Lakewood is also home to Colorado Christian University.

1.1.2 Population

The U. S Census Bureau’s estimated 2014 population of Lakewood was 149,643. Select Census and American Community Survey demographic and social characteristics for Lakewood are shown in Table 1.

Table 1. Lakewood’s Demographic and Social Characteristics

Characteristic	Percentage (%)
Gender/Age	
Male (%)	48.9
Female (%)	51.1
Under 5 Years (%)	5.9
65 Years and Over (%)	15
Race/Ethnicity (one race)	
White (%)	87.5
Hispanic or Latino (Of Any Race) (%)	21.6
Other	
Average Household Size	2.29
High School Graduate or Higher (%)	91.1

Source: U.S. Census Bureau, www.census.gov/

1.1.3 Economy

According to the 2013 American Community Survey, the industries that employed most of Lakewood’s labor force were educational, health, and social services (18.4%); professional, scientific, management, administrative, and waste management services (13.8%); and retail trade (11.9%). Select economic characteristics for Lakewood from the 2013 American Community Survey are shown in Table 2.

Table 2. Lakewood’s Economic Characteristics, 2013

Characteristic	
Families below Poverty Level,	9.1%
Individuals below Poverty Level,	12.8%
Median Home Value	\$238,500
Median Household Income,	\$56,492
Per Capita Income,	\$31,094
Population in Labor Force	79,906
Unemployment (%)*	9.2%

Source: U.S. Census Bureau, www.factfinder.census.gov/

1.2 Hazard Summary

A hazard identification and vulnerability analysis was completed for the City of Lakewood using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County. Information from the Data Collection Guide is summarized in Table 3 with all the hazards listed that could impact anywhere in Jefferson County. The purpose of this exercise was to identify and rank the hazards and vulnerabilities unique to the jurisdiction.

For this plan update, the City of Lakewood’s planning team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the City of Lakewood. The data in Table 3 reflects the most significant hazards for the City of Lakewood. They are: dam failure, flood, lightning, severe winter storms and tornado. The hazard significance listed is based on City HMPC member input from the Data Collection Guide and the risk assessment updated during the planning process (refer to Chapter 4 of the base plan).

Table 3. City of Lakewood – Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance	Hazard Map? (Paper/GIS/Source)
Avalanche	Unlikely	Limited	Negligible	Low	
Dam Failure	Occasional	Significant	Limited	Medium	
Drought	Occasional	Limited	Limited	Low	
Earthquake	Occasional	Limited	Limited	Low	
Erosion and Deposition	Likely	Limited	Negligible	Low	
Expansive Soils	Likely	Significant	Negligible	Low	
Extreme Temperatures	Occasional	Limited	Negligible	Low	
Flood	Likely	Significant	Limited	Medium	Paper & GIS
Hailstorm	Likely	Limited	Limited	Low	
Landslide, Debris flow, Rockfall	Likely	Limited	Negligible	Low	
Lightning	Likely	Limited	Negligible	Medium	
Severe Winter Storms	Highly Likely	Extensive	Limited	Medium	
Subsidence	Likely	Limited	Negligible	Low	
Tornado	Occasional	Limited	Limited	Medium	
Wildfire	Occasional	Limited	Negligible	Low	
Windstorm	Highly Likely	Extensive	Negligible	Low	
Frequency of Occurrence: Highly Likely: Near 100% probability in next year. Likely: Between 10 and 100% probability in next year or at least one chance in ten years. Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years. Unlikely: Less than 1% probability in next 100 years.		Potential Magnitude: Catastrophic: Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50% of property is severely damaged Critical: Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 25% of property is severely damaged Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged Negligible: Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.			
Spatial Extent: Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		Significance: Low, Medium, High			

Previous Hazard Events

Through the Data Collection Guide, the City of Lakewood noted specific historic hazard events to include in the community profile. These events have been incorporated into the appropriate hazard chapters in the base plan. These events had a particular impact on the community beyond the impacts and events recorded in the Jefferson County Hazard Mitigation Plan. This is not a comprehensive summary of past incidents, as the hazard profiles collected in the main Mitigation Plan include other events that may have historically impacted the jurisdiction. Notable events include:

1979 Dam Failure

On March 17, 1979, the fabric dam of the Maple Grove Dam was punctured by an unknown, sharp object. It was determined to be most likely due to vandalism. Vandals using knives sliced open the 30-foot long dam allowing a relatively small but certainly unexpected flood to occur. The peak flow immediately below the reservoir was about 750 cubic feet per second (cfs) and caused some residential basement flooding and first floor damage to some commercial buildings. Buildings in the area of 27th and Youngfield suffered the most damage. The fabric dam spillway was replaced in 2004 with a more vandal resistant structure.

December 2008 Snow Storm

A Pacific storm system coupled with upslope winds produced heavy snow in and near the foothills of Boulder, Jefferson, and Douglas Counties, and along the Palmer Divide. In the Front Range Foothills, storm totals included 12" in Lakewood. Heavy drifting was reported. Many roofs in Lakewood suffered damage. Businesses were forced to close, resulting in a loss of retail revenue for businesses and tax revenue for the city. Lakewood was granted state/federal reimbursement for snow removal costs in the amount of \$100,289.

2008 Green Mountain Fire

On August 4, 2008 at approximately 2:30 pm the City of Lakewood experienced a large grass land fire on Green Mountain. Fire crews from West Metro Fire District along with other fire departments in Jefferson County provided fire suppression resources to fight the fire. The fire consumed 388 acres and was declared controlled on August 8, 2008.

2013 September Floods

In September 2013, Bear Creek Lake Park and the Regional Law Enforcement Shooting Range were significantly impacted by the wide-spread and disastrous flooding that hit Colorado. The flooding at Bear Creek Lake Park began on September 12 when the U.S. Army Corps of Engineers, which owns the property and leases it to the City of Lakewood, closed the gates on Bear Creek Reservoir to prevent further downstream flooding as designed. On September 13, the park was closed and heavy rains caused Bear Creek to overflow its banks under C470 causing flood damage and debris collection and piling. By the end of the day, flood waters and debris reached to the paved bicycle trail adjacent to Morrison Road, Skunk Hollow Picnic Shelter and the surrounding Owl Trail, Mount Carbon Trail, and Cottonwood Trail. With a river flow of 1,800 cubic feet per second, the rushing waters of Bear Creek damaged surrounding park amenities such as trails and roads and changed the course of the creek. In total seven miles of the 16 total miles of trail in the park were impacted by the flood, with roughly 4,200 feet of trail needing significant repair. The Shooting Range at 690 S. Rooney Road also experienced unprecedented flooding and destructive debris flows on all three target ranges and on the facility property. On September 16, 2013 the City evaluated damage and developed plans to restore the site at a projected cost of \$90,000. Each of the three shooting ranges, the access road, adjacent ditches, steep slopes, and the main parking

area exhibited extensive flood damage. The scope of work restored immediate function to the ranges and provided preventative measures to improve future drainage. Total cost of project completion and removal of contaminated soils, \$110,000.

Vulnerability to Specific Hazards

This section details vulnerability to specific hazards, where quantifiable, and where it differs from that of the overall County. The results of detailed GIS analyses used to estimate potential for future losses are presented here, in addition to maps of hazard areas. For a discussion of the methodology used to develop the loss estimates refer to Section 4.3 of the Base Plan.

Flood

According to the GIS vulnerability assessment conducted for this plan update, Lakewood has one of the higher potentials for economic losses from flooding in the County. Note that this is based on computer modeling that may not reflect site specific mitigation activities. Lakewood Gulch, Lena Gulch, and other drainageways off Green Mountain are a source of flood concerns.

Figure 1 depicts the FEMA flood zones (1% annual chance and 0.2% annual chance) as well as all the at risk properties in Lakewood.

Table 4 shows the parcels and buildings at risk to the 1% annual chance flood and Table 5 shows the values at risk in the same flood scenario. For this analysis, content values were estimated based on prevailing land use and a multiplier was applied to building and content values to estimate losses to each. See Section 4 Hazard Profiles for details on methodology. According to the analysis, 272 buildings (120 of which are residential) are at risk, totaling \$56.7M of damage to buildings and contents.

Table 4. Lakewood Buildings At-Risk to 1% Annual Chance Flood

Jurisdiction	Property Type	Improved Parcels	Building Count
Lakewood	Agriculture	1	1
	Commercial	54	85
	Exempt	12	11
	Industrial	9	22
	Mixed Use	15	33
	Residential	122	120
	Total	213	272

Source: Jefferson County Assessor (October 2015)

Table 5. Lakewood Values At-Risk to 1% Annual Chance Flood

Property Type	Improved Value	Content Value	Total Value	Structure Loss	Content Loss	Total Loss Estimate
Agriculture	\$61,100	\$61,100	\$122,200	\$14,664	\$25,662	\$40,326
Commercial	\$31,604,100	\$31,604,100	\$63,208,200	\$7,584,984	\$13,273,722	\$20,858,706
Exempt	\$9,099,600	\$9,099,600	\$18,199,200	\$2,183,904	\$3,821,832	\$6,005,736
Industrial	\$3,510,400	\$5,265,600	\$8,776,000	\$842,496	\$2,211,552	\$3,054,048
Mixed Use	\$24,179,900	\$24,179,900	\$48,359,800	\$5,803,176	\$10,155,558	\$15,958,734
Residential	\$28,158,480	\$14,079,240	\$42,237,720	\$8,447,544	\$2,393,471	\$10,841,015
Total	\$96,613,580	\$84,289,540	\$180,903,120	\$24,876,768	\$31,881,797	\$56,758,565

Source: Jefferson County Assessor (October 2015)

Table 6 shows the parcels and buildings at risk to the 0.2% annual chance flood and Table 7 shows the values at risk in the same flood scenario. For this analysis, content values were estimated based on prevailing land use and a multiplier was applied to building and content values to estimate losses to each. See Section 4 Hazard Profiles for details on methodology. According to the analysis, 165 buildings (156 of which are residential) are at risk, totaling \$24.4M of damage to buildings and contents over and above the 1% scenario.

Table 6. Lakewood Buildings At-Risk to 0.2% Annual Chance Flood

Jurisdiction	Property Type	Improved Parcels	Building Count
Lakewood	Commercial	4	3
	Exempt	3	5
	Industrial	1	1
	Residential	150	156
	Total	158	165

Source: Jefferson County Assessor (October 2015)

Table 7. Lakewood Values At-Risk to 0.2% Annual Chance Flood

Property Type	Improved Value	Content Value	Total Value	Structure Loss	Content Loss	Total Loss Estimate
Commercial	\$5,364,300	\$5,364,300	\$10,728,600	\$1,287,432	\$2,253,006	\$3,540,438
Exempt	\$1,345,000	\$1,345,000	\$2,690,000	\$322,800	\$564,900	\$887,700
Industrial	\$387,700	\$387,700	\$775,400	\$93,048	\$162,834	\$255,882
Residential	\$41,949,685	\$41,949,685	\$83,899,370	\$12,584,906	\$7,131,446	\$19,716,352
Total	\$49,046,685	\$49,046,685	\$98,093,370	\$14,288,186	\$10,112,186	\$24,400,372

Source: Jefferson County Assessor¹ (October 2015)

According to the City Public Works Department, as of September 2015, there were four repetitive loss properties and one severe repetitive loss property. These five properties have made a total of thirteen repetitive loss claims since Lakewood's inclusion in the NFIP.

Three properties, previously on the repetitive loss list, with a total of eight claims were officially removed from the repetitive loss list effective August 26, 2014 following FEMA's approval of the RTD West Corridor Letter of Map Revision, effective June 6, 2014 (Case No. 14-08-0653P) and City request to update the repetitive loss list. The exact location of these structures cannot be listed due to Privacy Act restrictions.

To create the most accurate representation of critical facilities in the County, a composite of 3 different data sources were compiled: Jefferson County Assessor data, HSIP Freedom Data and HAZUS 2.2. This new data later was then cross referenced in GIS with the FEMA flood zone inundation maps.

This analysis showed that there are 19 critical facilities in the 1% annual chance flood zone, 11 of which are bridges (Table 8). The analysis also showed that there are 3 additional critical facilities in the 0.2% annual chance flood zone (Table 9).

Table 8. Lakewood Critical Facilities in 1% Annual Chance Floodplain

Jurisdiction	Category	Facility Type	Facility Count
Lakewood	Essential Facilities	Fire Station	1
	Essential Facilities	Urgent Care Facility	1
	High Potential Loss Facilities	Dam	2
	High Potential Loss Facilities	Day Care Center	1
	High Potential Loss Facilities	HAZMAT	3
	Transportation and Lifelines	Bridge	11
	Total		

Source: Jefferson County Assessor (October 2015) HSIP Freedom 2015 and HAZUS 2.2

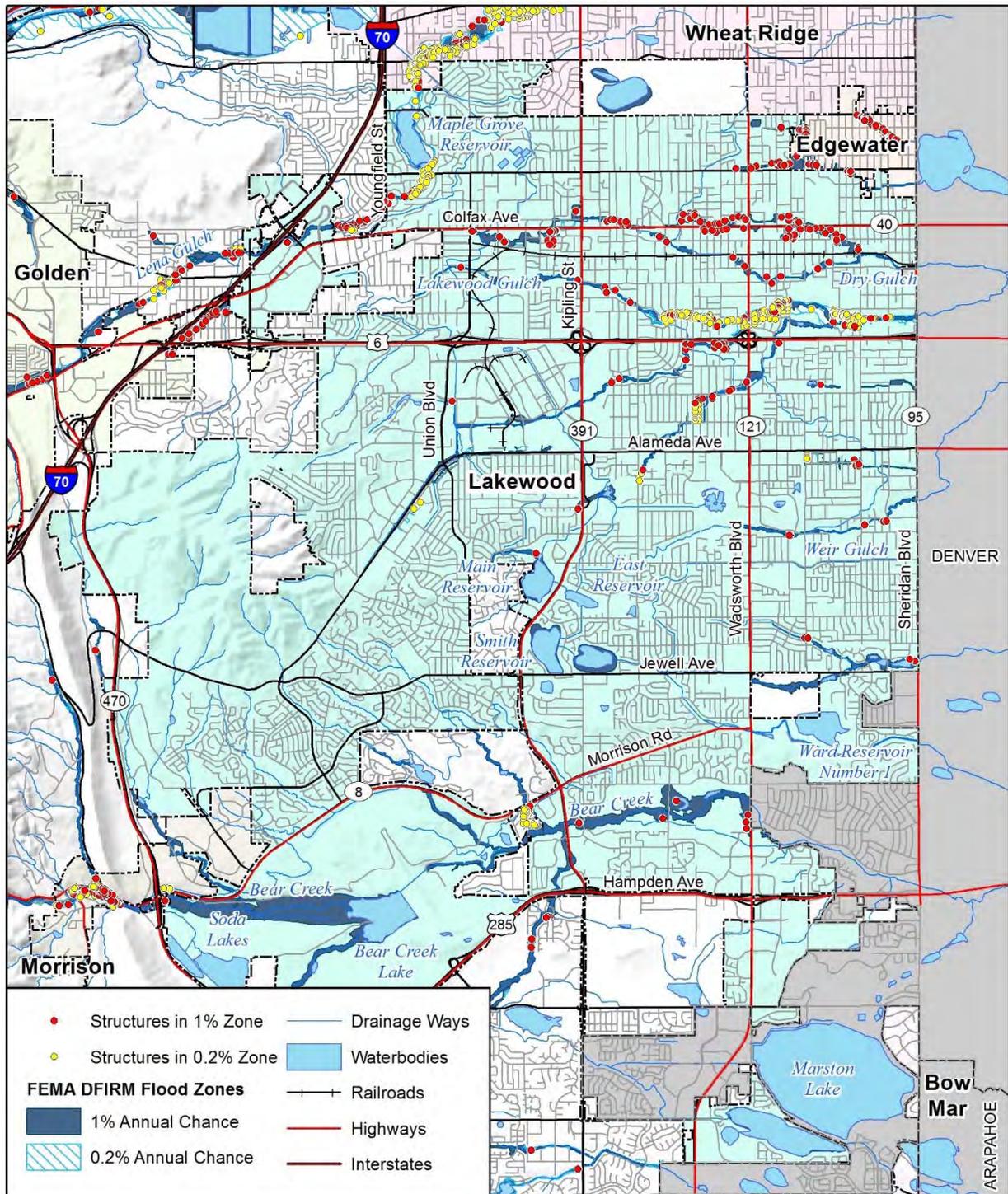
¹ The Assessor's Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values. The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values (typically 50% for residential structures, 100% for commercial, 100% for agricultural, 150% for industrial, 100% for mixed use and 100% for exempt.)

Table 9. Lakewood Critical Facilities in 0.2% Annual Chance Floodplain

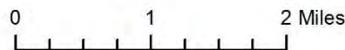
Jurisdiction	Category	Facility Type	Facility Count
Lakewood	High Potential Loss Facilities	Dam	1
	High Potential Loss Facilities	HAZMAT	1
	Transportation and Lifelines	Bridge	1
	Total		3

Source: Jefferson County Assessor (October 2015) HSIP Freedom 2015 and HAZUS 2.2

Figure 1. City of Lakewood Flood Hazards and At-Risk Properties



Map compiled 10/2015;
intended for planning purposes only.
Data Source: Jefferson County, CDOT,
NHD, FEMA DFIRM 02/05/2014



Dam Failure

According to the analysis in Section 4 of the Base Plan, Lakewood has 8 high hazard and 5 significant hazard dams whose failure could impact life and/or property.

Geologic Hazards

Lakewood has exposure to geologic hazards including: dipping bedrock, landslides, slope failures and subsidence, see Figure 2 Lakewood parcel data was intersected with geologic hazard data for this analysis. Most geologic hazards are concentrated in the western part of the jurisdiction just east of C-470. Rapid growth in the Rooney Valley area poses a potential concern from a geologic hazard standpoint.

Table 10 summarizes the parcels and values at risk to slope failure. Table 11 summarizes the parcels and values at risk to subsidence and Table 12 summarizes parcels and values at risk to dipping bedrock. Content values are estimated and provided as reference, but are not generally at-risk for subsidence or dipping bedrock.

Table 10. City of Lakewood Slope Failure Risk

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Lakewood	Exempt	2	1	\$1,136,100	\$1,136,100	\$2,272,200
	Residential	16	16	\$4,794,400	\$2,397,200	\$7,191,600
	Total	18	17	\$5,930,500	\$3,533,300	\$9,463,800

Source: Jefferson County Assessor (October 2015)

Table 11. City of Lakewood Subsidence Risk

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Lakewood	Exempt	2	0	\$154,970	\$154,970	\$309,940
	Residential	30	30	\$14,582,090	\$7,291,045	\$21,873,135
	Total	32	30	\$14,737,060	\$7,446,015	\$22,183,075

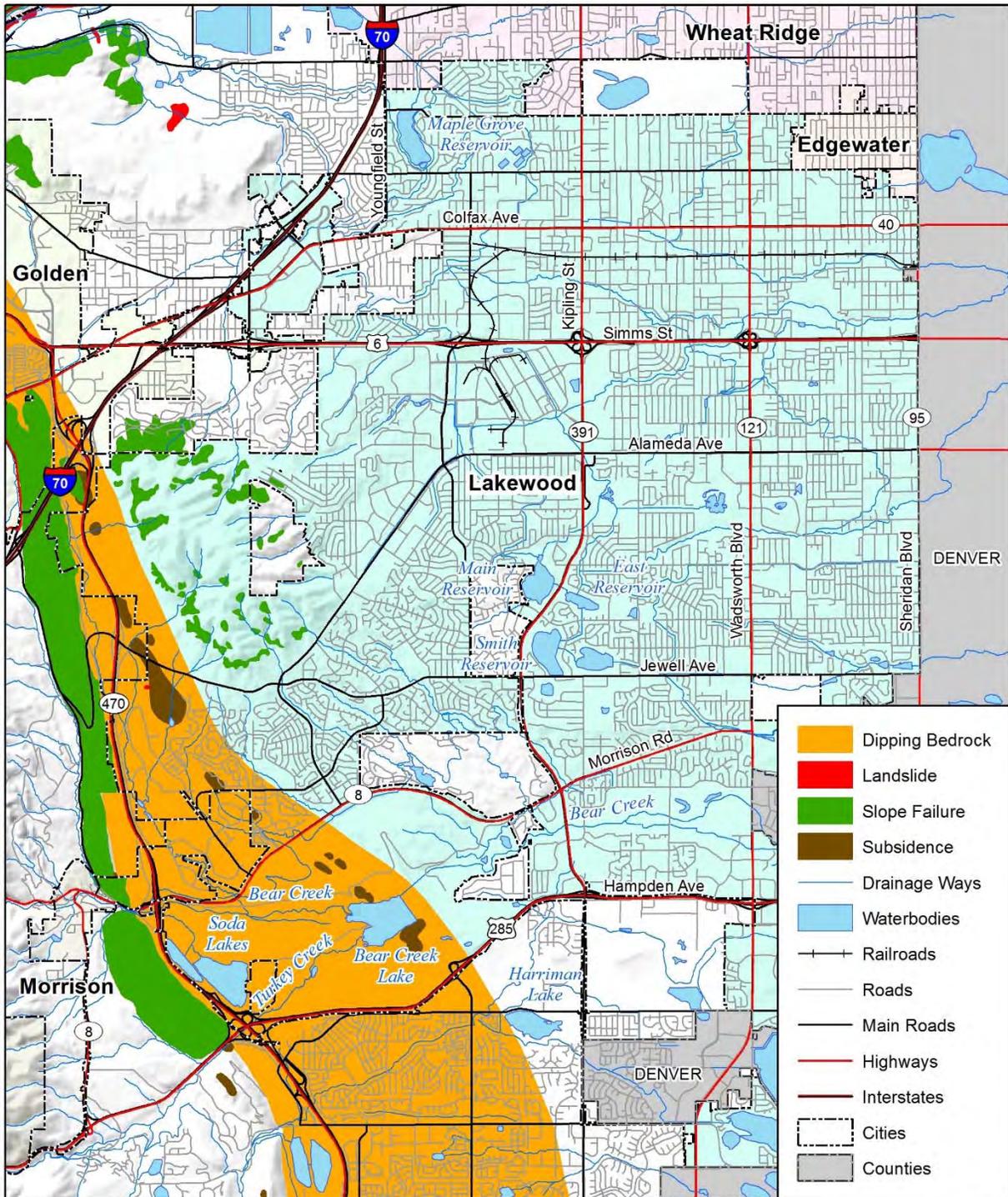
Source: Jefferson County Assessor (October 2015)

Table 12. City of Lakewood Dipping Bedrock Risk

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Lakewood	Commercial	2	1	\$107,400	\$107,400	\$214,800
	Exempt	12	3	\$2,129,870	\$2,129,870	\$4,259,740
	Residential	928	918	\$395,830,030	\$197,915,015	\$593,745,045
	Total	942	922	\$398,067,300	\$200,152,285	\$598,219,585

Source: Jefferson County Assessor (October 2015)

Figure 2. City of Lakewood Geologic Hazards Map




 Map compiled 10/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD

0 1 2 Miles



Wildfire

While not a foothills community, Lakewood does have risk to wildfires, particularly grass fires on the western edge of the City around Green Mountain and Bear Creek Reservoir, see Figure 3.

A GIS based analysis was conducted to identify the critical facilities (Table 13) in Lakewood at-risk to wildfires. A total of 40 critical facilities are at risk.

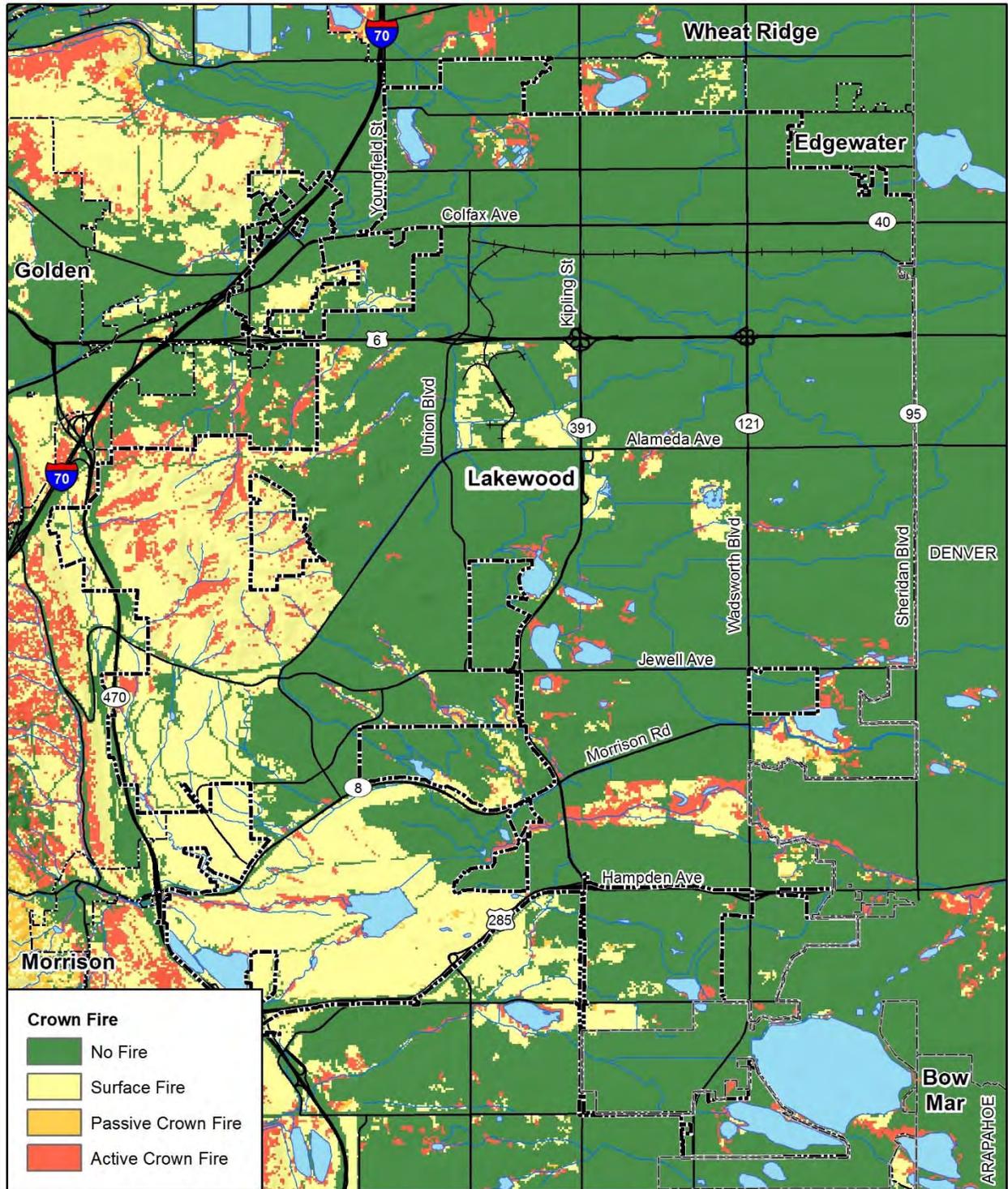
This table does not reflect the several hundred residential structures that border the Green Mountain Open Space potentially that are potentially at risk to grass fires.

Table 13. Lakewood Critical Facilities At-Risk to Wildfire by Type

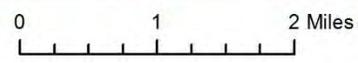
Category	Facility Type	Facility Count Active Crown Fire	Facility Count Passive Crown Fire	Facility Count Surface Fire
High Potential Loss Facilities	College	1	1	1
Essential Facilities	Fire Station	0	0	1
Essential Facilities	Hospital	0	0	2
Essential Facilities	Law Enforcement	0	0	1
High Potential Loss Facilities	Dam	3	1	0
High Potential Loss Facilities	HAZMAT	2	0	3
High Potential Loss Facilities	Day Care Center	1	1	4
Transportation and Lifelines	Aircraft Facility	1	0	0
Transportation and Lifelines	Bridge	4	0	2
High Potential Loss Facilities	Private School	0	0	1
Transportation and Lifelines	Communication	4	1	5
Total		16	4	20

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, Jefferson County CWPP

Figure 3. City of Lakewood Fire Exposure by Type, 90th Percentile Weather Conditions




 Map compiled 11/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD, 2011 Jefferson County CWPP



Other Hazards

In the case of other hazards that are not specific to geography such as drought, hailstorms, winter storms, earthquake, lightning, tornado and windstorm the entire building inventory and population in the City is potentially exposed. That is the reason for the asset inventory provided in Section 1.3 below. It should be noted that no hazard in this plan is expected to cause widespread impacts to this inventory.

Additional Vulnerability Issues

The City of Lakewood has a large population of citizens who would fall into the “Special Needs Category”. Existing plans are currently being revised and updated to better help address this vulnerability.

1.3 Asset Inventory

1.3.1 Property Inventory

Table 14 represents an inventory of property in Lakewood based on the Jefferson County Assessor’s data as of October 2015.

Table 14. Lakewood’s Property Inventory

Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Agriculture	15	12	\$5,790,328	\$5,790,328	\$11,580,656
Commercial	1,237	2,089	\$1,411,899,976	\$1,411,899,976	\$2,823,799,952
Exempt	363	546	\$1,024,368,156	\$1,024,368,156	\$2,048,736,312
Industrial	149	242	\$110,053,150	\$165,079,725	\$275,132,875
Mixed Use	679	2,487	\$1,470,194,485	\$1,470,194,485	\$2,940,388,970
Residential	41,427	46,648	\$8,814,385,047	\$4,407,192,524	\$13,221,577,571
Total	43,870	52,024	\$12,836,691,142	\$8,484,525,194	\$21,321,216,336

Source: Jefferson County Assessor’s Office
 The Assessor’s Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values. The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values (typically 50% for residential structures, 100% for commercial, 100% for agricultural, 150% for industrial, 100% for mixed use and 100% for exempt.)

1.3.2 Critical Facilities

The summary below is a compilation of critical facilities in GIS databases provided by the City of Lakewood and Jefferson County. Critical facility counts and types are shown in Table 15.

Table 15. Summary of Lakewood’s Critical Facilities in GIS

Category	Facility Type	Facility Count
Essential Facilities	EOC	1
	Fire Station	7
	Hospital	2
	Law Enforcement	4
	Urgent Care Facility	7
	Total	21
High Potential Loss Facilities	College	9
	Dam	9
	Day Care Center	43
	Government Facility	13
	HAZMAT	12
	Long Term Care Facility	45
	PK-12 School	46
	Powerplant	1
	Private School	9
Total	187	
Transportation and Lifelines	Aircraft Facility	1
	Bridge	44
	Communications	14
	Water Facility	1
	Waste Water Facility	1
Total	61	
Grand Total		269

Source: Jefferson County Assessor (October 2015) HSIP Freedom 2015 and HAZUS 2.2

1.3.3 Natural, Cultural, and Historic Resources

Assessing the vulnerability of Lakewood to disaster also involves inventorying the natural, historical, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Natural Resources

The City of Lakewood owns and maintains 99 parks totaling over 7,100 acres of open space with approximately 180 miles of multi-use trails.

Natural resources of importance in Lakewood include the Main Reservoir, Smith Reservoir, East Reservoir, Hayden Green Mountain Park, Bear Creek Lake Park, Charles Whitlock Recreation Center, Lakewood Park, Green Mountain Recreation Center, Addenbrooke Park, O’Kane Park, Carmody Recreation Center and Park, Belmar Park, Crown Hill Park, Kendrick Lake Park, and the Bear Creek Greenbelt. For information about natural resources in Jefferson County, which includes Lakewood, see Section 4.3 Vulnerability Assessment.

Historic and Cultural Resources

Table 16 lists the properties in Lakewood that are on the National Register of Historic Places and/or the Colorado State Register of Historic Properties (for more information about these registers, see Section 4.3 Vulnerability Assessment).

Table 16. Lakewood’s Historic Properties/Districts in National and State Registers

Property	Address	Date Listed
Building 710, Defense Civil Preparedness Agency, Region 6 Operations Center	Denver Federal Center	3/20/2000
Davies’ Chuck Wagon Diner	9495 W. Colfax Ave.	7/20/1997
Hill Section, Golden Hill Cemetery	12000 W. Colfax Ave.	7/31/1995
Jewish Consumptives’ Relief Society	6401 W Colfax Ave.	6/26/1980
Office of Civil Defense Emergency Operations Center	Denver Federal Center	12/16/1999
Peterson House	797 S. Wadsworth	9/10/1981
Schnell Farm	3113 S. Wadsworth	2/14/1997
Stone House	2900 S Estes Street	5/1/1975
Denver & Intermountain Interurban No. 25	Denver Federal Center, W. Alameda Ave. and S. Kipling St.	State Register 12/10/1997
Howell House	1575 Kipling St.	State Register 9/11/1996
Washington Heights School	6375 W. First Ave.	State Register 7/13/1994
Country Club Gardens	1160 Pierce St.	State Register 8/27/2009
Bonfils-Stanton Belmar Estate Outbuildings	797 S. Wadsworth Blvd.	State Register 5/23/2013

Sources: Directory of Colorado State Register Properties, www.coloradohistory-oahp.org/programareas/register/1503/cty/jf.htm; National Register Information System, www.nr.nps.gov/

The National Park Service administers two programs that recognize the importance of historic resources, specifically those pertaining to architecture and engineering. While inclusion in these programs does not give these structures any sort of protection, they are valuable historic assets. There are currently 17 Historic American Building Survey (HABS) or Historic American Engineering Record (HAER) buildings in the vicinity of the City of Lakewood, but only the Peterson House (see Table 16) lies within the City limits.

It should be noted that as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

1.4 Growth and Development Trends

Table 17 illustrates how Lakewood has grown in terms of population and number of housing units between 2010 and 2014 (or the most recently available data). The table illustrates that Lakewood is undergoing moderate growth without adding much housing stock. Table 18 shows Lakewood’s estimated population changes through 2030.

Table 17. Lakewood's Change in Population and Housing Units, 2010-2014

2010 Population	2014 Population Estimate	Estimated Percent Change 2010-2014	2010 # of Housing Units	2013 Estimated # of Housing Units	Estimated Percent Change 2010-2013
142,995	149,643	+4.6%	65,054	64,392	-1%

Source: <http://factfinder.census.gov/>

Table 18. City of Lakewood Population Projections Through 2030

2010 Population	2020 Population	2030 Population	% Projected Yearly Growth Rate
142,995	159,439	177,774	1.15%

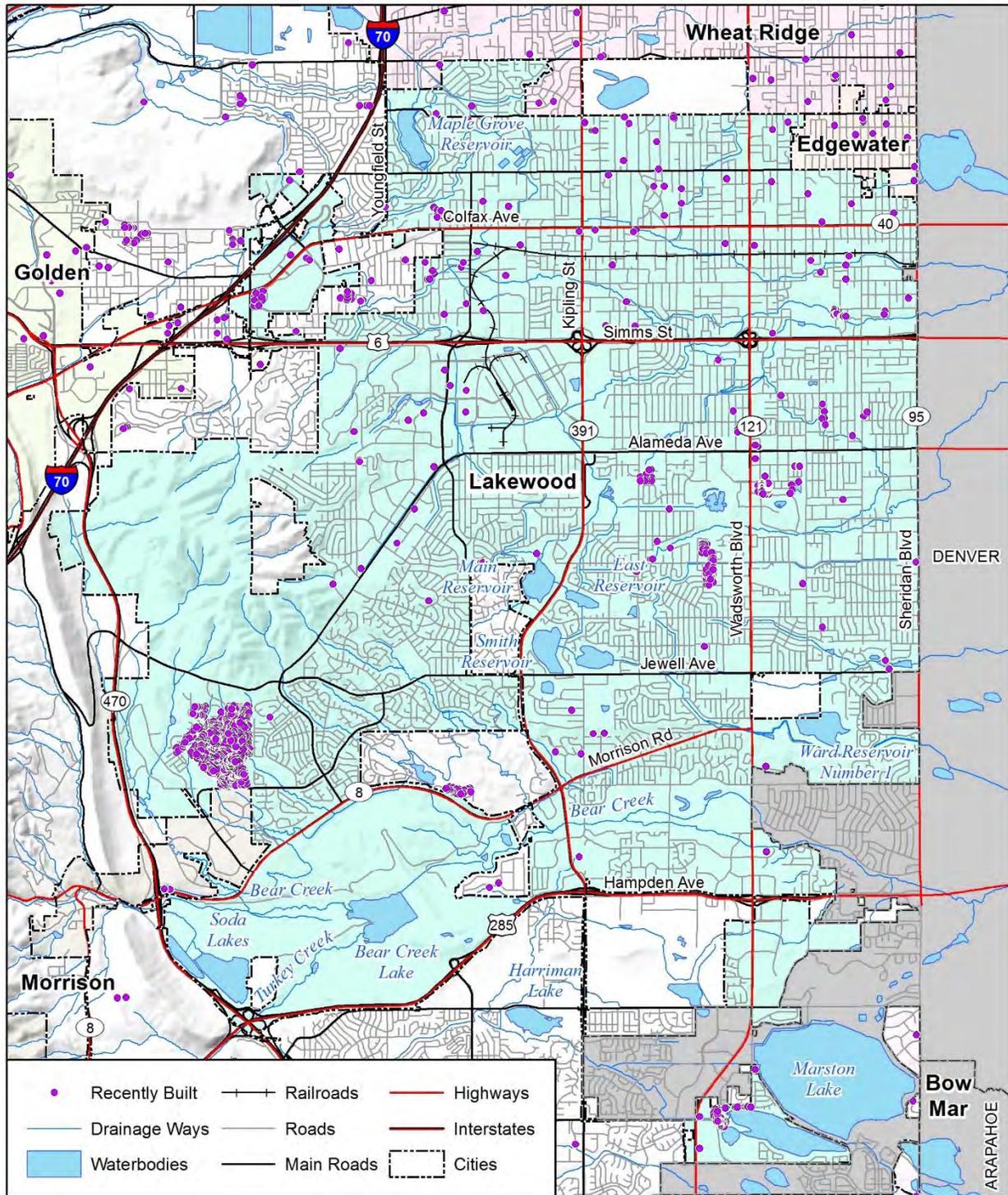
Source: <http://factfinder.census.gov/>

Lakewood is undergoing rapid growth throughout the jurisdiction, with particular concentration in the Rooney Valley area south of Green Mountain. See Figure 4. From 2009 to 2015, 1,017 parcels have been improved adding 1,017 buildings.

Future growth for the City of Lakewood will be concentrated around the following areas:

- St. Anthony Hospital
- Mission Trace/Academy Park
- Jewell/Wadsworth
- Downtown Lakewood
- Denver Federal Center
- Denver West Colorado Mills
- West Colfax Corridor
- Around the RTD light rail stations on the West Line corridor

Figure 4. City of Lakewood Recently Built 2009 to 2015




 Map compiled 10/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD

1.5 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes Lakewood’s regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities and then discusses these capabilities in further detail along with other mitigation efforts as they pertain to the National Flood Insurance Program’s Community Rating System (CRS). Although the CRS is flood-focused, this discussion also incorporates activities related to other hazards into the categories established by the CRS.

1.5.1 Mitigation Capabilities Summary

Table 19 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Lakewood.

Table 19. Lakewood’s Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
Master Plan	Y	Comprehensive Plan: Lakewood 2025
Zoning ordinance	Y	Title 17 of Municipal Code
Subdivision ordinance	Y	Title 16 of Municipal Code
Growth management ordinance	Y	Lakewood.org
Floodplain ordinance	Y	Title 14 of Municipal Code
Site plan review requirements	Y	Title 17 of Municipal Code
Other special purpose ordinance (stormwater, steep slope, wildfire)	Y	Stormwater; Community Resources Master Plan 2008 (Natural Resources and Open Space) and City of Lakewood Sustainability Plan
Building code	Y	Title 14 of Municipal Code
Fire department ISO rating (West Metro)	Y	Split rating of 3 for urban area and 9 for hog back area
Erosion or sediment control program	Y	Lakewood.org
Stormwater management program	Y	Title 14.18
Capital improvements plan	Y	Lakewood.org
Economic development plan	Y	Lakewood.org
Local emergency operations plan	Y	May 1, 2013
Other special plans/efforts	Y	Local Energy Assurance Plan 2012 Joint Emergency Operations Center
Flood insurance study or other engineering study for streams	Y	Flood Insurance Study Updated February 2014
BCEGS Ratings (1-10, 1 being best)	Y	Personal (1 and 2 family dwellings) 4 Commercial (all other buildings) 3, 2015
Elevation certificates	Y	Lakewood.org

Table 20 identifies the personnel responsible for mitigation and loss prevention activities as well as related data and systems in Lakewood.

Table 20. Lakewood’s Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Y	Planning and Public Works	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Y	Planning and Public Works City Engineer	
Planner/engineer/scientist with an understanding of natural hazards	Y	Environmental Services Division	
Personnel skilled in GIS	Y	IT Department - Software Services Division	
Full-time building official	Y	Public Works	
Floodplain manager	Y	Chief Executive Office or his/her appointed designee	
Emergency manager	Y	Police Department	
Grant writer	Y	City Manager’s Office	
GIS Data – Hazard areas	Y	IT Department - Software Services Division	
GIS Data – Critical facilities	Y	IT Department - Software Services Division	
GIS Data – Building footprints	Y	IT Department - Software Services Division	
GIS Data – Land use	Y	IT Department - Software Services Division	
GIS Data – Links to assessor’s data	Y	IT Department - Software Services Division	
Warning systems/services (Reverse 9-11, cable override, outdoor warning signals)	Y	Police Department	Reverse 911, outdoor sirens, KOA Radio 850 AM

Table 21 identifies financial tools or resources that Lakewood could potentially use to help fund mitigation activities.

Table 21. Lakewood’s Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Y	
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	N	
Incur debt through general obligation bonds	Y	
Incur debt through special tax bonds	N	
Incur debt through private activities	N	
Withhold spending in hazard-prone areas	N	

1.5.2 Community Rating System Activities (All Hazards)

National Flood Insurance Program

The City of Lakewood joined the National Flood Insurance Program (NFIP) on December 31, 1974, and the Community Rating System (CRS) on October 1, 1991. The NFIP allows private property owners to purchase affordable flood insurance and enables the community to retain its eligibility to receive certain federally backed monies and disaster relief funds. The CRS is a voluntary program for NFIP-participating communities. It provides flood insurance discounts to policyholders in communities that provide extra measures of flood protection above the minimum NFIP requirements. As of September 2015, Lakewood had a CRS class rating of 6 (one a scale of 1-10, 1 being the best). This rating provides a 20 percent discount for policyholders within a special flood hazard area (SFHA) and a 10 percent discount for those outside of an SFHA.

NFIP insurance data indicates that as of September 2015, there were 412 policies in force in Lakewood (down from 428 in 2010), resulting in \$113,461,100 of insurance in force. In Lakewood, there have been 147 historical claims (up from 117 claims in 2010) for flood losses totaling \$576,684².

Mapping: Lakewood’s initial Flood Insurance Rate Map became effective on 12/31/1974. The most current Digital Flood Insurance Rate Maps were updated and became effective on 2/5/14. Digital and physical (paper) map products are used for floodplain management and risk assessment purposes.

² Colorado Water Conservation Board, Department of Natural Resources – 2015

Community Rating System Categories

The Community Rating System (CRS) categorizes hazard mitigation activities into six categories. These categories, and applicable Lakewood activities, are described below. Note: some of the activities are appropriate to multiple categories. For purposes of simplicity, they are only included in the category deemed most appropriate based on the definitions and examples provided in the *CRS Coordinator's Manual*.

Preventive

Preventive activities keep problems from getting worse. The use and development of hazard-prone areas is limited through planning, land acquisition, or regulation. They are usually administered by building, zoning, planning, and/or code enforcement offices.

City of Lakewood Comprehensive Plan – Lakewood 2025

The City's Comprehensive Plan is a guide to help the City make decisions and establish its future direction. The goals and policies contained within the plan cover a broad range of subjects matter related to services, issues, and geographic areas within Lakewood. Combined, these elements serve to direct future policy decisions to preserve vital community attributes and service levels and manage growth.

The following goals and related polices that are relevant to this hazard mitigation plan are excerpted here:

- **Goal L-HP-3: Implement the Historic Preservation Plan**
 - **Action Steps**
 - Review the Historic Preservation Plan on an annual basis to ensure implementation of the goals, policies and action steps contained in the Plan.

- **Goal L-PR3: Implement the Community Resources Master Plan**
 - **Action Steps:**
 - Review the Community Resources Master Plan and other planning documents on an annual basis to ensure implementation of the goals and objectives contained in the plans.

- **Goal L-PS3: Leverage regionalization opportunities with other law enforcement agencies to improve police service and reduce costs.**
 - **Action Steps:**
 - Explore consolidating the five police communication centers into a regional communication center.

-
- **Goal L-PS4: Partner with the West Metro Fire Protection District to ensure adequate fire protection, emergency medical services, life safety, and community services are provided.**
 - **Action Steps:**
 - Work with West Metro Fire Protection District during the site plan review process to ensure site development adequately addresses fire and rescue access.
 - Adopt, in partnership with the West Metro Fire Protection District, appropriate changes to fire codes to take advantage of evolving building technologies and to stay current with developing fire protection science.

 - **Goal L-PS5: Ensure, to the greatest extent possible, the City is adequately prepared to respond to emergencies and recovery activities before, during, and after major emergencies and disaster events.**
 - **Action Steps:**
 - Evaluate the Emergency Operations Plan every four years and update as necessary to provide, manage, and coordinate high-level emergency response and recovery activities.

 - **Goal S-AQ2: Engage the public regarding climate change and its impact.**
 - **Action Steps:**
 - Develop programs to assist residents, neighborhoods, and businesses in identifying sources of greenhouse gas (GHG) emissions and strategies to reduce emissions.
 - Assess the community’s vulnerability to climate change impacts and develop plans and adaptation strategies to reduce community vulnerability, increase resiliency, and minimize adverse effects of climate change on the environment, economy, and public health.

 - **Goal S-AQ3: Improve air quality and reduce greenhouse gas (GHG) emissions by working towards compliance with state and local air quality standards.**
 - **Action Steps:**
 - Establish a target for planting new trees and vegetation to remove CO₂, reduce urban heat island effect, and enhance urban aesthetics.
 - Evaluate street sweeping and snow plowing services for opportunities to improve air and water quality, and mitigate environmental impacts of such processes.

 - **Goal S-W1: Protect and manage bodies of water, watersheds, and floodplains**
 - **Action Steps:**
 - Manage floodplains and minimize disturbance of stable, natural floodplains to the greatest extent possible in order to reduce flood risk.

-
- Develop policies and incentives to reestablish natural flow patterns and incorporate these areas as an amenity to the site in new development and redevelopment projects.
 - Identify potential incentives to encourage developers to dedicate or donate floodplain and floodway areas as drainage easements.
 - Determine a fee program or a funding mechanism for the purchase of parcels in the flood hazard area.
 - Develop policies and incentives for the preservation and restoration of riparian and wetland buffers on public and private property to protect and restore hydrologic function.
 - Implement the Bear Creek Watershed Association Plan.
- **Goal S-W2: Increase responsible and efficient use of water resources**
 - **Action Steps:**
 - Develop and distribute educational information to provide outreach and resources to the Lakewood community that provides water conservation education, water-wise landscaping techniques, and identifies incentives for retrofitting homes for water efficiency.
- **Goal S-W3: Enhance stormwater management and water quality.**
 - **Action Steps:**
 - Continue to work cooperatively with Front Range communities to utilize a regional stormwater quality approach.
 - Identify and evaluate natural infiltration methods and develop ways to incorporate these methods into the site plan review process.
 - Develop and distribute educational materials for property owners about stormwater runoff mitigation techniques and pollution prevention.
- **Goal S-BN1: Preserve and restore local ecosystems and ecosystem services and protect biodiversity.**
 - **Action Steps:**
 - Develop strategies to prevent and mitigate environmental contamination of soils, water, and air from hazardous chemicals.
- **Goal S-BN2: Provide and protect green infrastructure, including parks, greenways, wetlands, riparian corridors, and the urban tree canopy**
 - **Action Steps:**

-
- Identify opportunities to protect and restore riparian vegetation and wetlands through the site planning review process or through land acquisition, conservation easements, and other means.

Municipal Code

Title 14, Chapter 14.25: Floodplain Management (Ord. O-2013-1 § 2, 2013)

This section of the municipal code is intended to minimize property losses and public safety hazards due to flooding in the Lakewood flood zones.

Section 14.25.050 – Acceptance:

This section formally accepts the most recent FEMA flood insurance study (2014) and all the amendments to the Flood Insurance Rate Map (FIRM).

Section 14.25.100 – Floodplain Boundaries:

This section provides a methodology to determine the exact boundaries of the floodplain and floodway. The boundaries of the floodplain and the floodway shall be determined from information presented in the Official Flood Studies. In the absence of other information, boundaries shall be determined by scaling distances on the map. Where interpretation is needed as to the exact location of the boundaries, the Floodplain Administrator shall make the necessary interpretation. In all cases, the base flood elevation of the 100-year flood shall be the governing factor in locating the floodplain boundary on any property.

14.25.130 - Floodplain Regulations:

a. All new construction and substantial improvements of nonresidential and residential structures shall have the lowest floor, including basement, and electrical, heating, ventilation, plumbing, air conditioning equipment and other service facilities including ductwork, elevated above the highest adjacent grade at least one foot (1') above the depth number specified in feet on the FIRM, or at least three feet (3') if no depth number is specified, or one foot (1') above the crown of the nearest street, whichever is higher.

14.25.160 - Critical Facilities:

A. Classification. Critical Facilities are classified under the following categories: (1) Facilities Providing Essential Services; (2) Hazardous Materials Facilities (3) Facilities Serving At-risk Populations; and (4) Facilities Vital to Restoring Normal Services.

Other Regulations

Title 13 Water and Sewers – This section of municipal code spells out the authority of the City of Lakewood to regulate water quality, and to operate and maintain sewer and water systems. It also includes a subsection relating to stormwater runoff and quality in Lakewood. Regulations

regarding avoidance of erosion during land development are also included in this subsection, as are regulations regarding well drilling for personal use.

Title 17 Zoning - Pursuant to statutory authority, this Ordinance is enacted for the following purposes:

- To promote the public health, safety, and welfare of the citizens of the City of Lakewood.
- To implement the vision, goals and recommendations of the City of Lakewood Comprehensive Plan.
- To protect and enhance the natural environment including the conservation of natural features, land and energy.
- To provide for a range of housing types and costs to meet the current and future needs of the City.
- To promote the orderly development and redevelopment of land within the City of Lakewood.
- To ensure the effective integration of development and redevelopment with surrounding land uses.
- To respect the unique characteristics and attributes of individual neighborhoods.
- To promote multi-modal transportation options within the City including safe, efficient and attractive pedestrian and bicycle connections.
- To enhance the appearance of the City of Lakewood through quality site and building design.
- To ensure the economic vitality of the City of Lakewood.

Other Plans

Transportation Plans –

West Colfax Avenue Vision 2040 Action Plan.

Community Resources Master Plan - Natural Resource Protection 2008

Natural protection activities preserve or restore natural areas or their natural functions. They are usually implemented by parks, recreation, or conservation agencies or organizations.

The purpose of this plan is to provide direction and guidance to the Department of Community Resources in managing the parks, recreation and cultural art services and facilities to meet the needs of current and future residents in the next five to ten years. This Plan is the result of an extensive master planning process that began with a needs assessment survey in 2006, followed by an extensive planning process consisting of an inventory of Department facilities; public and staff input; review of demographics, trends and benchmarking data; and analysis of programs and services and operations.

Sustainability Plan 2015

This document offers ambitious goals, detailed strategies, and concrete measurements aimed at advancing a culture of permanence where community leaders, businesses, and residents work together to ensure that Lakewood remains a healthy and vibrant place for generations to come.

A sample of some of the goals that relate to hazard mitigation include:

- Climate Change and Adaptation 1 – Minimize Lakewood’s communitywide greenhouse gas emissions, and prepare and adapt to ongoing climate change impacts.
- Natural Systems 1 – Mitigate the negative effects of the built environment and human behavior on Lakewood’s natural systems to ensure biodiversity and enhance ecosystem services.
- Natural Systems 2 – Enhance Lakewood’s resilience to the impacts of climate change using green infrastructure and ecosystem-based adaptation.

The document includes specific targets, objectives and indicators, and implementation strategies to achieve each goal.

Lakewood Energy Assurance Plan 2012

The City of Lakewood Local Energy Assurance Plan (LEAP) is a guide for City staff and officials charged with the responsibility of ensuring the continuity of operations and health and safety of the citizens of the City during periods of energy emergencies. The overall goal of the LEAP is to enable Lakewood to be more resilient to energy disruptions as a community.

Emergency Services

Emergency services measures are taken during an emergency to minimize its impacts. These measures are the responsibility of city or county emergency management staff and the owners or operators of major or critical facilities.

The following relevant annexes have been incorporated into the City of Lakewood’s Emergency Preparedness Plan:

- City Wide Snow and Ice Response Plan
- City Wide Flood Plan
- City Wide Severe Winter Storm Plan
- Dam Failure Plans for:
 - East Reservoir
 - Main Reservoir
 - Smith Reservoir
 - Maple Grove Reservoir
 - Bear Creek Reservoir

City and Police Department participated and was a grant recipient for a Buffer Zone Protection Planning Grant in 2002.

Structural Projects

Structural projects keep hazards away from an area (e.g., levees, reservoirs, other flood control measures). They are usually designed by engineers and managed or maintained by public works staff.

- Bear Creek Reservoir was built by the Army Corp of Engineers to provide flood protection for Lakewood, Sheridan, Englewood, Denver, and areas downstream of Denver.

List of Stormwater Improvements

1. Dry Gulch at Wadsworth – capacity improvements 100-yr box culvert
2. McIntyre Gulch, 6th Ave. to Carr St. – stabilization of eroded banks, lowered flow velocities, eliminated/reduced floodplain impacts to structures
3. McIntyre Gulch at 8470 W. 4th Ave. – stabilization of eroded banks
4. McIntyre Gulch at Meadowlark Park – repair of retaining wall along channel bank
5. Bear Creek at Wadsworth – capacity improvements replacement of roadway bridge with 100-yr capacity, removed 3 structures from 100-yr floodplain
6. Weir Gulch at 8910 W. Ohio Ave. – stabilization of eroded banks, lowered flow velocities
7. Dry Gulch at Saulsbury St. – replaced failed culvert under Saulsbury St. on Dry Gulch with new 100-year capacity culvert, removed existing structures from 100-year floodplain
8. Lakewood Gulch at Teller St. – stabilization of eroded banks, lowered flow velocities
9. Dry Gulch at Richey Park – capacity improvements to Dry Gulch that removed several structures from the 100-year floodplain
10. McIntyre Gulch upstream of Carr St. – sediment removal, stabilization of eroded banks
11. Lakewood Gulch, Carr St. to Dudley St. – stabilization of eroded banks, lowered flow velocities
12. North Sanderson Gulch downstream of Pierce St. – capacity improvements that removed several structures from the 100-year floodplain

Public Information

Public information activities advise property owners, potential property owners, and visitors about the hazards, ways to protect people and property from the hazards, and the natural and beneficial functions of natural resources (e.g., local floodplains). They are usually implemented by a public information office.

Routine - Public announcements via Channel 8, Looking at Lakewood, and educational brochures on:

- Flood Hazard
- Recycling

-
- Homeland Defense
 - Emergency Preparedness

1.6 Mitigation Actions

This section of the Jefferson County Hazard Mitigation Plan provides updates on the actions originally identified in the 2010 plan and new actions identified in 2016.

1. Expand the existing Flood Hazard Inventory Tool (FHIT) for Lakewood Gulch, Weir Gulch, Sanderson Gulch, Sloan's Lake Basin, Dry Gulch, Bear Creek Tributaries and small portions of drainages south of Bear Creek

Hazards Addressed: Flood and dam failure

Issue/Background: The Flood Risk Assessment Tool would be used as a decision / planning tool to identify areas of risk in proportion to flood events and to develop flood mitigation and response actions. The flood assessment tool will include 10, 100 and 500 year flood events and will identify structures and their relative degree of flood risk. Additionally, the assessment tool will also provide 100/500 –year digital flood insurance rate maps, dam break inundation zone topography, satellite images and a Flood Alert Monitoring Network. It is envisioned that the development and testing of the Flood Hazard Inventory Tool will require several years to adequately develop prior to complete system-wide implementation.

Other Alternatives: No action

Responsible Office: Lakewood Department of Public Works and Emergency Management

Priority (High, Medium, Low): High

Cost Estimate: \$20,000

Potential Funding: UDFCD and Lakewood to share in the implementation cost.

Benefits (avoided losses): A FHIT will provide Lakewood with the ability to predict on a timely basis the impacts of severe flooding events.

Schedule: Phased in over a two year period of time.

STATUS: New in 2016

2. Revise Emergency Operations Plan (EOP) for Maple Grove Reservoir

Hazards Addressed: Dam Failure

Issue/Background: Continue to work with Urban Drainage and Flood Control District to revise the EOP to allow for incremental flood gate lowering during flood events.

Other Alternatives: No action

Responsible Office: Lakewood Emergency Management

Priority (High, Medium, Low): High

Cost Estimate: To be determined

Potential Funding: To be determined but could include Urban Drainage and internal funds.

Benefits (avoided losses): Allows for safe water discharge rates from spill way avoiding extreme flooding in area.

Schedule: Complete by December, 2016

STATUS: New action in 2016

3. Lakewood Energy Assurance Plan Update

Hazards Addressed: Multi-Hazard: Severe Winter Storms, Hailstorm, Lightning, Windstorm, Tornado, Earthquake

Issue/Background: Revise the existing Lakewood Energy Response Plan (3-22-2012) to update actionable guidance procedures for major energy deficiencies and disruptions.

Other Alternatives: No action

Responsible Office: Lakewood Emergency Management

Priority (High, Medium, Low): Medium

Cost Estimate: To be determined

Potential Funding: To be determined

Benefits (avoided losses): Understand major energy disruption impacts and ideal responses to critical functions in the city.

Schedule: Complete by December, 2016

STATUS: New action in 2016

4. Multi-Jurisdictional StormReady Program Participation

Issue/Background: This is a National Weather Service (NWS) Program helps communities to better prepare to save lives from the onslaught of severe weather through advanced planning, education and awareness. This is an accredited program through the National Oceanic & Atmospheric Administration & the National Weather Service.

Other Alternatives: Currently, we meet about 85% of the guidelines. To meet the accreditation, we would enhance our current program to meet 100% of the guidelines.

Responsible Office: Jefferson County Office of Emergency Management

Priority: Low

Cost Estimate: None (Unless upgrades to Emergency Preparedness infrastructure is needed to qualify as a Storm Ready Community). \$5,000, if it is necessary to upgrade equipment, training, staff hours, OT hours, and/or host trainings.

Benefits (Avoided Losses): Once Application has been submitted to the NWS, the application is reviewed and the Storm Ready chair will assign a team to visit the applicant and discuss options. The end result being a Certified Storm Ready Office and serving residents and County Offices better. An added benefit to this is, once a Community is certified as Storm Ready the Insurance Services Organization can provide Community Rating System points which may be applied to lower National Flood Insurance Program (NFIP) flood insurance rates.

Potential Funding: Our funding would be from our EMPG grant.

Schedule: Apply in 2016

Status: Deferred, meet most, if not all criteria but wasn't initiated.

5. Burying Power Lines to Green Mountain Repeater Site

Issue/Background: Currently the Cities of Lakewood and Wheat Ridge, together with West Metro Fire Protection District, utilize an 800 MHz radio repeater on the top of Green Mountain. The radio repeater site and associated equipment are critical for each of the aforementioned agency's equipment. The repeater and associated radio and antenna are connected to an "old" above ground power line that is highly vulnerable to extended power interruptions due to high winds, snow accumulations, tornadoes, and lightning. The repeater site does have a 100 Kw generator and associated 390 gallon fuel tank that can provide emergency backup power for up to 84 hours if everything works as designed. However, in the event of a severe winter storm or other natural hazard, access to the top of the mountain can be extremely hazardous and/ or impossible making emergency fueling operations impossible during inclement weather conditions.

Other Alternatives: As an alternative, a new or improved access road could be constructed to ensure all weather access to the radio repeater sit. However, such road construction would be very expensive and would not be supported by a large number of open space groups.

Responsible Office: Lakewood Office of Emergency Management

Priority (High, Medium, Low): High

Cost Estimate: \$150,000

Benefits (Avoided Losses): Reduce the possibility of power outages to critical asset that serves several jurisdictions.

Potential Funding: Grant

Schedule: Depending on available funding.

STATUS: This action was deemed cost prohibitive. As such, other measures were implemented to address shortfall: As part of the radio system upgrade in 2012, Lakewood installed a new battery system that upgrades battery life from four hours minimum to almost 24 hours. And, Lakewood made provisions for a mobile generator hookup at the site in the event of commercial power loss, generator loss, and 24 hour battery loss.

Further, Lakewood expanded the system from one site (Green Mountain) to three sites (inclusive Mt. Morrison and Lookout Mountain) to build redundancy into the system and prevent a single point of radio failure for first responders.

6. Continue to Implement Sound Floodplain Management Practices through Participation in the National Flood Insurance Program

Hazards Addressed: Flood

Issue/Background: The City of Lakewood participates in the National Flood Insurance Program. The City also participates in the Community Rating System and is a CRS Class 6. This project restates the City of Lakewood's commitment to implement sound floodplain management practices, as stated in the flood damage prevention ordinance. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits for appropriate development in Special Flood Hazard Areas and ensuring that this development is elevated above the base flood elevation. This project also includes periodic reviews of the floodplain management ordinance to ensure that it is clear and up to date. Floodplain managers remain current on NFIP policies, and are encouraged to attend appropriate training.

Other activities that could be included in this effort are:

- Ensure that stop work orders and other means of compliance are being used as authorized by each ordinance;
- Suggest changes to improve enforcement of and compliance with regulations and programs;
- Participate in Flood Insurance Rate Map updates by adopting new maps or amendments to maps;
- Utilize recently completed Digital Flood Insurance Rate Maps (DFIRM) in conjunction with GIS to improve floodplain management, such as improved risk assessment and tracking of floodplain permits. Continue to work with Urban Drainage and Flood Control District and Jefferson County to update and adopt DFIRM.
- Promote and disperse information on the benefits of flood insurance, with assistance from partners such as the County, Urban Drainage and Flood Control District, and Colorado Water Conservation Board, and FEMA/NFIP.
- Evaluate activities that will improve Community Rating System ratings that may further lower the cost of flood insurance for residents, work with the City of Lakewood Stormwater utility to obtain funding to complete projects that can mitigate flood hazard areas.
- Address the five repetitive loss properties within the City of Lakewood. The City has made note of these problems and continues to address the flooding issues as capital improvement funds allow and as future development/redevelopment necessitates.

Other Alternatives: No action

Responsible Office: Lakewood Department of Public Works

Priority (High, Medium, Low): Medium

Cost Estimate: Low

Potential Funding: Covered in existing budget

Benefits (avoided losses): Reduced property loss from floods, continued availability of flood insurance for residents; as a CRS participant residents will have lowered flood insurance rates.

Schedule: Ongoing

STATUS: The City of Lakewood participates in the National Flood Insurance Program by regulating all development in flood hazard areas through administration of its flood management ordinance including but not limited to reviewing all proposed development in FEMA and local community floodplains, issuing floodplain permits for all new construction and substantial improvements, requiring and maintaining records of elevation certificates, and adopting flood insurance studies, flood insurance rate maps, and official flood studies. The City fosters comprehensive floodplain management by preserving and protecting open space, providing public information and emergency management, planning and constructing storm water public works projects, and reviewing new development thereby ensuring no adverse impacts to watersheds and surrounding properties.

1.1 Community Profile

1.1.1 History

The City of Wheat Ridge is a Home Rule Municipality located in Jefferson County, Colorado, United States. Wheat Ridge is a western suburb of Denver.

Wheat Ridge was founded as a community in 1859. During that year, a small group of farmers, some coming to Colorado in search of gold and silver, founded a rural village in this location. By the late 1800s, fertile soils and plentiful water led to the development of a small farming community. Up until World War II, Wheat Ridge was a major supplier of fresh produce to the greater Denver area. However, during the 1940s and 1950s as the city evolved, carnation production became a major growth industry. For a time, Wheat Ridge was the largest producer of carnations throughout the world. Although commercial wheat production is a thing of the past, the ridges upon which much of this agricultural activity occurred remain, providing expansive views of the Front Range. Additionally, several greenhouses remain in the northwest metropolitan area. Each August, the city celebrates this heritage with the Carnation Festival. Started in 1970, the festival draws thousands of people to this premier civic event. The city was fully incorporated in 1969 as a statutory city when it was faced with annexation by surrounding cities. In 2009, the City celebrated its 40th birthday.

Today Wheat Ridge is home to approximately 31,000 residents – making it one the smallest cities in the Denver metropolitan area. The City is an inner-ring suburb that affords residents with many of the conveniences of urban living, though the community still retains its small town character with a strong sense of community. Its slow growth, compared to adjacent suburbs offer stark contrast to the region’s significant population growth over recent years. Residents enjoy easy access to I-70 and downtown Denver. The City is well known for its nationally recognized park and trail system and lush tree canopy. Wheat Ridge is a community with deep roots and short commutes.

1.1.2 Population

The U. S Census Bureau’s estimated 2014 population of Wheat Ridge was 31,034. Select Census and American Community Survey demographic and social characteristics are shown in Table 1.

Table 1. Wheat Ridge’s Demographic and Social Characteristics 2014

Characteristic	U. S. Census Estimate
Gender/Age	
Male (%)	48.6
Female (%)	51.4
Under 5 Years (%)	5.4
65 Years and Over (%)	18.6
Race/Ethnicity (one race)	
White (%)	74.0
Hispanic or Latino (Of Any Race) (%)	20.9
Other	
Average Household Size	2.16
High School Graduate or Higher (%)	88.8

Source: U.S. Census Bureau, <http://quickfacts.census.gov/>

1.1.3 Economy

According to the 2013 American Community Survey, the industries that employed most of Wheat Ridge’s labor force were: educational, health, and social services (21.4%); professional, scientific, management, administrative, and waste management services (12.3%); and retail trade (12.1%). Select economic characteristics for Wheat Ridge from the Census, as well as the American Community Survey, are shown in Table 2.

Table 2. Wheat Ridge’s Economic Characteristics, 2013

Characteristic	U.S. Census Estimate
Families below Poverty Level	10.3%
Individuals below Poverty Level	14.1%
Median Home Value	\$237,500
Median Household Income	\$48,063
Per Capita Income	\$30,647
Population in Labor Force	16,457
Unemployment (%)*	9.7%

Source: U.S. Census Bureau, <http://quickfacts.census.gov/>

1.2 Hazard Summary

A hazard identification and vulnerability analysis was completed for the City of Wheat Ridge using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide,

which was distributed to each participating municipality or special district to complete during the original outreach process in 2009.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County.

For this plan update, the City of Wheat Ridge’s planning team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the City of Wheat Ridge.

The data in Table 3 reflect the most significant hazards for the City of Wheat Ridge. They are: dam failure, flood, tornado, hail storm, windstorm, wildfire and severe winter storms.

The hazard significance listed is based on City input from the Data Collection Guide and the risk assessment developed during the planning process (refer to Chapter 4 of the base plan).

Table 3. City of Wheat Ridge – Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance	Hazard Map? (Paper/GIS/ Source)
Avalanche	Unlikely	Negligible	Negligible	Low	Paper/DRCOG
Dam Failure	Occasional	Limited	Critical	High	GIS/FHAD
Drought	Likely	Extensive	Limited	Low	No
Earthquake	Unlikely	Extensive	Limited	Low	No
Erosion and Deposition	Highly Likely	Limited	Negligible	Low	No
Expansive Soils	Likely	Limited	Negligible	Low	Paper/SCS
Extreme Temperatures	Highly Likely	Extensive	Negligible	Low	No
Flood	Occasional	Significant	Critical	High	GIS/FHAD/DFIRM
Hailstorm	Likely	Extensive	Limited	Medium	Paper/DRCOG
Landslide, Debris flow, Rockfall	Unlikely	Limited	Negligible	Low	Paper/DRCOG
Lightning	Likely	Limited	Negligible	Low	Paper/DRCOG
Severe Winter Storms	Highly Likely	Extensive	Limited	Medium	No
Subsidence	Unlikely	Limited	Negligible	Low	No
Tornado	Likely	Significant	Catastrophic	High	Paper/DRCOG
Wildfire	Occasional	Significant	Limited	Medium	Paper/DRCOG
Windstorm	Likely	Extensive	Limited	Medium	Paper/DRCOG

<p>Frequency of Occurrence: Highly Likely: Near 100% probability in next year. Likely: Between 10 and 100% probability in next year or at least one chance in ten years. Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years. Unlikely: Less than 1% probability in next 100 years.</p> <p>Spatial Extent: Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area</p>	<p>Potential Magnitude: Catastrophic: Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50% of property is severely damaged Critical: Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 25% of property is severely damaged Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged Negligible: Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.</p> <p>Significance: Low, Medium, High</p>
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Previous Hazard Events

Through the Data Collection Guide, the City of Wheat Ridge noted specific historic hazard events to include in the community profile. These events have been incorporated into the appropriate hazard chapters in the base plan. These events had a particular impact on the community beyond the impacts and events recorded in the Jefferson County Hazard Mitigation Plan. This is not a comprehensive summary of past incidents, as the hazard profiles collected in the main Mitigation Plan include other events that may have historically impacted the jurisdiction. The events noted by this jurisdiction in the Data Collection Guide include:

April 2015 thru Early July 2015 Heavy Rains and Flooding

During this period, the City received rainfall almost equal to its annual average. During just the 8 weeks from mid-April to mid-June, the City received 13.5 inches of rainfall. Basement flooding was reported throughout the City due to the high groundwater that resulted.

September 2013 Localized Flooding

Although the City was spared the impacts of the week-long rainfall that inundated northern Colorado, one afternoon a localized thunderstorm passed over the central part of the City dropping around 2.5 inches of rain and small hail in about an hour. Local flooding occurred in several areas with several basements being flooded. Clear Creek at the bridge over Kipling was very close to the underside of it due to high flows but was never overtopped.

July 2009 Hail/Wind Storm

A severe thunderstorm produced damaging winds, large hail and very heavy rain across the western and southern suburbs of Denver. Widespread damage was observed in the City of Wheat Ridge. The intense straightline winds were the result of a wet microburst which downed hundreds of trees and snapped power poles. Winds gusts to 80 mph were reported along with nickel to golf ball size hail. The combination of wind and hail produced widespread damage to homes and vehicles. Many Wheat Ridge residents were left without power. Minor injuries were reported from broken glass during the storm, but no one was hospitalized. The City suffered an estimated \$600,000 in damage to City property.

1979 Dam Failure

On March 17, 1979, the fabridam was punctured by an unknown, sharp object. It was determined to be most likely due to vandalism. Vandalism of fabridam spillway for the Maple Grove Dam caused an unscheduled release of 100 acre-ft of water from the Maple Grove Reservoir in about 3 hours. Flooding occurred from the Dam south of 32nd Avenue to the confluence with Clear Creek. The fabridam spillway was replaced in 2004 with a more vandal resistant structure.

Vulnerability to Specific Hazards

This section details vulnerability to specific hazards, where quantifiable, and where it differs from that of the overall County. The results of detailed GIS analyses used to estimate potential for future losses are presented here, in addition to maps of hazard areas. For a discussion of the methodology used to develop the loss estimates refer to Section 4.3 of the Base Plan.

Flood

According to the vulnerability assessment conducted using GIS, Wheat Ridge has one of the higher potentials for economic loss from flooding in the County. Clear Creek flows through Wheat Ridge, and there is also risk from Lena Gulch that crosses the City. Note that this is based on computer modeling that may not reflect specific mitigation activities.

Figure 1 depicts the FEMA flood zones (1% annual chance and 0.2% annual chance) as well as all the at-risk properties in Wheat Ridge.

Table 4 shows the total parcels and buildings at risk to the 1% annual chance flood and Table 5 shows the values at risk in the same flood scenario. For this analysis, content values were estimated based on prevailing land use and a multiplier was applied to building and content values to estimate losses to each. See Section 4 Hazard Profiles for details on methodology. According to the analysis, 424 buildings (333 of which are residential) are at risk, totaling \$29.8 million of damage to buildings and contents.

Table 4. City of Wheat Ridge Buildings At-Risk to 1% Annual Chance Flood

Jurisdiction	Property Type	Improved Parcels	Building Count
Wheat Ridge	Agriculture	3	3
	Commercial	7	12
	Exempt	10	18
	Industrial	13	24
	Mixed Use	9	34
	Residential	290	333
	Total		332

Source: Jefferson County Assessor (October 2015)

Table 5. City of Wheat Ridge Values At-Risk to 1% Annual Chance Flood

Property Type	Improved Value	Content Value	Total Value	Structure Loss	Content Loss	Total Loss Estimate
Agriculture	\$904,481	\$904,481	\$1,808,962	\$217,075	\$379,882	\$596,957
Commercial	\$5,402,500	\$5,402,500	\$10,805,000	\$1,296,600	\$2,269,050	\$3,565,650
Exempt	\$2,999,700	\$2,999,700	\$5,999,400	\$719,928	\$1,259,874	\$1,979,802
Industrial	\$4,493,400	\$6,740,100	\$11,233,500	\$1,078,416	\$2,830,842	\$3,909,258
Mixed Use	\$5,106,600	\$5,106,600	\$10,213,200	\$1,225,584	\$2,144,772	\$3,370,356
Residential	\$42,608,190	\$21,304,095	\$63,912,285	\$12,782,457	\$3,621,696	\$16,404,153
Total	\$61,514,871	\$42,457,476	\$103,972,347	\$17,320,060	\$12,506,116	\$29,826,177

Source: Jefferson County Assessor (October 2015)

Table 6 shows the parcels and buildings at risk to the 0.2% annual chance flood and Table 7 shows the values at risk in the same flood scenario. For this analysis, content values were estimated based on prevailing land use and a multiplier was applied to building and content values to estimate losses to each. See Section 4 Hazard Profiles for details on methodology. According to the analysis, 995 buildings (711 of which are residential) are at risk, totaling \$94.3 million in damage to buildings and contents over and above the 1% scenario.

Table 6. City of Wheat Ridge Buildings At-Risk to 0.2% Annual Chance Flood

Jurisdiction	Property Type	Improved Parcels	Building Count
Wheat Ridge	Agriculture	1	1
	Commercial	28	34
	Exempt	9	8
	Mixed Use	54	241
	Residential	605	711
	Total	697	995

Source: Jefferson County Assessor, October 2015

Table 7. City of Wheat Ridge Values At-Risk to 0.2% Annual Chance Flood

Property Type	Improved Value	Content Value	Total Value	Structure Loss	Content Loss	Total Loss Estimate
Agriculture	\$10,800	\$10,800	\$21,600	\$2,592	\$4,536	\$7,128
Commercial	\$9,006,200	\$9,006,200	\$18,012,400	\$2,161,488	\$3,782,604	\$5,944,092
Exempt	\$19,714,800	\$19,714,800	\$39,429,600	\$4,731,552	\$8,280,216	\$13,011,768
Mixed Use	\$31,598,700	\$31,598,700	\$63,197,400	\$7,583,688	\$13,271,454	\$20,855,142
Residential	\$116,112,530	\$116,112,530	\$232,225,060	\$34,833,759	\$19,739,130	\$54,572,889
Total	\$176,443,030	\$176,443,030	\$352,886,060	\$49,313,079	\$45,077,940	\$94,391,019

Source: Jefferson County Assessor¹ (October 2015)

Figure 2 shows the location of all the critical facilities in Wheat Ridge as well as the FEMA flood zones.

For the City of Wheat Ridge, this analysis showed that there are 9 critical facilities in the 1% annual chance flood zone, 8 of which are bridges (Table 8). The analysis also showed that there are 15 additional critical facilities in the 0.2% annual chance flood zone (Table 9), mostly in the northeastern portion of the City (Figure 2).

Table 8. City of Wheat Ridge Critical Facilities in 1% Annual Chance Floodplain

Jurisdiction	Category	Facility Type	Facility Count
Wheat Ridge	Essential Facilities	Urgent Care Facility	1
	Transportation and Lifelines	Bridge	8
	Total		9

Source: Jefferson County Assessor (October 2015) HSIP Freedom 2015 and HAZUS 2.2

¹ The Assessor's Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values. The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values (typically 50% for residential structures, 100% for commercial, 100% for agricultural, 150% for industrial, 100% for mixed use and 100% for exempt.)

Table 9. City of Wheat Ridge Critical Facilities in 0.2% Annual Chance Floodplain

Jurisdiction	Category	Facility Type	Facility Count
Wheat Ridge	Essential Facilities	Fire Station	1
	High Potential Loss Facilities	Government Facility	1
	High Potential Loss Facilities	Long Term Care Facility	1
	Transportation and Lifelines	Bridge	11
	Transportation and Lifelines	Communication	1
	Total		

Source: Jefferson County Assessor (October 2015) HSIP Freedom 2015 and HAZUS 2.2

Figure 1. City of Wheat Ridge Flood Hazards and At-Risk Properties

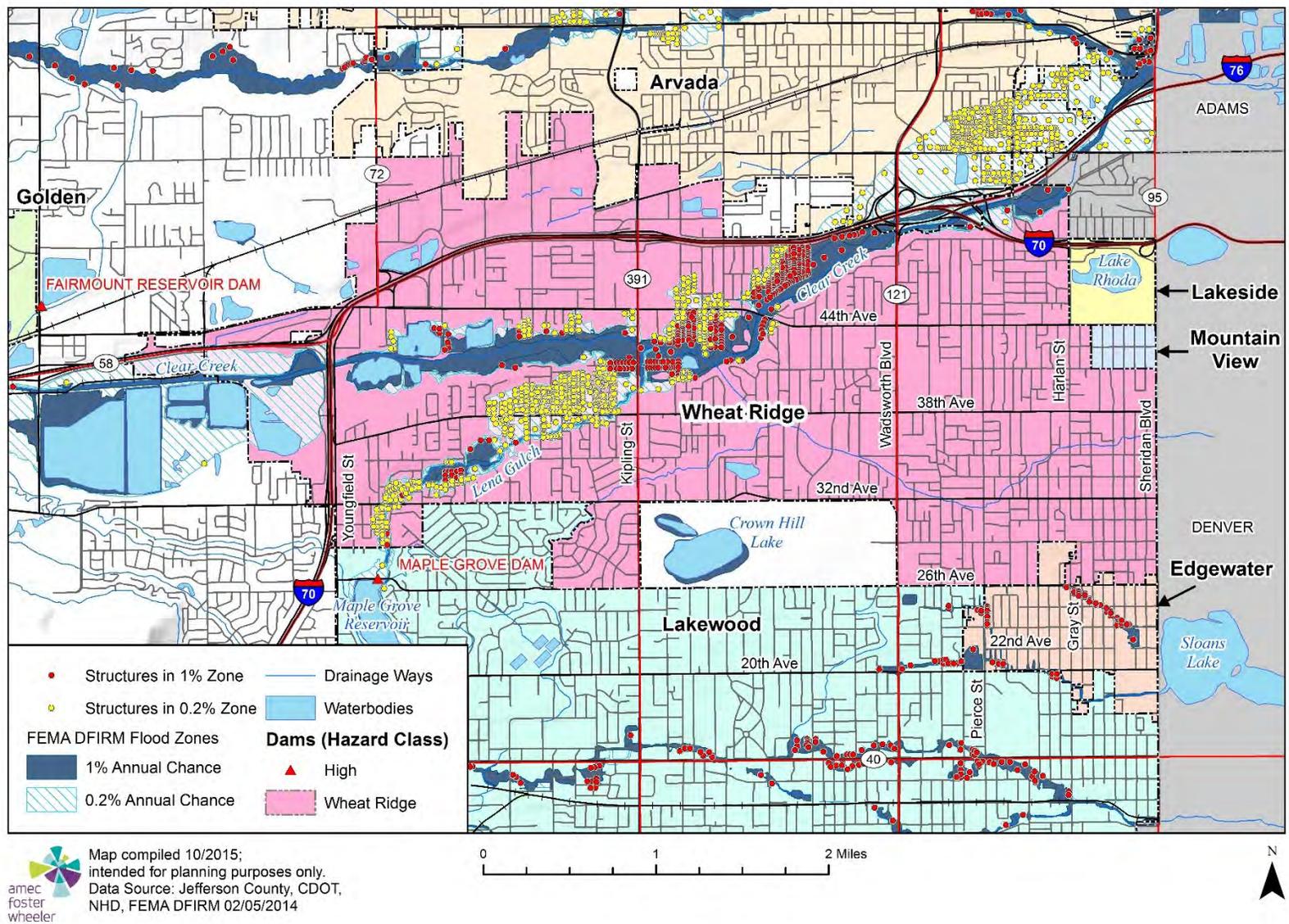
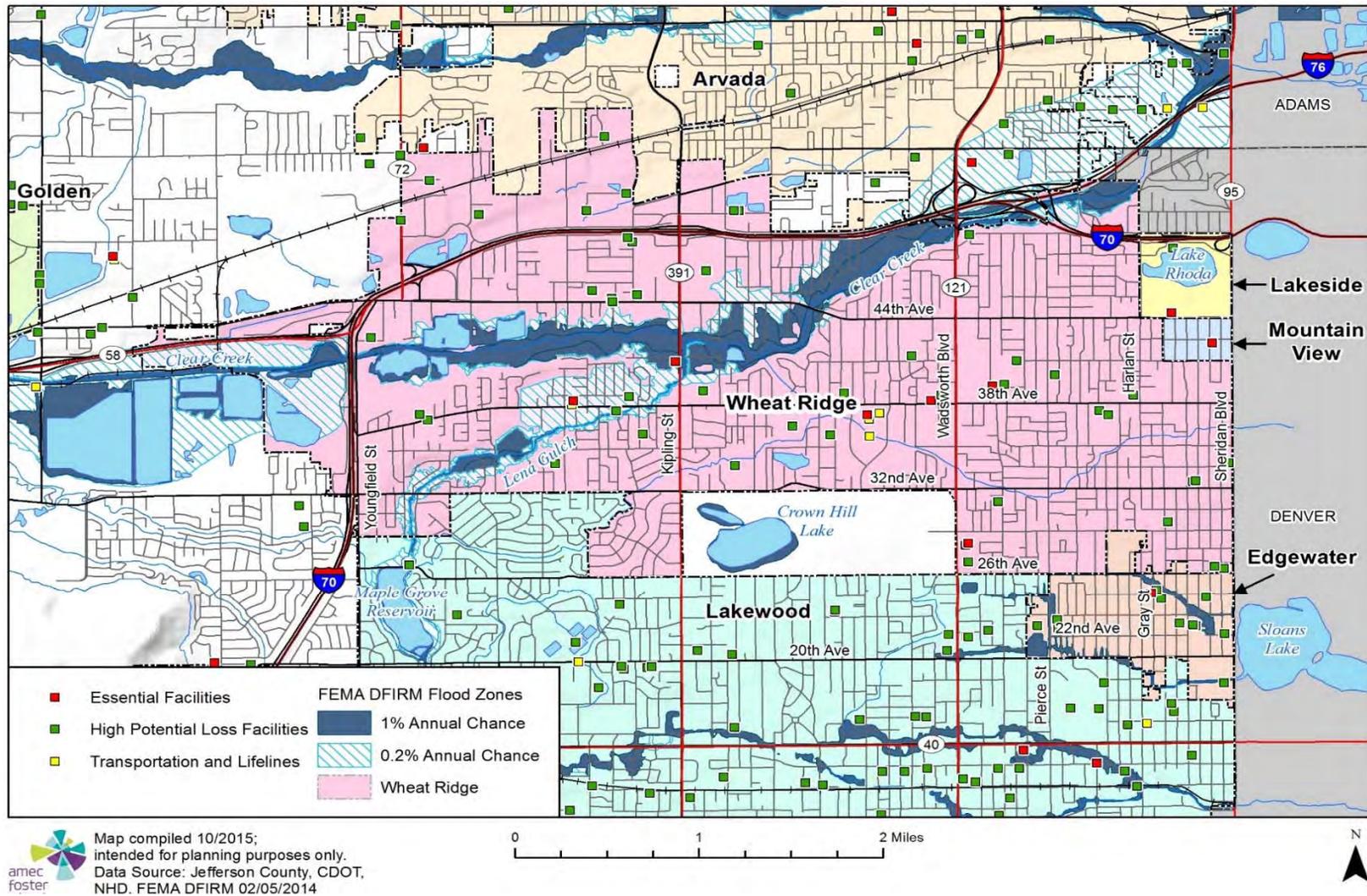


Figure 2. City of Wheat Ridge Flood Hazards and Critical Facilities



Dam Failure

According to the analysis of dams, Wheat Ridge has one High Hazard dam (Maple Grove Dam) whose failure could impact life and/or property. The Fairmount Reservoir Dam, also a High Hazard Dam, is located immediately to the west of the City of Wheat Ridge, see Figure 2. Note that there are several dams west of Jefferson County that could impact Clear Creek if they failed. These are noted as impacting Golden first in Section 4 of the Base Plan, but they would also impact Wheat Ridge.

Note: Hazard class does not indicate dam condition, it merely indicates risks in case of failure. A high hazard dam poses risk to both life and property, a significant hazard dam only poses a risk to property. See discussion the Section 4 of the Base Plan

Geologic Hazards

Wheat Ridge has some very limited exposure to landslide. There is a small area of risk in the northwest corner of the City, between Mt. Olivet Cemetery and Ward Road Pond. Wheat Ridge's proximity to the Golden Fault as a potential, though unlikely, earthquake source make it more vulnerable to earthquake damage.

Wildfire

While not a foothills community, Wheat Ridge does have some risk to wildfires, particularly along the Clear Creek riparian area, see Figure 3. According to the GIS based analysis of wildfire, Wheat Ridge has a total of 3 critical facilities at risk to wildfire, see Table 10.

Table 10. Wheat Ridge Critical Facilities At-Risk to Wildfire

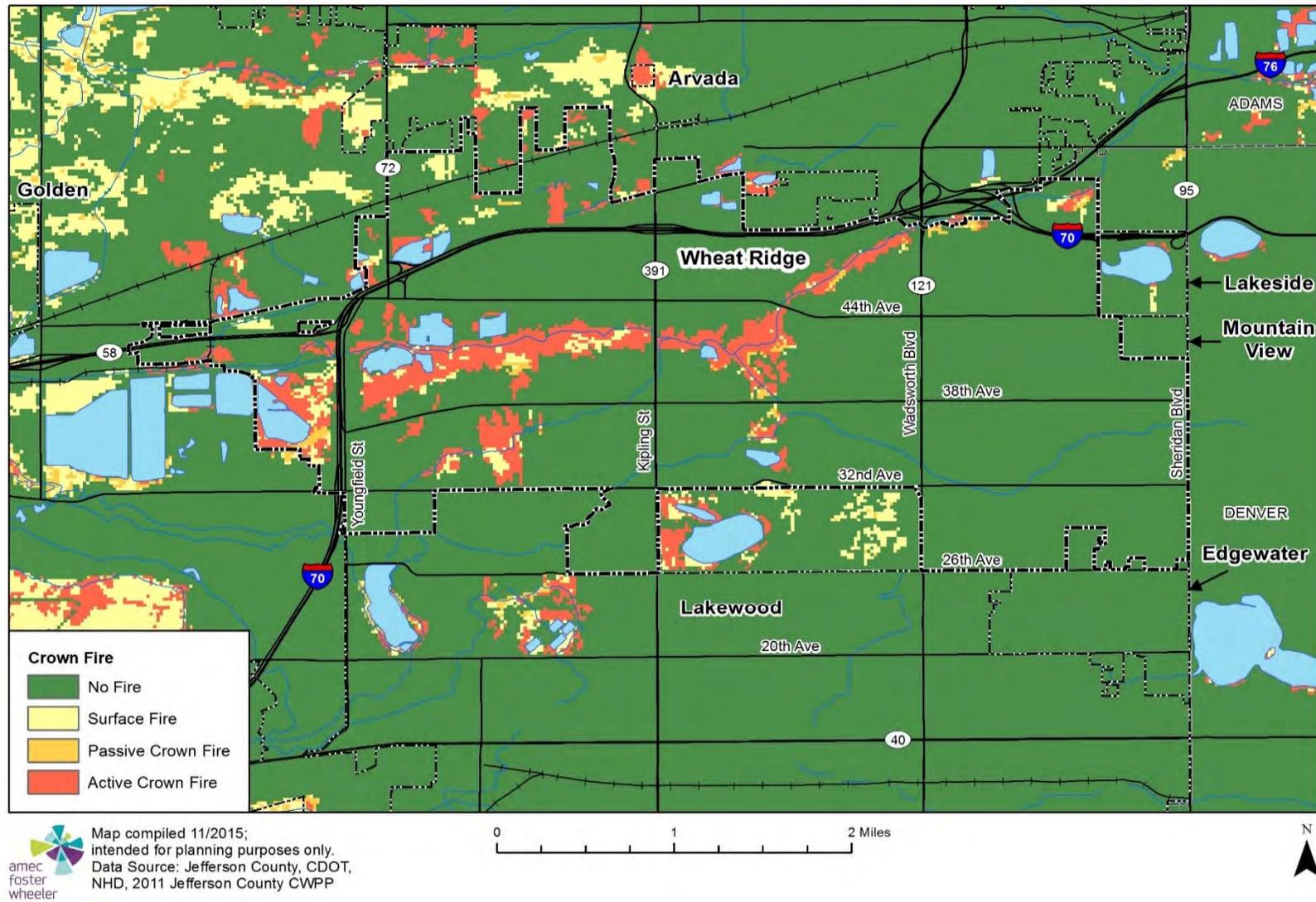
Jurisdiction	Category	Facility Type	Facility Count
Wheat Ridge	High Potential Loss Facilities	HAZMAT	1
	Transportation and Lifelines	Bridge	2
	Total		3

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, Jefferson County CWPP

Other Hazards

In the case of other hazards that are not specific to geography such as drought, hailstorms, winter storms, lightning, tornado and windstorm the entire building inventory and population in the City is potentially exposed. That is the reason for the asset inventory provided in Section 1.3. It should be noted that no hazard in this plan is expected to cause widespread impacts to this inventory. The urban forest present across much of Wheat Ridge can be prone to windstorms and winter storms. These storms occasionally cause large cottonwoods or tree limbs to impact power lines and properties.

Figure 3. City of Wheat Ridge Fire Exposure by Type, 90th Percentile Weather Conditions



1.3 Asset Inventory

1.3.1 Property Inventory

Table 11 represents an inventory of property in Wheat Ridge based on the Jefferson County Assessor’s data as of October 2015.

Table 11. Wheat Ridge’s Property Inventory

Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Agriculture	11	11	\$1,719,794	\$1,719,794	\$3,439,588
Commercial	421	711	\$242,109,920	\$242,109,920	\$484,219,840
Exempt	149	175	\$277,539,949	\$277,539,949	\$555,079,898
Industrial	244	293	\$148,267,911	\$222,401,867	\$370,669,778
Mixed Use	323	1,399	\$253,240,450	\$253,240,450	\$506,480,900
Residential	8,966	10,393	\$1,825,243,445	\$912,621,723	\$2,737,865,168
Total	10,114	12,982	\$2,748,121,469	\$1,909,633,702	\$4,657,755,171

Source: Jefferson County Assessor’s Office

*The Assessor’s Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values.

**The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values (typically 50% for residential structures and 100% for commercial/industrial)

1.3.2 Other Assets

Table 12 is a detailed inventory of assets identified by the City’s planning team. This inventory includes some critical facilities. For more information about how “critical facility” is defined in this plan, see Section 4.3 Vulnerability Assessment.

Table 12. Wheat Ridge’s Assets

Name of Asset	Type	Replacement Value (\$)	Occupancy/ Capacity #	Hazard Specific Info
Exempla Lutheran Medical Campus	EI		400 beds	Tornado
Wheat Ridge Medical Offices - Kaiser	EI			Tornado
City Hall – Police	EI			Tornado
Wheat Ridge Fire Station #1	EI			Tornado
Wheat Ridge Fire Station #2	EI			Tornado
Maintenance Facility	EI			Tornado

Name of Asset	Type	Replacement Value (\$)	Occupancy/ Capacity #	Hazard Specific Info
Maple Grove Reservoir	VF		550 AF	Flood, Dam Failure
Wheat Ridge High School	VF		1,275	Tornado
Everitt Middle School	VF		487	Tornado
Wheat Ridge Middle School	VF		366	Tornado
Prospect Valley Elementary School	VF		476	Tornado
Stevens Elementary School	VF		411	Tornado
Wilmore-Davis Elementary School	VF		283	Tornado
Pennington Elementary School	VF		277	Tornado
Kullerstand Elementary School	VF		267	Tornado
Martensen Elementary School	VF		252	Tornado
Compass Montessori Charter School	VF		661	Tornado
Saint Peter & Paul Catholic School	VF		351	Tornado
Beth Eden Baptist School	VF		233	Tornado
Foothills Academy	VF		190	Tornado
Wheat Ridge Christian Academy	VF		45	Tornado
Norma Anderson Preschool	VF		113	Tornado
Kids in Action Preschool	VF		80	Tornado
Alpine Valley Preschool	VF		27	Tornado
Mountain Vista Health Center	VF		168 Beds	Tornado
Highland West Apartments	VF		120 Beds	Tornado
Sandalwood Manor	VF		85 Beds	Tornado
Wheat Ridge Manor Nursing Home	VF		81 Beds	Tornado
Christopher House	VF		76 Beds	Tornado
Vista Village Assisted Living	VF		54 Beds	Tornado
Wheat Ridge Assisted Living	VF		46 Beds	Tornado
Spring Ridge Park	VF		37 Beds	Tornado
Wide Horizon	VF		37 Beds	Tornado

Name of Asset	Type	Replacement Value (\$)	Occupancy/ Capacity #	Hazard Specific Info
Verandas Assisted Living at Wheat Ridge	VF		48 Beds	Tornado
21 Other Nursing Homes	VF		178 Beds	Tornado
Interstate 70	VF		135,000 ADT	Winter Weather
State Highway 95 (Sheridan Boulevard)	VF		35,000 ADT	Winter Weather
State Highway 121 (Wadsworth Boulevard)	VF		50,000 ADT	Flood, Winter Weather
State Highway 391 (Kipling Street)	VF		50,000 ADT	Flood, Winter Weather
State Highway 72 (Ward Road)	VF		35,000 ADT	Winter Weather
State Highway 58	VF		26,000 ADT	Winter Weather
Kipling Bridge over Clear Creek	VF		50,000 ADT	Flood, Winter Weather
Wadsworth Bridge over Clear Creek	VF		50,000 ADT	Flood, Winter Weather
44th Avenue Bridge over Clear Creek	VF		14,000 ADT	Flood, Winter Weather
Youngfield Avenue Bridge over Clear Creek	VF		25,000 ADT	Flood, Winter Weather
Interstate 70 Bridge over Clear Creek	VF		85,000 ADT	Flood, Winter Weather
BNSF Railroad	VF			Winter Weather
Emergency Warning System	VF		NA	Hailstorm, Tornado, Windstorm
Clear Creek Greenbelt	NA		250 Acres	Drought, Erosion, Flood, Hailstorm, Lightning, Tornado, Wildfire
Spiranthes Diluvialis (Ute Ladies-Tresses Orchid)	NA		<20 Acres	Drought, Flood, Hailstorm, Wildfire
Mycenastrum Corium (Earth Star Fungus)	NA		< 1 Acre	Drought, Flood, Wildfire
Wetlands	NA		100 Acres	Drought, Flood, Hailstorm, Wildfire
Baugh House	NA			Tornado
Sod House	NA			Tornado
Richards-Hart Estate	NA		75	Tornado

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: natural assets

Many of the facilities listed above are also in GIS databases provided by the City of Wheat Ridge and Jefferson County. Critical facility counts and types are shown in Table 13 and in the map in Figure 1. Shelters may be in facilities such as schools or recreation centers and are not indicated on the map.

Table 13. Summary of Wheat Ridge’s Critical Facilities in GIS

Category	Facility Type	Facility Count
Essential Facilities	EOC	1
	Fire Station	2
	Hospital	1
	Law Enforcement	1
	Urgent Care Facility	2
	Total	7
High Potential Loss Facilities	Day Care Center	5
	Government Facility	3
	HAZMAT	4
	Long Term Care Facility	19
	PK-12 School	12
	Private School	3
	Total	46
Transportation and Lifelines	Aircraft Facility	1
	Bridge	31
	Communications	4
	Total	36
Grand Total		89

Source: City of Wheat Ridge, Jefferson County

1.3.3 Natural, Cultural, and Historic Resources

Assessing the vulnerability of Wheat Ridge to disaster also involves inventorying the natural, historical, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Natural Resources

Natural resources of importance in Wheat Ridge include the 42 sites that are parks, open space, recreation centers, or areas of visual green space totaling approximately 430 acres. Of this, 7

sites are neighborhood parks (49.20 acres) and 7 sites are pocket parks (8.0 acres). Two park sites in the city are community parks (66.0 acres). These two community parks also serve as neighborhood parks for residents living nearby, which is generally considered within a 0.5-mile radius. There is also 1 dedicated sports complex in the city (16.0 acres), 1 natural area (9.0 acres), 1 open space area (250.0 acres), and 17 areas of visual green space (0.87 acre). For information about natural resources in Jefferson County, which includes Wheat Ridge, see Section 4.3 Vulnerability Assessment.

Historic and Cultural Resources

Table 14 lists the properties in Wheat Ridge that are on the National Register of Historic Places and/or the Colorado State Register of Historic Properties (for more information about these registers, see Section 4.3 Vulnerability Assessment).

Table 14. Wheat Ridge’s Historic Properties/Districts in National and State Registers

Property	Address	Date Listed
James H Baugh House	11361 W 44 th Ave	8/14/12
Crown Hill Burial Park	7777 W. 29 th Ave.	7/24/08
Fruitdale Grade School	10801 W 44 th Ave	3/20/2013
Pioneer Sod House	4610 Robb St	03/14/1973
Richards Mansion	5349 W 27 th Ave	9/15/1977
Wheat Ridge Post Office	4610 Robb Street	State Register 8/12/1992

Sources: <http://www.nps.gov/nr/>

The National Park Service administers two programs that recognize the importance of historic resources, specifically those pertaining to architecture and engineering. While inclusion in these programs does not give these structures any sort of protection, they are valuable historic assets. There are currently no Historic American Building Survey (HABS) or Historic American Engineering Record (HAER) buildings in the City of Wheat Ridge.

It should be noted that as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

1.4 Growth and Development Trends

Table 15 illustrates how Wheat Ridge has grown in terms of population and number of housing units between 2010 and 2014 (or the most recently available data). The table illustrates that Wheat Ridge is undergoing moderate population growth but is losing housing stock. Table 16 shows Wheat Ridge’s estimated population changes through 2030.

Table 15. Wheat Ridge’s Change in Population and Housing Units, 2010-2014

2010 Population	2014 Population Estimate	Percent Change 2010-2014	2010 # of Housing Units	2013 Estimated # of Housing Units	Estimated Percent Change 2010-2013
30,192	31,034	2.7%	15,037	14,641	-2.6%

Source: <http://factfinder.census.gov/>

Table 16. City of Wheat Ridge Population Projections Through 2030

2010 Population	2020 Population Estimate	2030 Population Estimate	% Projected Yearly Growth Rate
30,192	32,229	34,267	0.675%

Source: <http://factfinder.census.gov/>

Most of the City is already developed; however, much of the developed areas are older and are slowly undergoing redevelopment. All redevelopments are complying with current codes, so the regulations are being followed in the identified hazard areas, i.e. floodplains. The only area available for new growth is on the west side of the City. Again, any developments in this area will also comply with the current codes, including those regulating identified hazard areas.

1.5 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes Wheat Ridge’s regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities and then discusses these capabilities in further detail along with other mitigation efforts as they pertain to the National Flood Insurance Program’s Community Rating System (CRS). Although the CRS is flood-focused, this discussion also incorporates activities related to other hazards into the categories established by the CRS.

1.5.1 Mitigation Capabilities Summary

Table 17 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities, and indicates those that are in place in Wheat Ridge.

Table 17. Wheat Ridge’s Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General or Comprehensive plan	Y	Adopted 2009
Zoning ordinance	Y	Chapter 26
Subdivision ordinance	Y	Article IV
Growth management ordinance	Y	DRCOG
Floodplain ordinance	Y	Article VIII
Other special purpose ordinance (stormwater, steep slope, wildfire)	Y	Chapter 20
Building code	Y	Chapter 5
Fire department ISO rating	Y	ISO Rating: 2
Erosion or sediment control program	Y	Section 26
Stormwater management program	Y	Chapter 20
Capital improvements plan	Y	www.ci.wheatridge.co.us
Economic development plan	Y	www.ci.wheatridge.co.us
Local emergency operations plan	Y	Administrative Services
Other special plans	Y	Police Department, Energy Assurance Plan 2012
Flood insurance study or other engineering study for streams	Y	Wildfire, www.ci.wheatridge.co.us Updated FIS: February 2014
Elevation certificates	Y	www.ci.wheatridge.co.us
BCEGS Ratings (1-10, 1 being best)	Y	Personal (1 and 2 family dwellings) 5 Commercial (all other buildings) 4 2013

Table 18 identifies the personnel responsible for mitigation and loss prevention activities as well as related data and systems in Wheat Ridge.

Table 18. Wheat Ridge’s Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Y	Community Development/Planning Division Staff	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Y	Community Development/Building Division Staff	
Planner/engineer/scientist with an understanding of natural hazards	Y	Public Works/Engineering Division Staff	
Personnel skilled in GIS	Y	Administrative/GIS Specialist	
Full-time building official	Y	Community Development/Chief Building Official	
Floodplain manager	Y	Public Works/Project Supervisor	
Emergency manager	Y	Police Department/Chief of Police	
Grant writer	N		
Other Personnel	Y	Parks/Open Space Personnel	
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	Yes	Administrative/GIS Specialist	
Warning systems/services (Reverse 9-11, cable override, outdoor warning signals)	Y	Police Department/Communications Manager	

Table 19 identifies financial tools or resources that Wheat Ridge could potentially use to help fund mitigation activities.

Table 19. Wheat Ridge’s Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Y	
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	Y	
Incur debt through general obligation bonds	Y	
Incur debt through special tax bonds	Y	
Incur debt through private activities	Y	
Withhold spending in hazard-prone areas	N	

1.5.2 Community Rating System Activities (All Hazards)

National Flood Insurance Program

The City of Wheat Ridge joined the National Flood Insurance Program (NFIP) on May 26, 1972 and the Community Rating System (CRS) on October 1, 1991. The NFIP allows private property owners to purchase affordable flood insurance and enables the community to retain its eligibility to receive certain federally backed monies and disaster relief funds. The CRS is a voluntary program for NFIP-participating communities. It provides flood insurance discounts to policyholders in communities that provide extra measures of flood above the minimum NFIP requirements. As of September 2015, Wheat Ridge had a CRS class rating of 6 (one a scale of 1-10, 1 being the best). This rating provides a 20 percent discount for policyholders within a special flood hazard area (SFHA) and a 10 percent discount for those outside of an SFHA.

NFIP insurance data indicates that as of September 2015, there were 254 (up from 190 policies in 2010) policies in force in Wheat Ridge, resulting in \$58,519,100 of insurance in force. In Wheat Ridge, there have been 44 historical claims (up from 38 historical claims in 2010) for flood losses totaling \$91,282. At the time this plan was developed there were no repetitive or severe repetitive loss structures as defined by the NFIP.

Mapping: Wheat Ridge's initial Flood Insurance Rate Map became effective on 5/26/1972. The most current Digital Flood Insurance Rate Maps were updated and became effective on 2/5/14.

Wheat Ridge's municipal codes and ordinances have been updated to reflect the most current mapping. DFIRMs have been used by the City for both floodplain management and risk assessment purposes.

Incorporation into Local Planning Mechanisms

This Hazard Mitigation Plan could be integrated into the next update of the City's Comprehensive Plan and any other ongoing/future planning efforts. The HMP was used to inform the Local Energy Assurance Plan developed for the City in 2012. The HIRA and mitigation strategies were referenced during that plan's development process.

Community Rating System Categories

The Community Rating System (CRS) categorizes hazard mitigation activities into six categories. These categories, and applicable Wheat Ridge activities, are described below. Note: some of the activities are appropriate to multiple categories. For purposes of simplicity, they are only included in the category deemed most appropriate based on the definitions and examples provided in the *CRS Coordinator's Manual*.

Preventive

Preventive activities keep problems from getting worse. The use and development of hazard-prone areas is limited through planning, land acquisition, or regulation. They are usually administered by building, zoning, planning, and/or code enforcement offices.

2009 City of Wheat Ridge Comprehensive Plan

The City's comprehensive plan is a guide to help the City make decisions and establish its future direction. The goals and policies contained within the plan cover a broad range of subjects matter related to services, issues, and geographic areas within Wheat Ridge. Combined, these elements serve to direct future policy decisions to preserve vital community attributes and service levels and manage growth. The goals and policies were defined in the original 2000 Plan, and remained unchanged in the Plan Addendums. The Plan Addendums each focus on new or changing development in Wheat Ridge.

The following goals and related polices that are relevant to this hazard mitigation plan are excerpted here:

- **Goal CS 2 – Continue investment in parks, recreation, and open space.** Wheat Ridge will maintain and continue to invest in providing quality parks, open space, and recreation facilities that are accessible to all neighborhoods and residents, using the Parks and Recreation Master Plan to guide investment and locations.
 - **CS 2.1 – Parks, Recreation and Open Space.** The City, in coordination with Jefferson County, Jefferson County Schools, and other organizations will continue to maintain and enhance parks, recreation, and open space offerings and facilities.
- **Goal CS 4 – Continue coordination with fire districts and utility providers to maintain quality service.** The City will continue to coordinate with utilities and fire districts to maintain quality levels of service to existing customers and provide new services to areas where future growth will occur.
 - **CS 4.1 – Utility and Service Districts.** The City will continue to coordinate development and redevelopment activities with utility providers and service districts.
- **Goal SF 2 – Protect and preserve natural assets.** Wheat Ridge will protect and conserve its natural, scenic, and environmental assets including the urban tree canopy, Wheat Ridge Greenbelt, Lena Gulch, and other drainage ways.
 - **SF 2.1 – Natural Resource Stewardship.** The City will continue to work with Jefferson County to provide stewardship of unique and sensitive natural resources and areas.

Wheat Ridge Weed Management Program (2003) The Wheat Ridge Parks and Recreation Department uses integrated pest management, a decision-making process that selects, integrates, and implements control methods to prevent or manage noxious weeds. The Weed Management

Plan focuses on long-term prevention or suppression of undesirable species while reducing the impact that control techniques may have on the environment, human health, and non-target species. The Weed Management Plan is an integral part of the Wheat Ridge Open Space Management Plan.

Municipal Code

Section 26, Article 8: Floodplain Management

The City adopted several revisions to the floodplain ordinance on January 13, 2014, that went into effect on January 28, 2014 (Ordinance 1544). These changes involved adopting new state regulations and new floodplain maps and incorporating minor changes to update the language in the ordinance to current standards.

There were two new state regulations that the City adopted that included:

1. The freeboard requirement is the minimum height above the flood elevation for most buildings. This requirement has been set at two feet for critical facilities.
2. Certain areas that are removed from the floodplain by using fill materials, would still be regulated as if they are still in a floodplain with respect to freeboard. This essentially means that basements would not be allowed in those areas.

An excerpt from the municipal code is provided here. The city council hereby finds it in the public interest, and in the furtherance of the public health, safety and welfare, that the following objectives be fulfilled:

- To promote the public health, safety and general welfare, to minimize flood losses in areas subject to flood hazards, and to promote wise use of the “Flood Regulatory District” by:
 - Prohibiting certain uses which are dangerous to life or property in time of flood.
 - Restricting uses which would be hazardous to the public health in time of flood.
 - Restricting uses which are so particularly susceptible to flood damage, so as to alleviate hardship and reduce demands for public expenditures for relief and protection.
 - Restricting permitted Flood Regulatory District uses, including public facilities which serve such uses, to be protected against floods by providing floodproofing and general flood protection at the time of initial construction.
- To protect occupants of the Flood Regulatory District from a flood which is or may be caused by their own, or other, land use and which is or may be undertaken without full realization of the danger through:
 - Regulating the manner in which structures designed for human occupancy may be constructed so as to prevent danger to human life within such structures.
 - Regulating the method of construction of water supply and sanitation systems so as to prevent disease, contamination and unsanitary conditions.

-
- Delineating and describing areas that could be inundated by floods so as to protect individuals from purchasing lands for purposes which are not in fact suitable.
 - Ensuring that potential buyers are notified that property is in an area of special flood hazard.
 - Ensuring that those who occupy the areas of special flood hazards assume responsibility for their actions.
 - To protect the public from the burden of extraordinary financial expenditures for flood control and relief.
 - Regulating all uses within the Flood Regulatory District so as to produce a method of construction and a pattern of development which will minimize the probability of damage to property and loss of life or injury to the inhabitants of the flood hazard areas.
 - Minimizing the need for rescue and relief efforts associated with flooding which are generally undertaken at the expense of the general public.
 - Minimizing prolonged business interruptions.
 - Minimizing damage to public facilities and utilities, such as water and gas mains; electric, telephone and sewer lines; streets and bridges located in areas of special flood hazard.
 - Helping maintain a stable tax base by providing for sound use and development of areas of special flood hazard so as to minimize future flood-blight areas.
 - Participating in the National Flood Insurance Program to assist property owners in obtaining adequate insurance coverage.
 - To protect the hydraulic characteristics and storage capacity of the Flood Regulatory District and small watercourses, including the gulches, sloughs and artificial water channels, used for conveying floodwaters so as to promote retention of sufficient floodway area to convey flood flows which can reasonably be expected to occur by:
 - Regulating filling, dumping, dredging and alteration of channels by deepening, widening or relocating, so as to maintain natural storage capacity and slow flow characteristics.
 - Prohibiting unnecessary encroachments.
 - Encouraging uses such as agriculture, open space, recreation, greenbelt, riding trails and parking.
 - Preventing or regulating the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas.
 - Restricting or prohibiting uses which are dangerous to health, safety and property due to water or erosion hazards or which result in damaging increases in erosion or in flood heights or velocities.
 - Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction.

(Ord. No. 2001-1215, § 1, 2-26-01)

Other Ordinances

Chapter 26 Zoning and Development - The intent and purpose of the zoning code of the City of Wheat Ridge is to encourage the most appropriate use of land throughout the city to ensure a logical growth of the various physical elements of the city; to lessen congestion in the streets and to facilitate the adequate provision of transportation within and through the city; to secure safety from fire, panic and other dangers; to provide adequate light and air to the residents, structures and properties within the city; to improve housing standards; to conserve property values; to facilitate adequate provision for water, sewage, schools, parks and other public improvements; to protect against poor or inadequate drainage or flood conditions and poor geologic conditions; and in general to promote the health, safety and welfare of the citizens and residents of the City of Wheat Ridge. It is further the intent of this zoning code to preserve the right of citizens to participate in the making of decisions which affect their properties while preserving, to the maximum lawful extent, the legislative and quasi-judicial discretion of the elected representatives of the City of Wheat Ridge.

Property Protection

Property protection activities are usually undertaken by property owners on a building-by-building or parcel basis.

The City has done several floodplain mitigation projects along Lena Gulch and purchased two properties in 2008 and 2009 for a future project. The houses and other improvements were removed from those properties and the properties were added to the nearby open space at Lewis Meadows Park. The City is also exploring funding opportunities for projects along Clear Creek.

Natural Resource Protection

Natural protection activities preserve or restore natural areas or their natural functions. They are usually implemented by parks, recreation, or conservation agencies or organizations.

City of Wheat Ridge Open Space Management Plan (2002) – The purpose of the City of Wheat Ridge Open Space Management Plan is to establish a framework for setting priorities and provide specific management direction for natural, scenic and recreational resources within the Wheat Ridge Greenbelt, Lewis Meadows, and future open space acquisitions. Implementation of the Plan will assist the Wheat Ridge Parks and Recreation Department in its efforts to preserve and enhance these areas for present and future generations. This Plan supplements numerous studies that have been completed through 2001 on Wheat Ridge open space. Relevant information from these municipal and county plans and environmental reports has been reviewed and incorporated into this Plan. The Weed Management and Wildfire Management Plans are integral to the Open Space Management Plan.

Emergency Services

Emergency services measures are taken during an emergency to minimize its impacts. These measures are the responsibility of city or county emergency management staff and the owners or operators of major or critical facilities.

The City has installed an Emergency Warning System with sirens that are capable of both tone and voice warnings. Most of the floodplain areas of the City are currently covered by the EWS. As of 2015, there are 18 EWS sirens in Wheat Ridge – these are described further in the Wheat Ridge Local Energy Assurance Plan.

City of Wheat Ridge Energy Assurance Plan (2012) - The City of Wheat Ridge Local Energy Assurance Plan (LEAP) is a guide for Wheat Ridge city staff and officials charged with the responsibility of ensuring the continuity of operations and health and safety of the citizens of the City during periods of energy emergencies. The overall goal of the LEAP is to enable Wheat Ridge to be more resilient to energy disruptions as a community.

The Plan is also designed to serve two specific purposes:

- (1) It serves as an energy disruption mitigation plan by identifying critical city facilities that must be operational during a disruption in order to maintain essential services.
- (2) It provides an analysis of events that could lead to widespread energy disruptions.

It serves as a supplement to the City of Wheat Ridge Emergency Operations Plan by outlining roles and actions to provide for effective response during energy disruption events.

City of Wheat Ridge Wildfire Management Plan (2003) – As its foundation, the Wildfire Management Plan emphasizes working with adjacent landowners, land managers, and local agencies to reduce the potential effects of wildfire on human life, private property, and the natural resources of Wheat Ridge’s Open Space. The Wildfire Management Plan is an integral part of the Wheat Ridge Open Space Management Plan.

Structural Projects

Structural projects keep hazards away from an area (e.g., levees, reservoirs, other flood control measures). They are usually designed by engineers and managed or maintained by public works staff.

The City and UDFCD have several proposed channelization projects that have been conceptually designed in the Major Drainageway Planning – Phase B Conceptual Preliminary Design Reports that were completed in 2007 and 2008 for Lena Gulch and Clear Creek. The goal of these projects is to reduce the number of properties within the 100-year floodplain. Funding for these projects is being pursued. Previous projects along Lena Gulch have already removed some properties from the 100-year floodplain.

Public Information

Public information activities advise property owners, potential property owners, and visitors about the hazards, ways to protect people and property from the hazards, and the natural and beneficial functions of natural resources (e.g., local floodplains). They are usually implemented by a public information office.

The City typically hosts an annual Open House event which is available to all residents. The Public Works Department sponsors several tables with floodplain and stormwater information. The Public Works Department has also hosted a separate floodplain open house for the past two years with invitations being sent to all properties within the 100 year floodplain.

The City prepared a floodplain video for its Top of the Hour series on Channel 8 that received a 3rd place award at a national competition.

Public information boards are also included at major parks that include emergency information and other public health issues, i.e. animal diseases, wildfire, floods, etc.

The City also utilizes its website, Channel 8, and quarterly newsletter to broadcast emergency information and public health concerns.

1.6 Mitigation Actions

This section of the Jefferson County Hazard Mitigation Plan provides updates on the actions originally identified in the 2010 plan and actions identified in the 2015-2016 update.

1. Maple Grove Dam operations plan

Issue/Background: Revise operations plan to reduce flood impacts from sub-100 year flood events

Other Alternatives: Continue current dam operations, which call for a sudden lower of the spillway gates after certain levels are reached.

Responsible Office: Public Works in cooperation with Consolidated Mutual Water Company and Lakewood and with assistance from UDFCD.

Priority (High, Medium, Low): Medium

Cost Estimate: \$10,000 from Wheat Ridge

Benefits (Avoided Losses): Reduces flooding potential for at-risk properties by better managing the storage-outfall relationship of the spillway use.

Potential Funding: 2014 Intergovernmental Agreement (IGA) between UDFCD, Lakewood, Wheat Ridge, and Consolidated Mutual Water Company

Schedule: New in 2016

2. Clear Creek Floodplain mapping and master plan

Issue/Background: Redo hydrology for Clear Creek to reflect gauge data, update floodplain maps and masterplan to reflect new flows

Other Alternatives: Continue to use existing maps that are based on higher calculated flows

Responsible Office: Public Works with assistance from UDFCD

Priority (High, Medium, Low): Medium

Cost Estimate: \$100,000 from Wheat Ridge

Benefits (Avoided Losses): Reduce or eliminate insurance costs to property owners by revising the floodplain maps to reflect more accurate gauge data rather than using maps based on calculated flows. Also potentially reduces cost of proposed floodplain projects by reducing necessary scope of work or with same scope of work or increases impact of the project by further reducing flood risk, thereby making the projects more appealing to the public and decision makers.

Potential Funding: 2015 IGA with UDFCD

Schedule: New in 2016

3. Sloan's Lake floodplain mapping and master plan

Issue/Background: The mapping in the Sloan's Lake area needs to be updated to reflect new development, completed projects, and accurate hydrology.

Other Alternatives: Continue to use existing mapping that is based on reportedly flawed hydrology.

Responsible Office: Public Works with assistance from UDFCD.

Priority (High, Medium, Low): Low

Cost Estimate: \$17,000 from Wheat Ridge

Benefits (Avoided Losses): Identifies new projects that could be used to further reduce flood risk. Also includes revised and additional mapping to better alert property owners of their flood risk.

Potential Funding: 2016 IGA with UDFCD.

Schedule: New in 2016

4. Stormwater CIP - Wadsworth and 35th drainage improvements

Issue/Background: Rebuild storm sewer on Wadsworth Blvd from 35th to Clear Creek in conjunction with Wadsworth widening project.

Other Alternatives: Use existing storm sewer that is aging and under capacity.

Responsible Office: Public Works with assistance from CDOT.

Priority (High, Medium, Low): Low

Cost Estimate: \$6,320 from Wheat Ridge; This will be part of a \$45 million widening project.

Benefits (Avoided Losses): Provide adequate capacity to handle storm flows from areas that are tributary to Wadsworth. In addition, the option of constructing the storm sewer with enough capacity to handle the 100-year event is being explored.

Potential Funding: 2015 IGA with CDOT

Schedule: New in 2016; Construction in 2019 and 2020.

5. Continue to improve the CRS rating to Class 4 through implementation of applicable elements of the Community Rating System Program

Issue/Background: Improve the CRS rating through additional outreach programs, including an annual floodplain open house, by additional analysis of the existing program, and by revising policies, ordinances, etc. to maximize the insurance discount for policy holders and to reduce flood risk.

Other Alternatives: Continue to maintain the current class 6 rating which results in a 20% discount.

Responsible Office: Public Works

Priority (High, Medium, Low): Medium

Cost Estimate: Ongoing operation.

Benefits (Avoided Losses): Maximize the insurance discount that is received by policy holders, thereby encouraging more at-risk properties to purchase insurance.

Potential Funding: City General Fund

Schedule: Ongoing with annual activities; 2016 flood workshop scheduled in March.

6. Floodplain Projects – Clear Creek & Lena Gulch

Issue/Background: This project would improve capacity for overbank areas along both drainageways to remove houses from floodplain.

Other Alternatives: Maintain drainageways in current configurations to maintain current flood risk.

Responsible Office: Public Works with assistance from UDFCD

Priority (High, Medium, Low): Low

Cost Estimate: \$1.5 million for Lena Gulch and \$3 million for Clear Creek

Benefits (Avoided Losses): Additional capacity in the open space areas reduces the flood risk for properties that are currently in the floodplain.

Potential Funding: Unknown

Schedule: New in 2016; schedule will be dependent on funding availability,

7. Multi-Jurisdictional StormReady Program Participation

Issue/Background: This is a National Weather Service (NWS) Program helps communities to better prepare to save lives from the onslaught of severe weather through advanced planning, education and awareness. This is an accredited program through the National Oceanic & Atmospheric Administration & the National Weather Service.

Other Alternatives: Currently, we meet about 85% of the guidelines. To meet the accreditation, we would enhance our current program to meet 100% of the guidelines.

Responsible Office: Jefferson County Office of Emergency Management

Priority: Low

Cost Estimate: None (Unless upgrades to Emergency Preparedness infrastructure is needed to qualify as a Storm Ready Community). \$5,000, if it is necessary to upgrade equipment, training, staff hours, OT hours, and/or host trainings.

Benefits (Avoided Losses): Once Application has been submitted to the NWS, the application is reviewed and the Storm Ready chair will assign a team to visit the applicant and discuss options. The end result being a Certified Storm Ready Office and serving residents and County Offices better. An added benefit to this is, once a Community is certified as Storm Ready the Insurance Services Organization can provide Community Rating System points which may be applied to lower National Flood Insurance Program (NFIP) flood insurance rates.

Potential Funding: Our funding would be from our EMPG grant.

Schedule: 2010 Apply and depending on results, implement in 2011

Status: Deferred, meet most, if not all criteria but wasn't initiated. Revisiting in 2016.

8. Channel 8/Website Updates

Issue/Background: Some hazards do not pose an immediate risk, but have longer range durations. Therefore, they do require immediate notification, but rather need to have information available to help cope with the ongoing nature of the hazard. Notices, information, and links other websites can be posted to keep current information available.

Other Alternatives: Rely on other sources to provide information.

Responsible Office: Administration Services

Priority (High, Medium, Low): Medium – Drought, Extreme Temperatures, and Winter Weather

Cost Estimate: Ongoing operation.

Benefits (Avoided Losses): Potential loss of life or injury and property damage.

Potential Funding: City General Fund

Schedule: Ongoing and implemented on an annual basis.

2015 Status: The City uses Channel 8 and the website to provide a wide range of information. This includes floodplain and stormwater news flashes and webpages, Top of the Hour videos, including an award winning floodplain video, mapping, including the floodplain maps, and alerts concerning other emergency activities.

9. Continue to implement sound floodplain management practices through participation in the National Flood Insurance Program NFIP/

Issue/Background: The City has a large number of properties that are either in the floodplain or in areas with substandard drainage conveyance. The City is a member of the NFIP and participates in the CRS in order to minimize flood losses over time.

Other Alternatives: Maintain current program.

Responsible Office: Public Works

Priority (High, Medium, Low): High – Dam Failure and Flood

Cost Estimate: Ongoing operation.

Benefits (Avoided Losses): Potential loss of life or injury and property damage.

Potential Funding: City General Fund

Schedule: Ongoing and implemented annually.

2015 Status: The City continues to participate in the NFIP and as a CRS program participant implements proactive floodplain management activities.

10. Stormwater Program and Maintenance Operations

Issue/Background: The City's Stormwater Program is in place to regulate public and private construction activities that could cause erosion. In addition, Public Works Operations has a program to clean out any accumulated sediment and repair a portion of the public storm sewer system each year. The amount that is done is dependent upon available funds.

Other Alternatives: None, the stormwater program is required by our State Permit.

Responsible Office: Public Works

Priority (High, Medium, Low): Medium – Erosion/Deposition

Cost Estimate: Ongoing operation.

Benefits (Avoided Losses) Potential environmental or public infrastructure damage.

Potential Funding: City General Fund

Schedule: Ongoing and implemented annually dependent on funding.

2015 Status: The City continues to fund both the program and maintenance operations on an annual basis.

Projects Completed or Deleted Since 2010

Emergency Warning System

Issue/Background: The City has a large amount of open space and other areas that cannot receive warnings from current technology, i.e. reverse 911. A total of 15 sirens were located throughout the City with both wailing and voice broadcast capabilities. Phase 1, with 6 sirens, was completed in early 2009. Phase 2, with 5 sirens, was completed in late 2009. Phase 3, with 4 sirens, was completed in 2010.

Emergency Operations Plan

Issue/Background: The City's plan was updated in 2009 to provide general guidelines and principles for planning, managing, and coordinating the overall response and recovery activities of Wheat Ridge government before, during, and after major emergency and disaster events. It delineates the roles and responsibilities of City departments, outside agencies, and volunteer organizations which are expected to contribute to the protection of people and property. The Emergency Operations Plan was updated in January 2014.

City of Wheat Ridge Open Space Wildfire Management Plan

Issue/Background: The purpose of this plan is to outline basic considerations and constraints and provide guidelines for wildfire management planning within the Wheat Ridge Greenbelt and Lewis Meadows. The Plan was adopted in 2014 and is being used.

Education and Ordinance's regarding the mitigation of trees as hazards in Natural Disaster

Issue/Background: Trees of certain types, such as cottonwoods, are susceptible to damage during severe weather events and can cause damage to property, disrupt power, and are a danger to the public. Untrimmed trees of many types also become a hazard to life and property during severe weather events. Implementing or changing City Ordinances that address types of trees to be planted by property owners as well as the care and proper trimming of trees would alleviate loss of power, damage and injury during a severe weather event. A public education program using printed media and cable television programs would be used to inform the public on these issues and encourage compliance. The City has a webpage (since 2011) that provides resources to property owners.

Stormwater CIP – 29th Avenue Storm sewer Project

Issue/Background: An abandoned 42” water main in 29th Avenue was converted to a storm sewer main with laterals and inlets installed at the street intersections from Sheridan Blvd to Fenton Street. The 42” pipe is also utilized as a detention facility during smaller storms to keep the flows at Sheridan Blvd below previous levels. A bypass structure was installed at Benton Street that directs excess flows to a detention pond in a park, the Richard Hart Estate, that reduces the flows to previous levels. The system eliminates overtopping of 29th Avenue for smaller storm events, greatly reducing the flood risk for properties south of 29th Avenue. The project was completed in 2014.

Deleted Project: Lena Gulch Channelization

Issue/Background: 15 houses along Lena Gulch between Simms and Tabor Streets were shown within the 100-year floodplain on the 2007 FHAD. Two properties have already been purchased with the houses and other improvements being removed. Other property is already owned by City. The project would improve up to 1,000 feet of channel to fully convey the 100-year event, completely removing the remaining 13 houses from the 100-year floodplain.

2015 Status: FEMA funding was not possible for this project as the Benefit/Cost ratio of 1.0 could not be achieved. This action has been replaced by the ‘Floodplain projects – Clear Creek and Lena Gulch’ action #6.

ANNEX F

TOWN OF LAKESIDE

1.1 Community Profile

1.1.1 History

The Town of Lakeside is a Statutory Town in Jefferson County, Colorado, northwest of, and adjacent to, the City and County of Denver. The population was 8 at the 2010 census, making Lakeside one of the least populous incorporated towns in the State of Colorado. The town's namesake lake is Lake Rhoda, which covers 20% of its total area. A year after its incorporation on November 12, 1907, the Lakeside Amusement Park, nicknamed "White City", opened on the eastern shores. Both town and park were founded by a syndicate led by prominent Denver brewer Adolph Zang, who endeavored to build the resort just across the county line from Denver, and incorporate to move beyond the reach of Denver liquor laws. Also in town on the southern shore is Lakeside Mall, built in 1956. The amusement park, shopping mall, and lake occupy almost all the tiny municipality. Residences are limited to a handful of houses on the west side of Sheridan Boulevard, across the street from Denver. See Figure 1.

1.1.2 Population

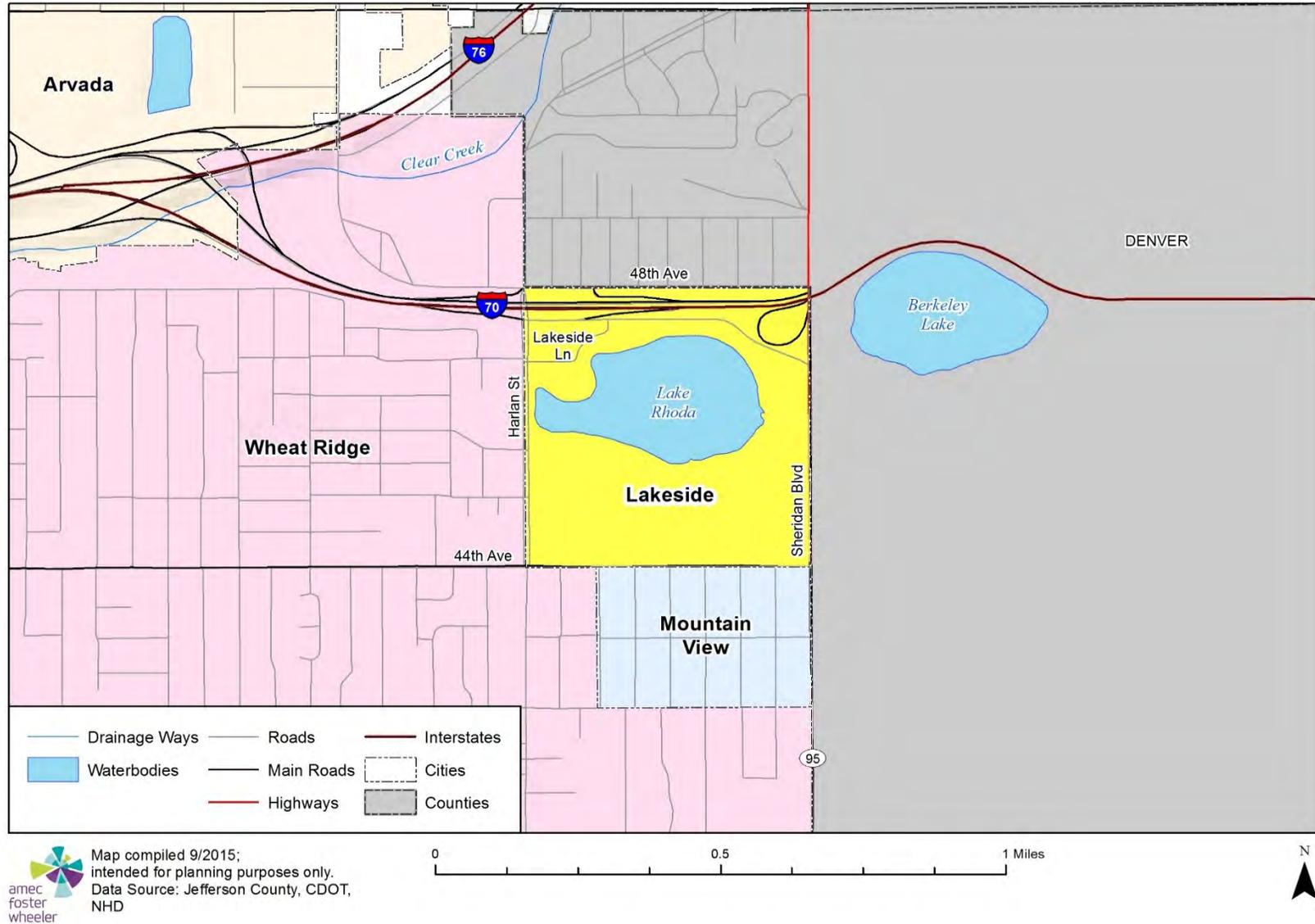
Select Census 2010 demographic and social characteristics for Lakeside are shown in Table 1.

Table 1. Lakeside's Demographic and Social Characteristics, 2010

Characteristic	
Total population	8
Total households	9
Households with someone over 65 (%)	22.2
Households with children under 18 (%)	33.3
Race/Ethnicity (one race)	
White (%)	100
Hispanic or Latino (Of Any Race) (%)	0
Other	
Average Household Size	2.22
Median age	58

Source: U.S. Census Bureau, www.census.gov/

Figure 1. Lakeside Basemap



1.1.3 Economy

Select economic characteristics for Lakeside from the 2010 Census are shown in Table 2. The major employers in the Town are Wal-Mart and the Lakeside Amusement Park.

Table 2. Lakeside’s Economic Characteristics

Characteristic	
Median Household Income	\$34,375
Median Family Income	\$9,375
Per capita income	\$16,339
Families living below poverty line	66.7%

Source: U.S. Census Bureau, www.census.gov/

1.2 Hazard Summary

A hazard identification and vulnerability analysis was completed for the Town of Lakeside using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County. Information from the Data Collection Guide is summarized in Table 3 with all the hazards listed that could impact anywhere in Jefferson County. The purpose of this exercise was to identify and rank the hazards and vulnerabilities unique to the jurisdiction.

For this plan update, the Town of Lakeside’s planning team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the Town of Lakeside.

The data in Table 3 reflect the most significant hazards for the Town of Lakeside. They are: earthquake, hail storm and severe winter storms.

The hazard significance listed is based on Town of Lakeside HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (refer to Chapter 4 of the base plan). The risk assessment was a more detailed qualitative analysis with better available data that varied.

Table 3. Town of Lakeside – Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Avalanche	Unlikely	Limited	Negligible	Low
Dam Failure	Unlikely	Limited	Negligible	Low
Drought	Occasional	Limited	Negligible	Low
Earthquake	Unlikely	Extensive	Critical	Medium
Erosion and Deposition	Unlikely	Limited	Negligible	Low
Expansive Soils	Unlikely	Limited	Negligible	Low
Extreme Temperatures	Occasional	Limited	Negligible	Low
Flood	Unlikely	Limited	Negligible	Low
Hailstorm	Likely	Significant	Negligible	Medium
Landslide, Debris flow, Rockfall	Unlikely	Limited	Negligible	Low
Lightning	Likely	Limited	Negligible	Low
Severe Winter Storms	Highly likely	Extensive	Negligible	Medium
Subsidence	Unlikely	Limited	Negligible	Low
Tornado	Unlikely	Significant	Critical	High
Wildfire	Unlikely	Limited	Negligible	Low
Windstorm	Likely	Extensive	Limited	Low
Frequency of Occurrence: Highly Likely: Near 100% probability in next year. Likely: Between 10 and 100% probability in next year or at least one chance in ten years. Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years. Unlikely: Less than 1% probability in next 100 years.		Potential Magnitude: Catastrophic: Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50% of property is severely damaged Critical: Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 25% of property is severely damaged Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged Negligible: Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.		
Spatial Extent: Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		Significance: Low, Medium, High		

Previous Hazard Events

Through the Data Collection Guide, the Town of Lakeside noted specific historic hazard events to include in the community profile. These events have been incorporated into the appropriate hazard chapters in the base plan. These events had a particular impact on the community beyond the impacts and events recorded in the Jefferson County Hazard Mitigation Plan. This is not a comprehensive summary of past incidents, as the hazard profiles collected in the main Mitigation Plan include other events that may have historically impacted the jurisdiction. The events noted by this jurisdiction in the Data Collection Guide include:

March 2009 Winter Storm

A winter storm brought heavy snow to much of the region as a potent low pressure system dropped out of the Pacific Northwest, and tracked through the Four Corners region and into Southeast Colorado. As a result, significant snowfall occurred across most of North-Central and Northeast Colorado. The heaviest snowfall occurred in and near the Front Range Foothills and Palmer Divide as a deep east to northeasterly upslope flow developed. Over a foot of snow fell in Lakeside. 2 injuries were reported, and 20-25 vehicles were damaged from minor to complete. Businesses were closed, causing a loss of revenue for retailers and loss of tax revenue for the Town. Schools were closed, and minor damages were suffered by local roads.

Vulnerability to Specific Hazards

This section details vulnerability to specific hazards, where quantifiable, and where it differs from that of the overall County. The results of detailed GIS analyses used to estimate potential for future losses are presented here, in addition to maps of hazard areas. For a discussion of the methodology used to develop the loss estimates refer to Section 4.3 of the Base Plan.

Flood

According to the GIS vulnerability assessment conducted for this plan update, the Town of Lakeside has no flood risk.

Wildfire

There is no wildfire risk in the Town of Lakeside.

Other Hazards

In the case of other hazards that are not specific to geography such as drought, hailstorms, winter storms, lightning, tornado and windstorm the entire building inventory and population in the Town is potentially exposed. That is the reason for the asset inventory provided in Section 1.3. It should be noted that no hazard in this plan is expected to cause widespread impacts to this inventory.

Additional Vulnerabilities

- There is one business that deals with special needs persons. They may be present from time to time.
- The residences are all lower income, older homes or mobile homes
- The main part of the town has been developed into a new retail shopping center which brings outside visitors to the Town. This could be a potential problem in a hazard situation.

1.3 Asset Inventory

1.3.1 Property Inventory

Table 4 represents an inventory of property in Lakeside based on the Jefferson County Assessor's data as of October 2015.

Table 4. Lakeside's Property Inventory

Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Commercial	9	10	\$13,189,900	\$13,189,900	\$26,379,800
Mixed Use	1	11	\$604,600	\$604,600	\$1,209,200
Total	10	21	\$13,794,500	\$13,794,500	\$27,589,000

Source: Jefferson County Assessor's Office

*The Assessor's Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values.

**The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values (typically 50% for residential structures and 100% for commercial/industrial)

1.3.2 Other Assets

Table 5 is a detailed inventory of assets identified by the City's planning team. This inventory includes critical facilities. For more information about how "critical facility" is defined in this plan, see Section 4.3 Vulnerability Assessment.

Table 5. Lakeside's Assets

Name of Asset	Type	Replacement Value (\$)	Occupancy/Capacity #	Hazard Specific Info
Town Offices, Police Dept.	EI	\$500,000	50	
Police & Fire Garage	EI	\$100,000	50	
Lakeside Amusement Park	VF	5 million	2500	Earthquake, wind, hail, lightning
Heritage College	VF	1 million	200	Earthquake, winter snow storm

Many of the facilities listed above are also in GIS databases provided by the Town of Lakeside and Jefferson County. Critical facility counts and types are shown in Table 6. Shelters may be in facilities such as schools or recreation centers and are not indicated on the map.

Table 6. Summary of Lakeside’s Critical Facilities in GIS

Category	Facility Type	Facility Count
Essential Facilities	Fire Station	1
	Law Enforcement	1
	Total	2
High Potential Loss Facilities	College	1
	Total	1
Transportation and Lifelines	Bridge	2
	Total	2
Grand Total		5

Source: Town of Lakeside, Jefferson County

1.3.3 Natural, Cultural, and Historic Resources

Assessing the vulnerability of Lakeside to disaster also involves inventorying the natural, historical, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Natural Resources

For information about natural resources in Jefferson County, which includes Lakeside, see Section 4.3 Vulnerability Assessment.

Historic and Cultural Resources

There are no properties in Lakeside that are on the National Register of Historic Places and/or the Colorado State Register of Historic Properties (for more information about these registers, see Section 4.3 Vulnerability Assessment).

While Lakeside Amusement Park is not listed as an officially designated historic property, it is a significant cultural resource for the region. Opening in 1908, Lakeside is the lone remaining American amusement park to have had the name White City. The park was originally built in the Exposition and White City architectural styles following the Chicago World’s Fair in 1893. After its acquisition by Ben Krasner in the 1930s, Lakeside underwent a period of major renovations

and incorporated many new features in the Art Deco style. Noted Architect Richard L. Crowther designed much of Lakeside's Deco and Modern features¹.

The National Park Service administers two programs that recognize the importance of historic resources, specifically those pertaining to architecture and engineering. While inclusion in these programs does not give these structures any sort of protection, they are valuable historic assets. There are currently no Historic American Building Survey (HABS) or Historic American Engineering Record (HAER) buildings in the Town of Lakeside.

It should be noted that as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

1.4 Growth and Development Trends

Table 7 illustrates how Lakeside has grown in terms of population and number of housing units between 2000 and 2010. Given the very small size of the town, trends cannot be interpreted.

Table 7. Lakeside's Change in Population and Housing Units, 2000-2010

2000 Population	2010 Population	Estimated Percent Change 2000-2010	2000 # of Housing Units	2010 Estimated # of Housing Units	Estimated Percent Change 2000-2010
20	8	-60%	9	9	0%

Source: Colorado Division of Local Government State Demography Office, www.dola.colorado.gov/dlg/demog/

1.5 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes Lakeside's regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities and then discusses these capabilities in further detail along with other mitigation efforts as they pertain to the National Flood Insurance Program's Community Rating System (CRS). Although the CRS is flood-focused, this discussion also incorporates activities related to other hazards into the categories established by the CRS.

¹ Leuthner, Stuart (July/August 1992). Lake Side. *American Heritage*.

1.5.1 Mitigation Capabilities Summary

Table 8 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Lakeside.

Table 8. Lakeside’s Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
Master plan	No	
Zoning ordinance	No	
Subdivision ordinance	No	
Growth management ordinance	No	
Floodplain ordinance	No	
Site plan review requirements	No	
Other special purpose ordinance (stormwater, steep slope, wildfire)	No	
BCEGS Rating	No	
Building code	No	
Fire department ISO rating	No	
Erosion or sediment control program	Yes	
Stormwater management program	No	
Capital improvements plan	No	
Economic development plan	No	
Local emergency operations plan	No	
Other special plans	No	
Flood insurance study or other engineering study for streams	No	
Elevation certificates	No	

Table 9 identifies the personnel responsible for mitigation and loss prevention activities as well as related data and systems in Lakeside.

Table 9. Lakeside’s Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Yes	contracted	As needed
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	contracted	As needed
Planner/engineer/scientist with an understanding of natural hazards	Unknown		
Personnel skilled in GIS	No		
Full time building official	No		
Floodplain manager	No		
Emergency manager	Yes	Commander with Police	
Grant writer	No		
Other personnel	No		
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	Unknown		
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Yes	JCSO Dispatch	Reverse 9-1-1

Table 10 identifies financial tools or resources that Lakeside could potentially use to help fund mitigation activities.

Table 10. Lakeside’s Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Unknown	
Capital improvements project funding	Unknown	
Authority to levy taxes for specific purposes	Unknown	
Fees for water, sewer, gas, or electric services	No	
Impact fees for new development	Unknown	
Incur debt through general obligation bonds	Unknown	
Incur debt through special tax bonds	Unknown	
Incur debt through private activities	Unknown	
Withhold spending in hazard-prone areas	Unknown	

1.5.2 Community Rating System Activities (All Hazards)

National Flood Insurance Program

The Town of Lakeside does not participate in the National Flood Insurance Program (NFIP). The Town has not been mapped by the NFIP thus participation is optional. The NFIP allows private property owners to purchase affordable flood insurance and enables the community to retain its eligibility to receive certain federally backed monies and disaster relief funds.

Incorporation into Local Planning Mechanisms

The 2010 Local Hazard Mitigation Plan has not been incorporated yet into existing planning mechanisms include but additional opportunities will be evaluated using the process identified in Chapter 7 of the base plan.

1.6 Mitigation Actions

The Town did not identify any specific mitigation actions in 2010 or 2016.



ANNEX G

TOWN OF MORRISON

1.1 Community Profile

1.1.1 History

The area around Morrison began to be settled in 1860 and was originally known as Mt. Morrison. The settlement had a population of between two and twenty five people who were mainly located near the confluence of Mount Vernon and Bear Creeks. The area grew quickly after the Civil War and became a center for coal mining, rock quarries, timbering, and other mineral extraction services that were needed to meet the construction and building needs of the growing Denver area. By 1880 the population in and around Morrison had grown to 750.

The physical setting of the town is dominated by two creeks and spectacular land forms associated with hogbacks and sandstone formations which separate Morrison from the Great Plains to the east. In the late 1800s and early 1900s, the close proximity to Denver and the beauty of the area started to attract tourists from Denver. At the time, the Denver South Park and Pacific Railroad later named the Colorado and Southern Railway connected Mt. Morrison to downtown Denver. Transporting visitors to the activities and sights around Morrison, as well as moving freight, coal, stone, lumber, cement, and gypsum back to the burgeoning City of Denver. At its peak in 1913, the Colorado and Southern Railway ran four daily roundtrips to and from Morrison.

Bear Creek flows through the center of downtown Morrison. It provides water for Denver, Englewood, and Morrison, as well as towns upstream, and has been a primary attraction for residents and visitors alike. It has also been the source of much destruction. A wide bench carved by Bear Creek near the hogback first attracted George Morrison's attention as a potential townsite. The creek also provided a passable route to move people and supplies into the goldfields to the west.

As was common with many of Colorado's early mountain communities, Morrison's population declined sharply at the turn of the 20th Century. Morrison was incorporated in 1906 and by 1910 the Town's population had dropped to 250. As road and highway connections to Morrison were constructed to accommodate automobile and truck traffic, rail services declined and scheduled rail service ended in 1925. Rail services were abandoned following a series of disastrous floods in the 1930s. Morrison's population grew slowly from 1910 to the 1980s when it topped out at just over 500. Morrison is unique in terms of population change since World War II. While most Front Range and foothills communities have mushroomed in growth, the Town's population numbers have declined to approximately 428 (Census 2010), and have remained relatively unchanged for over a quarter of a century.

1.1.2 Population

The U. S Census Bureau’s estimated 2010 population of Morrison was 428. Select Census 2010 demographic and social characteristics for Morrison are shown in Table 1. Population statistics are influenced by the large number of town residents who live in the Bear Creek Nursing Home.

Table 1. Morrison’s Demographic and Social Characteristics 2010

Characteristic	
Gender/Age	
Male (%)	44.4
Female (%)	55.6
Under 5 Years (%)	1.2
65 Years and Over (%)	14.3
Race/Ethnicity	
Race white (%)	97.4
Any race Hispanic or Latino (%)	4.7
Other	
Average Household Size	2.07

Source: U.S. Census Bureau, www.census.gov/

1.1.3 Economy

Select economic characteristics for Morrison from the 2010 Census are shown in Table 2.

Table 2. Morrison’s Economic Characteristics 2010

Characteristic	
Families below Poverty Level	4.9%
Individuals below Poverty Level	5.5%
Median Household Income	\$53,438
Per Capita Income	\$24,347

Source: U.S. Census Bureau, www.census.gov/

1.2 Hazard Summary

A hazard identification and vulnerability analysis was completed for the Town of Morrison using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County. Information from the Data Collection Guide is summarized in Table 3 with all the hazards listed that could impact anywhere in Jefferson County. The purpose of this exercise was to identify and rank the hazards and vulnerabilities unique to the jurisdiction.

For this plan update, the Town of Morrison's planning team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the Town.

The data in Table 3 reflect the most significant hazards for the Town of Morrison. They are: flood and severe winter storms.

The hazard significance listed is based on Town of Morrison Hazard Mitigation Planning Committee (HMPC) member input from the Data Collection Guide and the risk assessment developed during the planning process (refer to Chapter 4 of the base plan). The risk assessment was a more detailed qualitative analysis with better available data.

Table 3. Town of Morrison – Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Avalanche	Unlikely	Limited	Negligible	Low
Dam Failure	Unlikely	Limited	Limited	Medium
Drought	Likely	Extensive	Negligible	Low
Earthquake	Unlikely	Extensive	Negligible	Medium
Erosion and Deposition	Occasional	Limited	Negligible	Low
Expansive Soils	Unknown	Limited	Negligible	Low
Extreme Temperatures	Unlikely	Extensive	Negligible	Low
Flood	Likely	Significant	Catastrophic	High
Hailstorm	Likely	Extensive	Negligible	Medium
Landslide, Debris flow, Rockfall	Likely	Limited	Negligible	Low
Lightning	Likely	Limited	Negligible	Medium
Severe Winter Storms	Likely	Extensive	Negligible	High
Subsidence	Unlikely	Limited	Negligible	Low
Tornado	Occasional	Extensive	Limited	Low
Wildfire	Likely	Significant	Negligible	Medium
Windstorm	Likely	Extensive	Limited	Low to Medium
Frequency of Occurrence: Highly Likely: Near 100% probability in next year. Likely: Between 10 and 100% probability in next year or at least one chance in ten years. Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years. Unlikely: Less than 1% probability in next 100 years.		Potential Magnitude: Catastrophic: Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50% of property is severely damaged Critical: Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 25% of property is severely damaged Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged Negligible: Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.		
Spatial Extent: Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		Significance: Low, Medium, High		

Previous Hazard Events

Through the Data Collection Guide, the Town of Morrison noted specific historic hazard events to include in the community profile. These events have been incorporated into the appropriate hazard chapters in the base plan. These events had a particular impact on the community beyond the impacts and events recorded in the Jefferson County Hazard Mitigation Plan. This is not a comprehensive summary of past incidents, as the hazard profiles collected in the main Mitigation Plan include other events that may have historically impacted the jurisdiction. The events noted by this jurisdiction in the Data Collection Guide include:

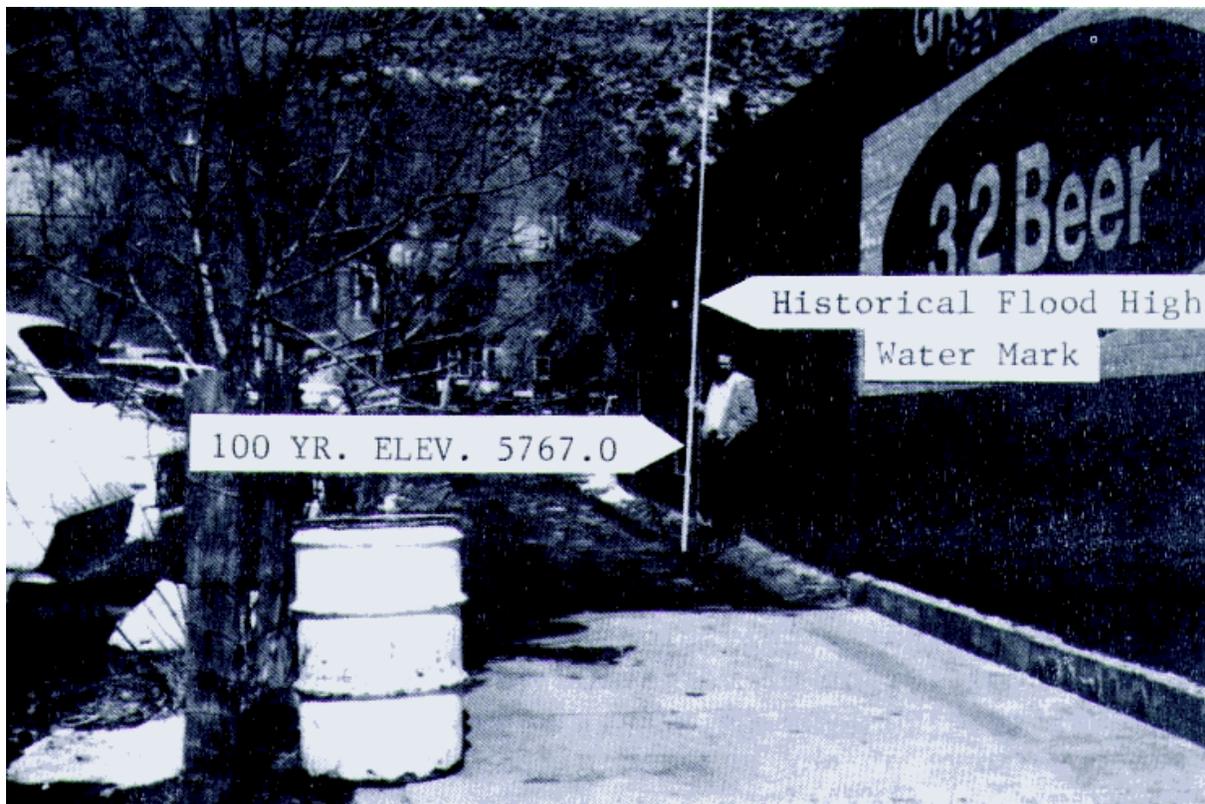
1896 Flooding

A cloudburst in Bear Creek Canyon brought a solid wall of water through the Town of Morrison. The flood was 200 feet wide and 15 feet deep. It caused over \$6 million in damages (1999 dollars). 27 people lost their lives. Most of those who lost their lives were Denverites camping in the canyon. All bridges across Bear Creek were washed away, trees were uprooted, and long stretches of railroad track were washed out. This flood was one of the most deadly floods in Colorado history.

Multiple Floods - 20th Century

There have been multiple major floods during the 20th century on both the Bear and Mount Vernon Creek. These floods have caused extensive damage to property and infrastructure. Roads and bridges were damaged. Significant losses were suffered by local residents and businesses. Multiple deaths and injuries were reported. The Town has been subject to severe and repetitive floods. See the flood hazard profile in the Base Plan for descriptions of these events. Figure 1 depicts Bear Creek flood levels on the wall of a store in Morrison between Market Street and Mount Vernon Street downstream of the Mount Vernon Creek confluence with Bear Creek. The “Historic High Water Mark” depicts the level of the September 2, 1938 flood that peaked around 7 p.m.

Figure 1. 1938 Flood High Water Mark between Market Street and Mount Vernon Street



1913 Winter Storm Blizzard

A severe snow event in the winter of 1913 caused a complete shutdown of the town as well as Turkey and Bear Creek Canyons. Food items and mail had to be delivered to residents by pack mule and horseback while medical supplies, food and other critical items were brought in by rail and then relayed up the canyons by private contractors.

2006 Winter Storm Blizzard

A slow moving low pressure system moved from the Desert Southwest and into Southeastern Colorado. As a result, a deep upslope flow developed along the Front Range and Northeast Plains of Colorado. Strong winds and heavy snow brought blizzard conditions to the Interstate 25 Corridor, from the Wyoming state line south to Colorado Springs. Storm totals generally ranged from 2 to 4 feet in and near the Front Range Foothills and Palmer Divide. Schools in Morrison were closed, and businesses in the town suspended their business to dig out from the storm, causing a loss of business and sales tax revenue. The Town of Morrison was given aid in the amount of \$8,000 to offset snow removal costs.

2013 Storms and Flooding

From September 9 - 15, 2013, very heavy rains created massive flooding along Bear Creek and Mt. Vernon Creek through Morrison. Bear Creek peaked at a flow of about 3,200 cfs in Morrison as reported by the Division of Water Resources, which is likely a 10 to 15-year storm event. The Bear Creek at Morrison gaging station recorded a 3' rise in water surface. Upstream of Highway 8 near Morrison Park, the Bear Creek flooding caused damages to the channel banks and trail. Downstream of the Highway 8 crossing, an existing sewer main below the Canon Street bridge was threatened and the Ward Ditch diversion dam and adjacent concrete bike path were undermined. The State Engineers' Office was concerned that the Evergreen dam located upstream of Morrison would exceed its capacity. As a result, for several days Morrison was under an evacuation alert status.

Vulnerability to Specific Hazards

This section details vulnerability to specific hazards, where quantifiable, and where it differs from that of the overall County. The results of detailed GIS analyses used to estimate potential for future losses are presented here, in addition to maps of hazard areas. For a discussion of the methodology used to develop the loss estimates refer to Section 4.3 of the Base Plan.

Flood

According to the GIS vulnerability assessment conducted for this plan update, Morrison has the highest flood risk, based on loss ratio (see Section 4.3), in the planning area in terms of the potential for loss of life and severe damage to the downtown area. Note that this is based on computer modeling that may not reflect site specific mitigation activities.

Morrison town shops are located adjacent to Bear Creek in a flood zone. Equipment necessary for flood recovery is stored in these shops. Relocation to safer location would protect equipment from damage/loss due to flash flooding.

Table 4 shows the total parcels and buildings at risk to the 1% annual chance flood and Table 5 shows the values at risk in the same flood scenario. For this analysis, content values were estimated based on prevailing land use and a multiplier was applied to building and content values to estimate losses to each. See Section 4 Hazard Profiles for details on methodology. According to the analysis, 56 buildings (30 of which are Commercial) are at risk, totaling \$3.8 million in damage to buildings and contents.

Table 4. Town of Morrison Buildings At-Risk to 1% Annual Chance Flood

Property Type	Improved Parcels	Building Count
Commercial	21	30
Mixed Use	5	11
Residential	12	24
Total	38	65

Source: Jefferson County Assessor, October 2015

Table 5. Town of Morrison Values At-Risk to 1% Annual Chance Flood

Property Type	Improved Value	Content Value	Total Value	Structure Loss	Content Loss	Total Loss Estimate
Commercial	\$3,188,300	\$3,188,300	\$6,376,600	\$765,192	\$1,339,086	\$2,104,278
Mixed Use	\$1,405,100	\$1,405,100	\$2,810,200	\$337,224	\$590,142	\$927,366
Residential	\$2,016,050	\$1,008,025	\$3,024,075	\$604,815	\$171,364	\$776,179
Total	\$6,609,450	\$5,601,425	\$12,210,875	\$1,707,231	\$2,100,592	\$3,807,823

Source: Jefferson County Assessor, October 2015

Table 6 shows the parcels and buildings at risk to the 0.2% annual chance flood and Table 7 **Error! Reference source not found.** shows the values at risk in the same flood scenario. According to the analysis, 23 buildings (15 of which are residential) are at risk, totaling \$1.8 million in damage to buildings and contents over and above the 1% scenario.

Table 6. Town of Morrison Buildings At-Risk to 0.2% Annual Chance Flood

Property Type	Improved Parcels	Building Count
Commercial	2	2
Exempt	3	1
Mixed Use	3	5
Residential	14	15
Total	22	23

Source: Jefferson County Assessor, October 2015

Table 7. Town of Morrison Values At-Risk to 0.2% Annual Chance Flood

Property Type	Improved Value	Content Value	Total Value	Structure Loss	Content Loss	Total Loss Estimate
Commercial	\$123,000	\$123,000	\$246,000	\$29,520	\$51,660	\$81,180
Exempt	\$277,700	\$277,700	\$555,400	\$66,648	\$116,634	\$183,282
Mixed Use	\$1,017,500	\$1,017,500	\$2,035,000	\$244,200	\$427,350	\$671,550
Residential	\$1,976,300	\$1,976,300	\$3,952,600	\$592,890	\$335,971	\$928,861
Total	\$3,394,500	\$3,394,500	\$6,789,000	\$933,258	\$931,615	\$1,864,873

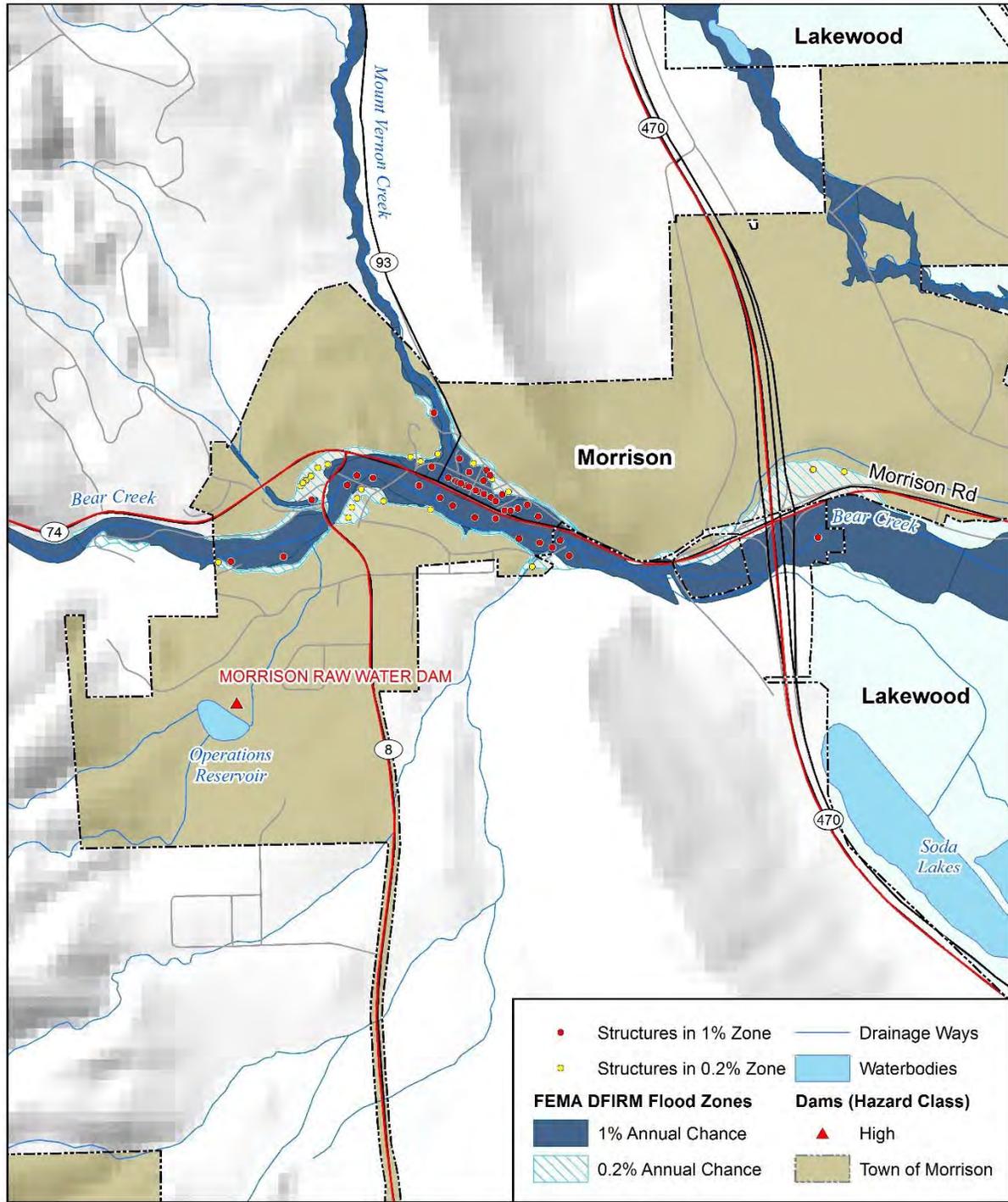
Source: Jefferson County Assessor¹ October 2015

To create the most accurate representation of critical facilities in the County, a composite of 3 different data sources were compiled: Jefferson County Assessor data, HSIP Freedom Data and HAZUS 2.2. This new data later was then cross referenced in GIS with the FEMA flood zone inundation maps. Figure 3 shows the location of all the critical facilities in Morrison as well as the FEMA flood zones.

For the Town of Morrison, this analysis showed that there are 3 critical facilities in the 1% annual chance flood zone, all of which are bridges. There are no critical facilities in the 0.2% annual chance flood zone.

¹ The Assessor's Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values. The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values (typically 50% for residential structures, 100% for commercial, 100% for agricultural, 150% for industrial, 100% for mixed use and 100% for exempt.)

Figure 2. Town of Morrison Flood Hazard and At-Risk Properties

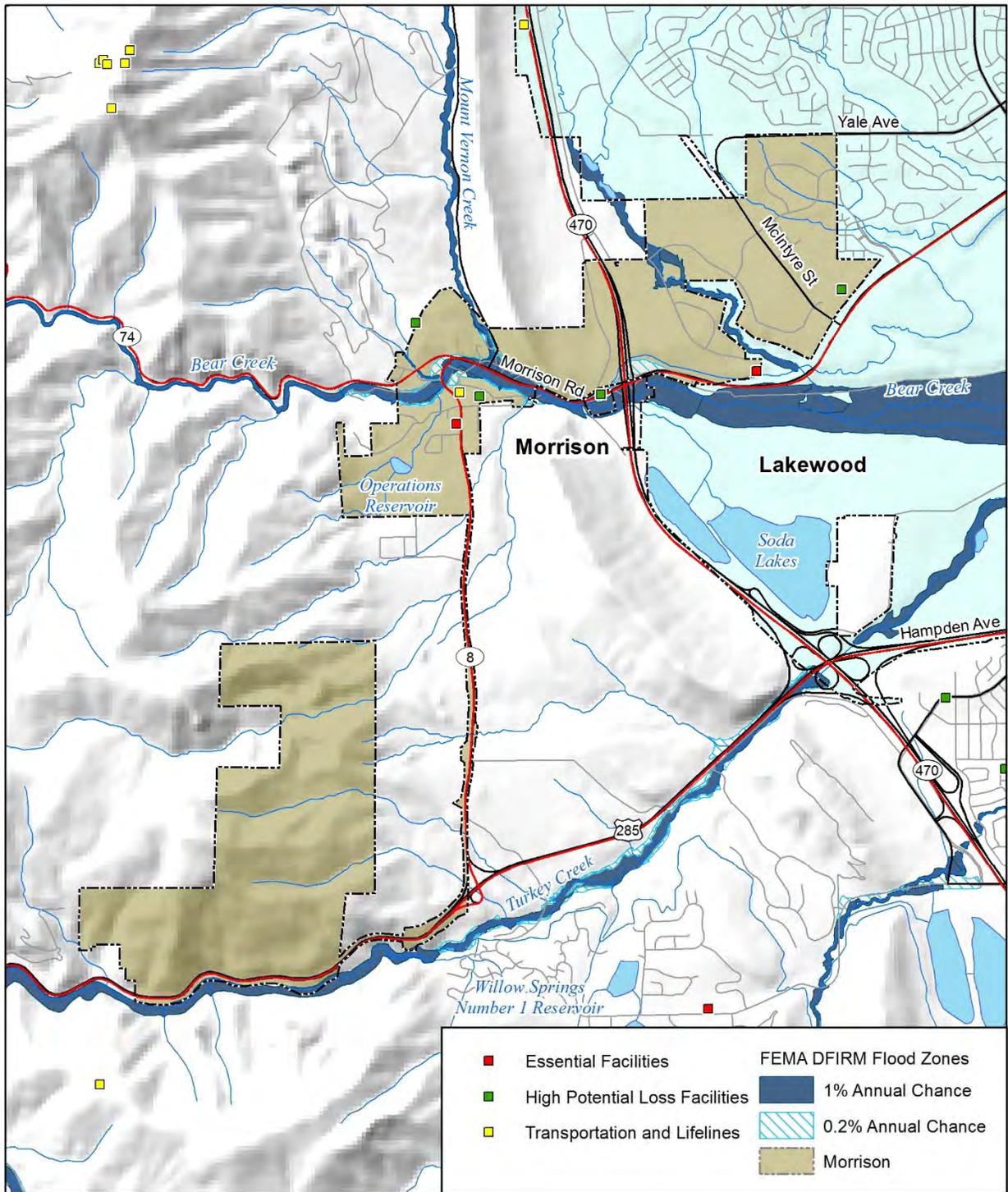


Map compiled 10/2015;
intended for planning purposes only.
Data Source: Jefferson County, CDOT,
NHD, FEMA DFIRM 02/05/2014

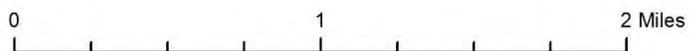
0 1,000 2,000 Feet



Figure 3. Town of Morrison Flood Hazard and Critical Facilities



Map compiled 11/2015;
intended for planning purposes only.
Data Source: Jefferson County, CDOT,
NHD, FEMA DFIRM 02/05/2014



Dam Failure

To create the most accurate representation of dams in the County, a composite of 3 different data sources were compiled: Jefferson County facility data, National Inventory of Dams (NID) database data and the list of dams in the original 2010 Jefferson County Hazard Mitigation Plan.

According to this analysis, Morrison has one High Hazard dam (Morrison Raw Water Dam, see Figure 2) whose failure could impact life and/or property. Note: Hazard class does not indicate dam condition, it merely indicates risks in case of failure. A high hazard dam poses risk to both life and property, a significant hazard dam only poses a risk to property. See discussion the in Section 4.3 in the Base Plan.

Geologic Hazards

Morrison has some limited exposure to geologic hazards including dipping bedrock and slope failure.

These hazard areas mainly affect the eastern and central portions of the Town of Morrison. See the map in Figure 4. Specific structures at risk from specific geologic hazards are detailed in Table 8 and Table 9. Methodology for this table can be found in Section 4.3.4 Estimating Potential Losses.

Table 8. Town of Morrison Dipping Bedrock Risk

Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Commercial	1	1	\$626,000	\$626,000	\$1,252,000
Exempt	4	2	\$9,099,700	\$9,099,700	\$18,199,400
Industrial	1	1	\$267,300	\$400,950	\$668,250
Total	6	4	\$9,993,000	\$10,126,650	\$20,119,650

Source: Jefferson County

Table 9. Town of Morrison Slope Failure Risk

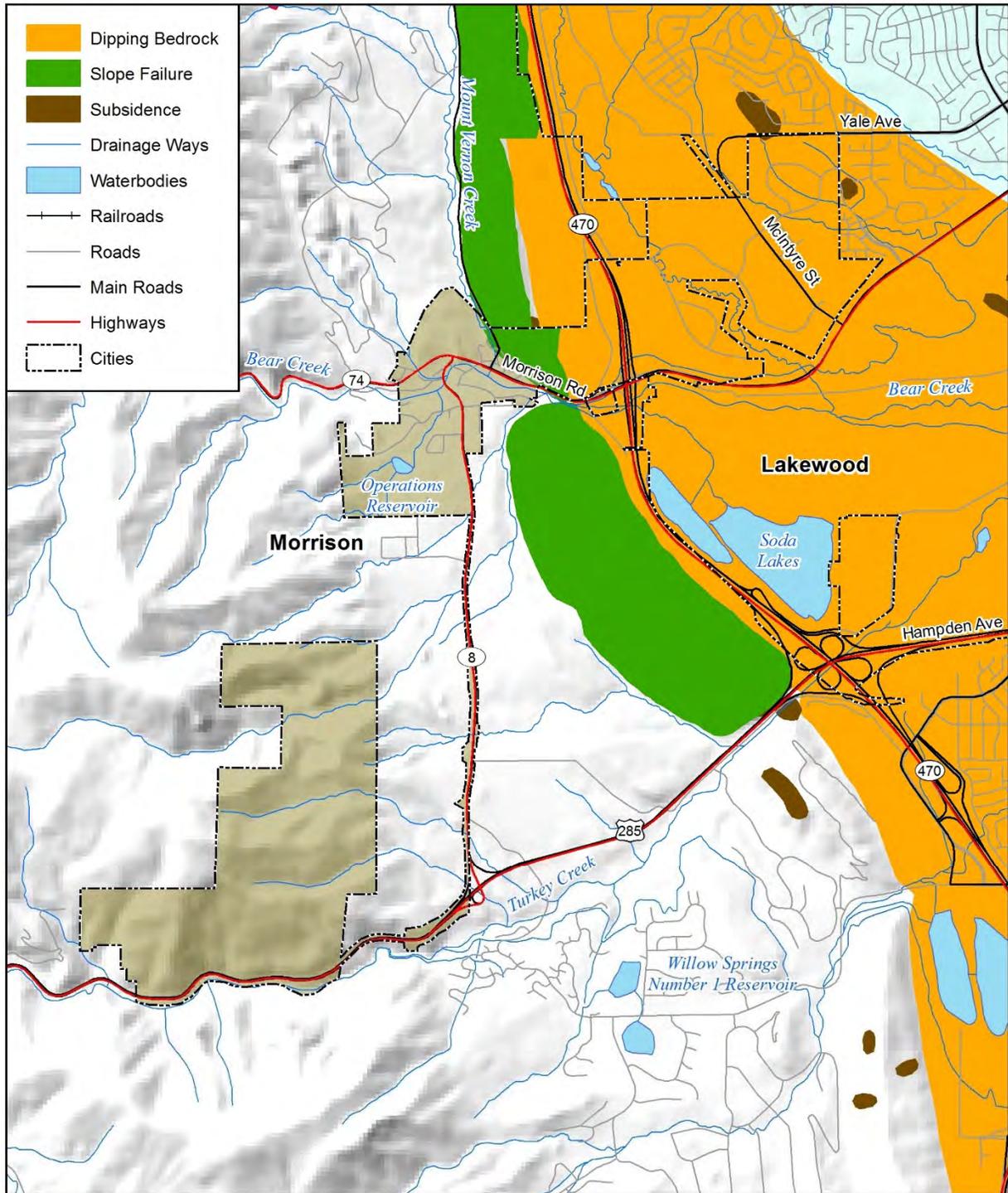
Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Commercial	2	2	\$326,500	\$326,500	\$653,000
Exempt	1	1	\$27,500	\$27,500	\$55,000
Industrial	1	1	\$267,300	\$400,950	\$668,250
Residential	4	4	\$375,400	\$187,700	\$563,100
Total	8	8	\$996,700	\$942,650	\$1,939,350

Source: Jefferson County

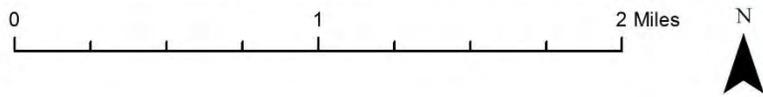
According to a Geological Society of America report the town's water treatment plant was affected by a landslide in the past, but this has been mitigated.

Morrison's proximity to the Golden Fault as a potential, though unlikely, earthquake source makes it vulnerable to earthquake damage. Morrison's downtown historic district has a number of unreinforced masonry buildings that are particularly vulnerable to earthquake shaking.

Figure 4. Town of Morrison Geologic Hazards Map



Map compiled 10/2015;
intended for planning purposes only.
Data Source: Jefferson County, CDOT,
NHD



Wildfire

With its location in the Rocky Mountain foothills Morrison does have risk to wildfires, both from grass fires on the open spaces to the southeast and northeast edges of the City and along the flanks of the Hogbacks, and from forest fires in the foothills, see Figure 5.

According to the GIS based analysis of wildfire in Morrison, the community has a total of 2 critical facilities at risk to wildfire and 146 improved parcels in the Wildland Urban Interface communities of Morrison and Red Rocks totaling over \$50 million in value at risk.

Table 10. Town of Morrison Critical Facilities At-Risk to Wildfire by Type

Category	Facility Type	Facility Count	Facility Count	Facility Count
		Active Crown Fire	Passive Crown Fire	Surface Fire
Transportation and Lifelines	Bridge	1	0	0
High Potential Loss Facilities	Private School	0	0	1
Total		1	0	1

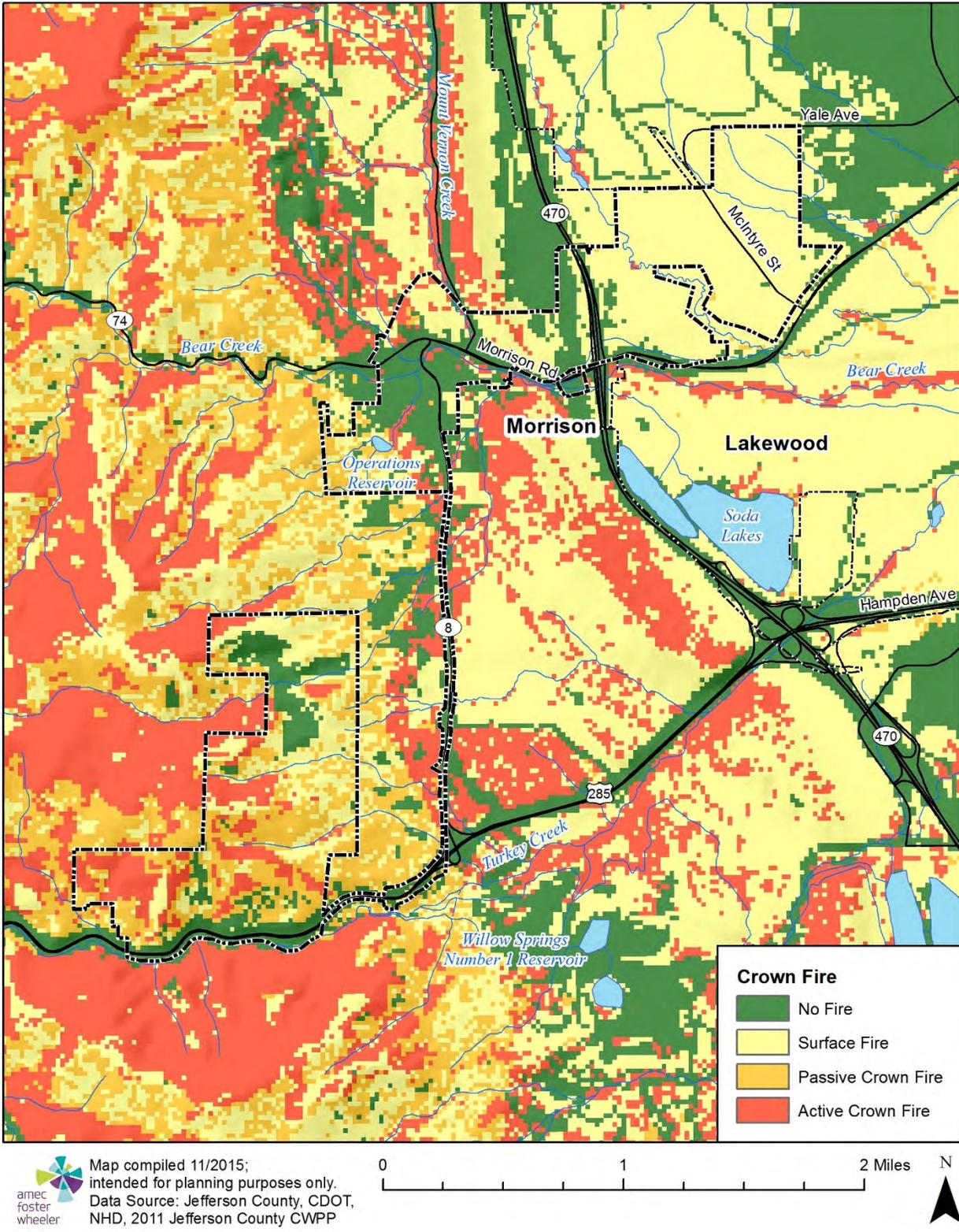
Source: Amec Foster Wheeler analysis on data provided by Jefferson County, Jefferson County CWPP

Table 11. Town of Morrison Parcels and Values At-Risk to Wildfire by Type

WUI Name	Hazard Class	Improved Parcels	Improved Value	Content Value	Total Value
Morrison	Moderate	145	\$33,836,250	\$16,918,125	\$50,754,375
Red Rocks	High	1	\$137,700	\$68,850	\$206,550
Total		146	\$33,973,950	\$16,986,975	\$50,960,925

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, Jefferson County CWPP

Figure 5. Town of Morrison Wildfire Hazard Map, 90th Percentile Weather Conditions



Other Hazards

In the case of other hazards that are not specific to geography such as drought, hailstorms, winter storms, lightning, tornado, and windstorm the entire building inventory and population in the Town is potentially exposed. That is the reason for the asset inventory provided in Section 1.3. It should be noted that no hazard in this plan is expected to cause widespread impacts to this inventory. Morrison’s location at the base of the foothills makes it more prone to high wind events than other communities in this plan.

1.3 Asset Inventory

1.3.1 Property Inventory

Table 12 represents an inventory of property in Morrison based on the Jefferson County Assessor’s data as of October 2015.

Table 12. Morrison’s Property Inventory

Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Commercial	26	35	\$4,293,600	\$4,293,600	\$8,587,200
Exempt	7	5	\$9,935,600	\$9,935,600	\$19,871,200
Industrial	1	1	\$267,300	\$400,950	\$668,250
Mixed Use	9	17	\$6,509,600	\$6,509,600	\$13,019,200
Residential	108	121	\$22,693,550	\$11,346,775	\$34,040,325
Total	151	179	\$43,699,650	\$32,486,525	\$76,186,175

Source: Jefferson County Assessor’s Office
*The Assessor’s Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values.
**The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values (typically 50% for residential structures and 100% for commercial/industrial)

1.3.2 Other Assets

Table 13 is a detailed inventory of assets identified by the Town’s planning team. This inventory includes critical facilities. For more information about how “critical facility” is defined in this plan, see Section 4.3 Vulnerability Assessment.

Table 13. Morrison’s Assets

Name of Asset	Type	Replacement Value (\$)	Occupancy/ Capacity #	Hazard Specific Info
Historic Business District	VF	Unknown		Loss of sales tax/employment
Town Shops/Equipment	VF	\$200,000		Recovery activity – flood
Wastewater Treatment Plant	EI	\$5-7 Million		Downstream impacts
Police Garage	EI			
Morrison Natural History Museum	NA			
3 Town buildings	EI	\$200,000		Flood damage
Town Hall/Courthouse	VF	\$900,000		Court activities/Large meeting area
Town Water Diversion Structure (Bear Creek)	EI	\$200,000		Drinking Water Supply

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: natural assets

Many of the facilities listed above are also in GIS databases provided by the Town of Morrison and Jefferson County. Critical facility counts and types are shown in Table 14 and in the map in Figure 3. Shelters may be in facilities such as schools or recreation centers and are not indicated on the map. Bridges are also not indicated on the map.

Table 14. Summary of Morrison’s Critical Facilities in GIS

Category	Facility Type	Facility Count
Essential Facilities	Fire Station	1
	Law Enforcement	1
	Total	2
High Potential Loss Facilities	Dam	1
	Day Care Center	1
	Long Term Care Facility	1
	Private School	1
	Total	4
Transportation and Lifelines	Bridge	4
	Waste Water Facility	1
	Total	5
	Grand Total	11

Source: Jefferson County Assessor (October 2015) HSIP Freedom 2015 and HAZUS 2.2

1.3.3 Natural, Cultural, and Historic Resources

Assessing the vulnerability of Morrison to disaster also involves inventorying the natural, historical, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Natural Resources

Natural resources of importance around the area of Morrison include nearby open space, Red Rocks Park and the Bear Creek corridor. For information about natural resources in Jefferson County, which includes Morrison see Section 4.3 Vulnerability Assessment.

Historic and Cultural Resources

Table 15 lists the properties in Morrison that are on the National Register of Historic Places and/or the Colorado State Register of Historic Properties (for more information about these registers, see Section 4.3 Vulnerability Assessment).

Table 15. Morrison’s Historic Properties/Districts in National and State Registers

Property	Address	Date Listed
Bear Creek Canyon Scenic Mountain Drive	CO 74 section between Morrison and Idledale	11/15/1990
Bradford House III Archeological Site		04/08/1980
Craig, Katherine, Park	Along US 40/I-70 NW of Morrison	6/30/1995
LoDaisKa Site		9/25/2003
Morrison Historic District	CO 8	09/28/1976
Morrison Schoolhouse	226 Spring St.	09/04/1974
Red Rocks Park District	16351 Co. Rd. 93 (not in Morrison)	05/18/1990
Bradford, Robert Boyles, Property	Address restricted	2/2/2015
District No. 17 School--Medlen School	Address restricted	4/14/2015
Dinosaur Ridge	Nearby but not in Morrison	State Register 3/10/1993,

Sources: Directory of Colorado State Register Properties, www.coloradohistory-oahp.org/programareas/register/1503/cty/jf.htm;
National Register Information System, www.nr.nps.gov/

It should be noted that the Morrison Historic District incorporates many historic properties. Seventy buildings and sites were listed as part of the District, which encompasses the downtown area and some buildings on the neighboring streets. Some of these structure date to the founding of the town in 1872.

The National Park Service administers two programs that recognize the importance of historic resources, specifically those pertaining to architecture and engineering. While inclusion in these programs does not give these structures any sort of protection, they are valuable historic assets. There are currently no Historic American Building Survey (HABS) or Historic American Engineering Record (HAER) buildings in the Town of Morrison, although there are 19 in the Morrison vicinity.

It should be noted that as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

1.4 Growth and Development Trends

Table 16 illustrates how Morrison has grown in terms of population and number of housing units between 2000 and 2010. The table illustrates that Morrison is holding steady with regards to population and housing stock. With the anticipated buildout in the Rooney Valley area, north of Morrison Road and east of C-470, the town may see a substantial population increase sometime between 2015 and 2030. The Rooney Valley Joint Master Plan (2002) calls for a balanced land use approach including mixed use, office, commercial and residential development between the jurisdictions of Morrison and Lakewood, which both administer land in the area. This part of the Town of Morrison is outside of the floodplain, but is within an area of dipping bedrock and near some suspected subsidence areas.

Table 16. Morrison’s Change in Population and Housing Units, 2000-2010

2000 Population	2010 Population	Percent Change 2000-2010	2000 # of Housing Units	2010 # of Housing Units	Percent Change 2000-2010
430	428	-0.46%	136	141	3.6%

Source: American Fact Finder, www.census.gov

The Town of Morrison is currently updating its land use plan for the South Planning Area, or SPA, located north of US-285 and in between Mount Falcon and Mount Glennon, two Jefferson County Open Space park units. The draft revisions call for very limited growth and development in the SPA². Once approved, this update will be integrated into Morrison’s Comprehensive Plan (anticipated adoption in December 2015).

1.5 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes Morrison’s regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities and then discusses these capabilities in further detail along with other mitigation efforts as they pertain to the National Flood Insurance Program’s Community Rating System (CRS). Although the CRS is flood-focused, this discussion also incorporates activities related to other hazards into the categories established by the CRS.

1.5.1 Mitigation Capabilities Summary

Table 17 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Morrison.

² Draft Town of Morrison Comprehensive Plan Update, September 2015

Table 17. Morrison’s Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
Master plan	Y	2008, Update in December 2015
Zoning ordinance	Y	Title 10
Subdivision ordinance	Y	Title 9
Growth management ordinance	N	
Floodplain ordinance	Y	Title 10 Part 3
Other special purpose ordinance (stormwater, steep slope, wildfire)		Development plan review
Building code	Y	Title 9 Part 1
Fire department ISO rating		West Metro FPD Dual Rating of 3 (urban area) 9 (hogback area)
Erosion or sediment control program		Development plan
Stormwater management program	Y	New development
Site Plan Review Requirements	Y	
Capital improvements plan	Y	
Economic development plan	Y	In comprehensive plan
Local emergency operations plan		Police protection only
Other special plans		
Flood insurance study or other engineering study for streams	Y	FIS Update: February 2014
Elevation certificates	Y	
BCEGS Ratings (1-10, 1 being best)	Y	Personal (1 and 2 family dwellings) 5 Commercial (all other buildings) 5 2010

Source: Town of Morrison

Table 18 identifies the personnel responsible for mitigation and loss prevention activities as well as related data and systems in Morrison.

Table 18. Morrison’s Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Y	Contracted consultant	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Y	Contracted consultant	
Planner/engineer/scientist with an understanding of natural hazards	N		
Personnel skilled in GIS	Y	Contract consultant	
Full-time building official	N	Contract building inspector (as needed)	
Floodplain manager		Contract planner/ engineer	
Emergency manager		Police Chief	

Grant writer	Y	Town Administrator	
Other personnel		Town Clerk	
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)		Utilities Land use	Minimal capacity. Some data available – needs improvement
Warning systems/services (Reverse 9-11, cable override, outdoor warning signals)	Y	Jeffco OEM	A siren/voice message system was installed.

Source: Town of Morrison

Table 19 identifies financial tools or resources that Morrison could potentially use to help fund mitigation activities.

Table 19. Morrison’s Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Y	State program for non entitlements
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	Y	
Incur debt through general obligation bonds	Y	
Incur debt through special tax bonds	Y	
Incur debt through private activities	Y	
Withhold spending in hazard-prone areas	Y	No formal policies
Other	CDPHE COAPA DOLA	

Source: Town of Morrison

1.5.2 Community Rating System Activities (All Hazards)

National Flood Insurance Program

The Town of Morrison joined the National Flood Insurance Program (NFIP) on December 1, 1982, and the Community Rating System (CRS) on October 1, 1996. The NFIP allows private property owners to purchase affordable flood insurance and enables the community to retain its eligibility to receive certain federally backed monies and disaster relief funds. The CRS is a voluntary program for NFIP-participating communities. It provides flood insurance discounts to policyholders in communities that provide extra measures of flood above the minimum NFIP requirements. As of September 2015, Morrison had a CRS class rating of 9 (one a scale of 1-10, 1 being the best). This rating provides a 5 percent discount for policyholders within a special flood hazard area (SFHA) and a 5 percent discount for those outside of an SFHA.

NFIP insurance data indicates that as of September 2015, there were 12 policies in force in Morrison, resulting in \$2,590,000 of insurance in force (an increase in 1 policy since 2010). In Morrison, there have been 2 historical claims for flood losses totaling \$1,231.62. At the time this plan was developed there were no repetitive or severe repetitive loss structures as defined by the NFIP.

In January 2014, Morrison adopted an ordinance (Floodplain Damage Prevention Ordinance) that included the adoption of the Flood Insurance Study for Jefferson County, Colorado and Incorporated Areas, dated February 5, 2014. This ordinance also revised the Town's floodplain regulations to be compliant with the State of Colorado's floodplain requirements. The Town of Morrison's jurisdictional boundaries lie within FEMA's Flood Insurance Rate Map (FIRM) No.'s 08059C0287F, 08059C0289F, 08059C0291F, 08059C0293F, and 08059C0380F, Bear Creek Flood Profiles 011P to 017P, and Mt. Vernon Creek Flood Profiles 358P – 359P. These FEMA documents are used to manage the Town of Morrison's floodplain regulations.

Incorporation into Local Planning Mechanisms

The 2008 Town of Morrison Comprehensive Plan sets forth policies related to creating and adopting natural hazard regulations in order to guide development. The next full update of the Town's Plan should also cross-reference the 2015 Jefferson County Hazard Mitigation Plan to reinforce the goals and recommendations specified within this document.

Community Rating System Categories

The Community Rating System (CRS) categorizes hazard mitigation activities into six categories. These categories, and applicable Morrison activities, are described below. Note: some of the activities are appropriate to multiple categories. For purposes of simplicity, they are only included in the category deemed most appropriate based on the definitions and examples provided in the *CRS Coordinator's Manual*.

Preventive

Preventive activities keep problems from getting worse. The use and development of hazard-prone areas is limited through planning, land acquisition, or regulation. They are usually administered by building, zoning, planning, and/or code enforcement offices.

Town of Morrison Comprehensive Plan (2008)

The City's comprehensive plan is a guide to help the City make decisions and establish its future direction. The goals and policies contained within the plan cover a broad range of subject matter related to services, issues, and geographic areas within Morrison. Combined, these elements serve to direct future policy decisions to preserve vital community attributes and service levels and manage growth.

The following excerpts are goals and related policies that are relevant to this hazard mitigation plan.

- **Goal SA-1:** Preserve significant natural, cultural, and agricultural resources within the planning area and maintain the rural character of Morrison.
 - **Policy SA-1:** Identify and encourage the preservation and enhancement of agricultural lands, scenic view corridors, wildlife habitat, and geologic rock formations.
- **Goal A-1:** Grow with the intention of maintaining Morrison’s small town atmosphere.
 - **Policy A2:** Adequate public facilities and services should be available to serve current and future residents in a cost-effective, efficient manner. Development should occur where it can be served by Town infrastructure.
- **Goal D-1:** Create and plan for the future public recreational opportunities for both residents and day visitors to improve tourism and support existing retail businesses.
 - **Policy D-3:** Parks, trails, and open space shall be designed and constructed concurrently with new development. In addition, new parks and trails shall be multi-purpose and enhance the area’s quality of life and small town character.
- **Goal D-2:** Preserve, protect, and enhance significant open spaces, natural and wildlife habitat.
 - **Policy D-4:** Protect and enhance significant wildlife habitat, vegetation communities, geologic features, viewsheds, agricultural land, and natural areas.
- **GOAL 1:** Complete the Town reservoir and water treatment improvements in order to take full advantage of the Town’s current water rights.
 - **Policy I-1:** Develop a water system capable of providing an adequate year-round water supply in dry years and for future residential and commercial growth by creating storage and treatment facilities.
 - **Policy I-3:** Assure that businesses comply with regulations governing water and wastewater usage as well as solid waste storage and disposal.
- **Goal J-1:** Promote the conservation of natural resources and the efficient use of energy while encouraging sustainable development practices.
 - **Policy J-7:** Create and adopt natural hazard regulations in order to guide development.
- **GOAL 1:** Continue to ensure adequate flood, police, fire, and emergency protection for Morrison residents and property by collaborating with other agencies during major events and relocating some Town facilities out of the floodplain.
 - **Policy K-1:** Continue to expand the positive working relationship with Denver’s Theatres and Arenas, Bandimere Speedway, the Jefferson County Sheriff’s Office, the Colorado State Patrol, the West Metro Fire Protection District, and other entities associated with public safety and emergency response in the area.

-
- **Policy K-2:** Continue to participate in the federal flood insurance program and work to maintain and improve its working relationship with the Urban Drainage and Flood Control District.

Municipal Code

Title 10, Chapter 3: Floodplain Damage Prevention (Ord. 407, 1-7-2014)

10-3-1 Statutory Authorization

The legislature of the state of Colorado has, in title 29, article 20 of the Colorado Revised Statutes, delegated the responsibility of local governmental units to adopt regulations designed to minimize flood losses. Therefore, the Board of Trustees of the Town of Morrison, Colorado, does hereby adopt the following floodplain management regulations.

10-3-3 Statement of Purpose

It is the purpose of this chapter to promote the public health, safety and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed:

- To protect human life and health.
- To minimize expenditure of public money for costly flood control projects.
- To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public.
- To minimize prolonged business interruptions.
- To minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, and streets and bridges located in areas of special flood hazards.
- To help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future flood blight areas.
- To ensure that potential buyers are notified that property is in an area of special flood hazard.
- To ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

Other Regulations

Title 10, Chapter 1: Zoning Regulations

The zoning code is enacted for the purpose of promoting the health, safety, morals, convenience, order, prosperity and welfare of the present and future inhabitants of the town by lessening of congestion in the streets and roads, securing safety from fire and other dangers, providing adequate light and air; the classification of land uses and the distribution of land development and utilization, avoiding undue congestion of population, facilitating the adequate provision of transportation, water, schools, sewer and other public requirements; and by other means in accordance with a master plan and the zoning map adopted herewith.

Title 10, Chapter 5: Land Disturbance Regulations

This section of municipal code governs land development and the possible resultant erosion. The clearing, stripping and grading of land for nonagricultural uses can cause accelerated, localized erosion rates with subsequent deposition and damage to off-site properties and receiving drainageways. Erosion and sedimentation are natural processes whose intensity, when increased by development, can destroy the environmental, aesthetic and economic values of other properties, streams and lakes. The purpose of a land disturbance permit process is to reduce erosion and sedimentation.

Title 10; Chapter 6 Storm Drainage Regulations

Due to its general terrain and geographical location, the Town is particularly subject to damage from storm waters which, from time to time, overflow from existing water courses and drainage facilities. Presently existing storm drainage facilities, as well as future storm drainage facilities, require continuous operation, maintenance, renewal and replacement. Each owner of a lot or parcel of real property within the Town to the extent that he makes use of, and is served by, the Town's storm drainage facilities by contributing to those facilities storm water runoff beyond that amount (both in terms of peak rates and volumes) of storm water which would occur if that real property were undeveloped in its natural state, should pay for the use and the availability of use of such facilities.

Public Information

Public information activities advise property owners, potential property owners, and visitors about the hazards, ways to protect people and property from the hazards, and the natural and beneficial functions of natural resources (e.g., local floodplains). They are usually implemented by a public information office.

- Distribution of flood related info
- Wildfire precaution
- Potable water conservation
- Morrison and Jeffco Emergency Management Office worked together on the installation of an emergency warning alert siren/voice message system in the Town to provide alerts related to flash flooding, wind related emergencies, haz mat incidents etc. The equipment was installed at the Town public work shops and will afford protection to most at risk residential and commercial areas of the Town. Activation to be provided by Jeffco Sheriff's Office.

1.5.3 Ongoing and Complete Hazard Mitigation Projects:

Since 2010, the Town has completed the following hazard mitigation projects:

-
- In 2012, Market Street was regraded to drain properly to an existing inlet. This reduced frequent flooding through an adjacent building.
 - In 2012, the Urban Drainage and Flood Control District installed improvements to stabilize the existing rock wall along the east side of Mt. Vernon Creek just upstream of Highway 8. The east wall was repaired by installing colloidal concrete behind the wall.
 - In 2014, the Urban Drainage and Flood Control District constructed bank stabilization repairs at Morrison Park adjacent to the existing footbridge at the request of the Town.
 - In 2014, the Town repaired the trail along Bear Creek. The trail elevation was raised slightly to reduce the potential for overtopping.
 - In 2014, the Town coordinated with the Ward Ditch to reconstruct the Ward Ditch Diversion Dam and repair the adjacent undermined concrete bike path.
 - In 2014, the Town had a floodplain address map and flood hazard area property information list prepared to assist them with implementing their floodplain regulations.
 - In 2014, CDPHE approved funds for the Town to relocate 640 feet of an existing 8” sanitary sewer main that was suspended below the Canon Street bridge. The sewer main was in contact with flood waters during the September 2013 flooding and could have been destroyed or trapped floating debris. The sewer main relocation was completed in 2014.
 - In 2015, heavy spring runoff flows damaged the existing rock wall along the west side of Mt. Vernon Creek just upstream of Highway 8. The Urban Drainage and Flood Control District repaired the wall by installing grouted boulders along the toe of the wall and repointing the rock wall to strengthen it and reduce the possibility of the wall being undermined.

1.6 Mitigation Actions

The following actions were identified for Morrison and prioritized using the process found in Section 5.3.1 Prioritization Process.

1. Relocation of Town Shops

Issue/Background: Morrison town shops are located adjacent to Bear Creek in a flood zone. Equipment necessary for flood recovery is stored in these shops. Relocation to safer location would protect equipment from damage/loss due to flash flooding.

Other Alternatives: Seasonal outdoor storage of heavy equipment at other locations

Responsible Office: Town Administrator - Town of Morrison

Priority (High, Medium, Low): High

Cost Estimate: \$50,000 plus site acquisition and development costs

Benefits (Avoided Losses): \$100,000 equipment costs, \$50,000 building cost

Potential Funding: Town general fund, Jefferson County Open Space

Schedule: Listed on town capital improvements 5 year plan

STATUS: This has not been implemented, primarily due to lack of funds as well as land under Town ownership that can accommodate this use. During the 2013 floods, the equipment within the sheds necessary for flood recovery was temporarily moved so that it could be utilized during the floods. The project is being carried forward as it is still a priority.

2. Continue to Implement Sound Floodplain Management Practices through Participation in the National Flood Insurance Program

Hazards Addressed: Flood

Issue/Background: The Town of Morrison participates in the National Flood Insurance Program and the Community Rating System. The Town implements sound floodplain management practices, as stated in the flood damage prevention ordinance. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits for appropriate development in Special Flood Hazard Areas and ensuring that this development is elevated to or above the base flood elevation. This project also includes periodic reviews of the floodplain ordinance to ensure that it is clear and up to date. Floodplain managers will remain

current on NFIP policies, and are encouraged to attend appropriate training and consider achieving Certified Floodplain Manager (CFM) status.

Other activities that could be included in this effort are:

- Ensure that stop work orders and other means of compliance are being used as authorized by each ordinance;
- Suggest changes to improve enforcement of and compliance with regulations and programs;
- Participate in Flood Insurance Rate Map updates by adopting new maps or amendments to maps;
- Promote and disperse information on the benefits of flood insurance, with assistance from partners such as the County, Urban Drainage and Flood Control District, and Colorado Water Conservation Board.
- Evaluate activities that will improve Community Rating System ratings that may further lower the cost of flood insurance for residents

Other Alternatives: No action

Responsible Office: Floodplain Engineer: Charles Weiss, Bowman Consulting

Priority (High, Medium, Low): Medium

Cost Estimate: Low

Potential Funding: Covered in existing budget

Benefits (avoided losses): Reduced property loss from floods, continued availability of flood insurance for residents.

Schedule: Ongoing

STATUS: The Town continues to implement sound Floodplain Management Practices through their adopted ordinance and floodplain regulations. The Town's current Floodplain Manager is a Certified Floodplain Manager. In January 2014, Morrison updated its Floodplain Damage Prevention Ordinance that included the adoption of the Flood Insurance Study for Jefferson County, Colorado and Incorporated Areas, dated February 5, 2014. This ordinance also revised the Town's floodplain regulations to be compliant with the State of Colorado's floodplain requirements. The Town continues to participate in the CRS program.

Projects Completed Since 2010

Emergency Warning System

Issue/Background: Morrison is identified by most emergency management organizations as the highest risk community for death by flash flooding in the metro area. The town lacks an adequate warning/alert system targeted at residents and day visitors to the historic business district. During high seasonal tourism periods day visitor numbers are very high. These periods coincide with peak potential flash flood season. Implemented – The Town now has an Emergency Warning Siren.



ANNEX H

TOWN OF MOUNTAIN VIEW

1.1 Community Profile

1.1.1 History

The Town of Mountain View is a Home Rule Municipality located in Jefferson County, Colorado. Mountain View is situated northwest of, and adjacent to, the City and County of Denver. It is surrounded on all four sides by existing municipalities. To the north is the City of Lakeside, to the east is the City and County of Denver, and to the south and west is the City of Wheat Ridge. The town consists of twelve city blocks and is home to 521 residents according to the Colorado Department of Local Affairs (2013).

During the gold rush years, the land of the present site of Mountain View was owned by the Yule Family, who subsequently moved to the Crystal River Valley on the Western Slope in Gunnison County.

John Brishen Walker (1847-1930) - In 1879 Walker purchased 1,200 acres of land in the Berkeley area for \$1,000. He added to the land until he had 1,600--1,700 acres, which he named Berkeley Farm. Walker and a British investor, Dr. William Bell, grew alfalfa on the farm until the late 1880's. Walker eventually gave 50 acres of his farm, on which is now Lowell Blvd., to the Jesuit College, (now Regis College). Walker later sold the land for \$325,000 to a Kansas City syndicate, who put the Denver investment firm of Carleton Ellis and John McDonough in charge of the development of a new suburb--the Berkeley Annex.

Carleton Ellis was active in investments and real estate, and was vice president of the Citizens Bank in Denver. Not much is known about John McDonough. He lived in a spacious home at West 46th Avenue and Perry, in Harkness Heights, a development of his own making. The Berkeley Annex is from Sheridan Blvd. west to Fenton Street and 41st Avenue north to 44th Avenue. Ellis and McDonough platted what became Mountain View, Colorado, as Plat T3S, R69W on December 19, 1888. (The town was located on the Denver International Railroad at one time.)

It is thought the streets in Mountain View acquired their original Spanish and Indian names from Ellis and McDonough. From Sheridan Blvd. west, the streets were named Allita, Veta, Rietta, Bonita, Chipeta and Uintah. In February 1897 Arapahoe County (now Denver and Adams County) collaborated with Jefferson County to unify the street system. Names of streets became Ames, Benton, Chase, Depew, Eaton and Fenton. These names were chosen to honor American political figures. Numbered avenues in Mountain View had various names (West 41st was B, Dakota or Maple). West 43rd was C, Wyoming or Oak, while 44th Ave. was D.

Mountain View was incorporated in 1904 for water and sewer purposes on the land occupied by the Berkeley Annex subdivision established in 1888, which itself was part of the Berkeley Farm founded by John Brishen Walker in 1879.

1.1.2 Population

The U. S Census Bureau’s estimated 2010 population of Mountain View was 507. Select Census 2010 demographic and social characteristics for Mountain View are shown in Table 1.

Table 1. Mountain View’s Demographic and Social Characteristics 2010

Characteristic	
Gender/Age	
Male (%)	49.5
Female (%)	50.5
Under 5 Years (%)	3.7
65 Years and Over (%)	12.4
Race/Ethnicity (one race)	
White (%)	80.1
Hispanic or Latino (Of Any Race) (%)	28.4
Other	
Average Household Size	1.97

Source: U.S. Census Bureau, 2010, www.census.gov/

1.1.3 Economy

According to the 2000 Census, the industries that employed most of Mountain View’s labor force were: educational, health, and social services (18.1%); construction (15.2%); and retail trade (10.3%). Select economic characteristics for Mountain View from the 2000 Census are shown in Table 2.

Table 2. Mountain View’s Economic Characteristics

Characteristic	
Families below Poverty Level, 1999	12.2%
Individuals below Poverty Level, 1999	13.0%
Median Home Value	\$125,000
Median Household Income, 1999	\$41,364
Per Capita Income, 1999	\$21,425
Population in Labor Force	369
Unemployment (%)*	4.3%

Source: U.S. Census Bureau (2000), www.census.gov/

1.2 Hazard Summary

A hazard identification and vulnerability analysis was completed for the Town of Mountain View using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County. Information from the Data Collection Guide is summarized in Table 3 with all the hazards listed that could impact anywhere in Jefferson County. The purpose of this exercise was to identify and rank the hazards and vulnerabilities unique to the jurisdiction.

For this plan update, the Town of Mountain View's planning team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the Town.

The data in Table 3 reflect the most significant hazards for the Town of Mountain View. They are: flood, hail storm, tornado, windstorms and severe winter storms.

The hazard significance listed is based on Town of Mountain View HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (refer to Chapter 4 of the base plan).

Table 3. Town of Mountain View – Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Avalanche	Unlikely	Limited	Negligible	Low
Dam Failure	Occasional	Limited	Negligible	Low
Drought	Occasional	Extensive	Negligible	Low
Earthquake	Occasional	Limited	Limited	Low
Erosion and Deposition	Unlikely	Limited	Negligible	Low
Expansive Soils	Unlikely	Limited	Negligible	Low
Extreme Temperatures	Likely	Extensive	Negligible	Low
Flood (Drainage Problems)	Highly Likely	Significant	Limited	Medium
Hailstorm	Likely	Extensive	Negligible	Medium
Landslide, Debris flow, Rockfall	Unlikely	Limited	Negligible	Low
Lightning	Highly Likely	Extensive	Negligible	Low
Severe Winter Storms	Highly Likely	Extensive	Negligible	Medium
Subsidence	Unlikely	Limited	Negligible	Low
Tornado	Occasional	Limited	Critical	Medium
Wildfire	Unlikely	Limited	Limited	Low
Windstorm	Likely	Extensive	Limited	Medium
Frequency of Occurrence: Highly Likely: Near 100% probability in next year. Likely: Between 10 and 100% probability in next year or at least one chance in ten years. Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years. Unlikely: Less than 1% probability in next 100 years.		Potential Magnitude: Catastrophic: Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50% of property is severely damaged Critical: Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 25% of property is severely damaged Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged Negligible: Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.		
Spatial Extent: Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		Significance: Low, Medium, High		

Previous Hazard Events

Through the Data Collection Guide, the Town of Mountain View noted specific historic hazard events to include in the community profile. These events have been incorporated into the appropriate hazard chapters in the base plan. These events had a particular impact on the community beyond the impacts and events recorded in the Jefferson County Hazard Mitigation Plan. This is not a comprehensive summary of past incidents, as the hazard profiles collected in the main Mitigation Plan include other events that may have historically impacted the jurisdiction. The events noted by this jurisdiction in the Data Collection Guide include:

June 1989 and June 1994 Hailstorms

On June 26, 1989 and June 3, 1994 hail up to 2" in diameter fell in the Town of Mountain View. Winds accompanied these storms, exacerbating damages to cars and roofs. All roofs in the area had to be reshingled. All trees stripped of leaves. People and businesses had to pay for roofing costs not covered by insurance.

December 2006 Blizzards

Back to back blizzards struck the city a week apart in late December of 2006. The first blizzard, on December 20, struck as a result of a slow moving low pressure system that moved from the Desert Southwest into Southeastern Colorado. As a result, a deep upslope flow developed along the Front Range and Northeast Plains of Colorado. One to two feet of snow were recorded. On December 28th, another slow moving storm system moved from the Desert Southwest and into the Texas Panhandle. As it did, a deep easterly upslope flow occurred along the Front Range, with blizzard conditions developing over portions of the Northeast Plains of Colorado, mainly south of Interstate 76. The heaviest snow fell along east facing slopes with storm totals up to 2 1/2 feet in the North Central Mountains and Front Range Foothills.

Annual Flooding

The Town of Mountain View experiences seasonal drainage problems. Water from an adjoining City floods into the Town, mostly at street intersections. The magnitude varies with severity of storms. Areas damaged include W 41st Ave from Chase Street to Fenton Street. Most of the damage is light – mostly cleanup of debris. There have been reports of some undercutting of W 41st Avenue. This has caused minor delays to traffic, as well as minor impacts to local businesses.

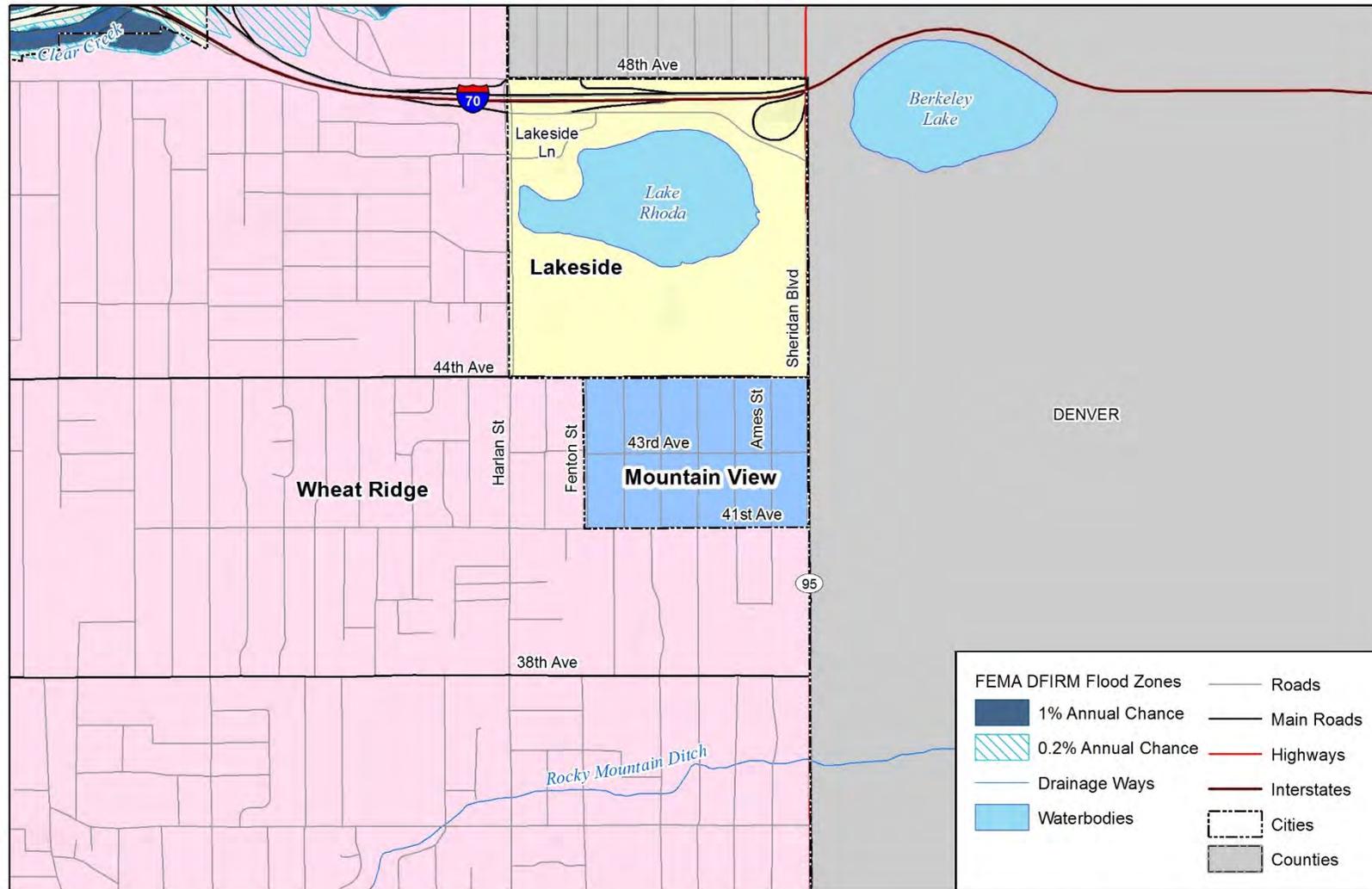
Vulnerability to Specific Hazards

This section details vulnerability to specific hazards, where quantifiable, and where it differs from that of the overall County.

Flood

There is no floodplain in the Town of Mountain View. However, Mountain View experiences stormwater drainage flooding along 41st Ave at Ames, Benton and Chase Streets intersection. During adverse precipitation conditions, pooling at these locations are both hazardous to pedestrians and travelers and can be a real nuisance. The impacts normally come into the town from Wheat Ridge. The Town of Mountain View would like to examine potential mitigation alternatives in coordination with the City of Wheat Ridge.

Figure 1. Town of Mountain View Flood Map




 Map compiled 9/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD

Wildfire

There is no wildfire hazard in the Town of Mountain View.

Other Hazards

In the case of other hazards that are not specific to geography such as drought, hailstorms, winter storms, lightning, tornado and windstorm the entire building inventory and population in the Town is potentially exposed. That is the reason for the asset inventory provided in Section 1.3. Other than the remote possibility of a direct tornado impact, it should be noted that no hazard in this plan is expected to cause widespread impacts to this inventory.

1.3 Asset Inventory

1.3.1 Property Inventory

Table 4 represents an inventory of property in Mountain View based on the Jefferson County Assessor’s data as of October 2015.

Table 4. Mountain View’s Property Inventory

Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Commercial	15	22	\$4,491,340	\$4,491,340	\$8,982,680
Exempt	6	5	\$1,270,600	\$1,270,600	\$2,541,200
Mixed Use	6	12	\$1,268,000	\$1,268,000	\$2,536,000
Residential	219	233	\$36,931,620	\$18,465,810	\$55,397,430
Total	246	272	\$43,961,560	\$25,495,750	\$69,457,310

Source: Jefferson County Assessor’s Office
*The Assessor’s Office values buildings for the specific purpose of valuation for ad valorem tax purposes and values represented do not reflect actual building replacement values.
**The Assessor does not have data about the contents of structures and the contents values shown in the table are not derived from Assessor data but are estimates based upon the structure value using FEMA recommended values (typically 50% for residential structures and 100% for commercial/industrial)

1.3.2 Other Assets

Table 5 is a detailed inventory of assets identified by the Town’s planning team. This inventory includes critical facilities. For more information about how “critical facility” is defined in this plan, see Section 4.3 Vulnerability Assessment.

Table 5. Mountain View’s Assets

Name of Asset	Type	Replacement Value (\$)	Occupancy/Capacity #	Hazard Specific Info
W 41 st Ave	EI	\$300,000	NA	Washout of thoroughfare
Private Dwellings	Frame	\$500,000	10 people	Water damage to homes

Many of the facilities listed above are also in GIS databases provided by the Town of Mountain View and Jefferson County. Critical facility counts and types are shown in Table 6.

Table 6. Summary of Mountain View’s Critical Facilities in GIS

Category	Facility Type	Facility Count
Essential Facilities	Law Enforcement	1
	Total	1
	Grand Total	1

Source: Town of Mountain View, Jefferson County

1.3.3 Natural, Cultural, and Historic Resources

Assessing the vulnerability of Mountain View to disaster also involves inventorying the natural, historical, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Natural Resources

For information about natural resources in Jefferson County, which includes Mountain View, see Section 4.3 Vulnerability Assessment.

Historic and Cultural Resources

There are no properties in Mountain View that are on the National Register of Historic Places and/or the Colorado State Register of Historic Properties (for more information about these registers, see Section 4.3 Vulnerability Assessment).

The National Park Service administers two programs that recognize the importance of historic resources, specifically those pertaining to architecture and engineering. While inclusion in these programs does not give these structures any sort of protection, they are valuable historic assets. There are currently no Historic American Building Survey (HABS) or Historic American Engineering Record (HAER) buildings in the Town of Mountain View.

The Town of Mountain View currently has 3 designated historic structures located throughout the Town. A structure may be designated for preservation if it has historical, architectural, or geographical importance to the community. Table 7 lists Mountain View’s designated historic landmarks not already mentioned in the previous paragraphs.

Table 7. Additional Historic Landmarks in Mountain View

Property	Address	Year Built
Berkley United Methodist Church	43 rd Ave and Sheridan Boulevard	1892
Mountain View School	41 st and Chase	1897
Mountain View Town Hall	4176 Benton Street	1948

Source: Town of Mountain View

It should be noted that as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

1.4 Growth and Development Trends

Table 8 illustrates how Mountain View has grown in terms of population and number of housing units between 2000 and 2010.

Table 8. Mountain View’s Change in Population and Housing Units, 2000-2010

2000 Population	2010 Population Estimate	Estimated Percent Change 2000-2010	2000 # of Housing Units	2010 Estimated # of Housing Units	Estimated Percent Change 2000-2010
569	507	-10.8%	287	278	-3.1%

Source: <http://factfinder.census.gov/>

1.5 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes Mountain View’s regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities and then discusses these capabilities in further detail along with other mitigation efforts as they pertain to the National Flood Insurance Program’s Community Rating System (CRS). Although the CRS is flood-focused, this discussion also incorporates activities related to other hazards into the categories established by the CRS.

1.5.1 Mitigation Capabilities Summary

Table 9 lists planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Mountain View.

Table 9. Mountain View’s Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
Master plan	Y	
Zoning ordinance	Y	
Subdivision ordinance	N	Planned Development Zone District
Growth management ordinance	N	
Floodplain ordinance	N	
Other special purpose ordinance (stormwater, steep slope, wildfire)	N	
Building code	Y	UBC Adopted
Fire department ISO rating		West Metro FPD
Erosion or sediment control program	Y	Ch 18 Art 9
Stormwater management program	Y	Ch 13 Art 2
Capital improvements plan	Y	Ch 11
Economic development plan	N	
Local emergency operations plan	Y	
Other special plans	N	
Flood insurance study or other engineering study for streams	N	
Elevation certificates	N	

Table 10 identifies the personnel responsible for mitigation and loss prevention activities as well as related data and systems in Mountain View.

Table 10. Mountain View's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	N		
Engineer/professional trained in construction practices related to buildings and/or infrastructure	N		
Planner/engineer/scientist with an understanding of natural hazards	N		
Personnel skilled in GIS	N		
Full-time building official	N	Use a part-time official	
Floodplain manager	N		
Emergency manager	Y	Police Chief	
Grant writer	N		
Other personnel	Y	Director of Public Works	
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	N		
Warning systems/services (Reverse 9-11, cable override, outdoor warning signals)	Y	Jefferson County	

Table 11 identifies financial tools or resources that Mountain View could potentially use to help fund mitigation activities.

Table 11. Mountain View's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Y	
Capital improvements project funding	N	
Authority to levy taxes for specific purposes	Y	Within TABOR limits
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	N	Not needed, fully built out
Incur debt through general obligation bonds	N	
Incur debt through special tax bonds	Y	Within TABOR
Incur debt through private activities	N	
Withhold spending in hazard-prone areas	N	

1.5.2 Community Rating System Activities (All Hazards)

National Flood Insurance Program

The Town of Mountain View does not participate in the National Flood Insurance Program (NFIP). The Town is not mapped by the NFIP thus participation is optional.

Incorporation into Local Planning Mechanisms

The 2010 Local Hazard Mitigation Plan has not been incorporated yet into existing planning mechanisms include but additional opportunities will be evaluated using the process identified in Chapter 7 of the base plan.

Other Activities

The Town of Mountain View has a Comprehensive Plan developed in October of 2000. It serves as an official policy guide for decisions regarding the built environment, development and redevelopment within the city limits. It reflects the desires of both the citizens and the community leaders concerning the current and future built environment. It serves as a 20- year vision for the community.

Although Mountain View has received redevelopment pressures, their goals, policies and actions reflect maintaining its “small town feel” mostly concerned with redevelopment, traffic, parking and maintaining and improving the tax base.

Their definition of *Goal* is, a statement of an intended direction or desire, desired ultimate result, or vision of what is to be achieved.

- Policy – a statement of the direction or position to achieve desired goals
 - Action – a specific process used to implement a policy.

The Comprehensive Plan philosophy aligns with the philosophy of the Jefferson County Mitigation Plan process, and excerpts of the plan are highlighted here to show common themes and proactive planning measures.

Land use patterns in Mountain View are similar to most communities. The primary use of land along arterial roads is commercial. Residential is primarily single family with multifamily and two family homes scattered amongst them.

In the plan, goals are identified by category: Community, Land Use, Transportation, and Implementation.

Community

- Goal: Maintain a sense of community within the Town of Mountain View

-
- Goal: Promote and improve community resources, services, and programs that are available to Mountain View town residents both within the town and from surrounding communities.
 - Goal: enhance and preserve park and recreational amenities available to town residents.

Land Use

- Goal: Retain town of Mountain View’s “small town feel”.
 - Policy: Support development and redevelopment that is similar in scale and design to existing and surrounding development.
 - Policy: Support redevelopment that does not include “cookie cutter” architecture.
 - Action: The Town will establish a review process for commercial and multifamily development.
 - Action: The Town will create a process for lot boundary variations that does not increase the number of dwelling units (paraphrased).
- Goal: Improve and maintain quality and condition of properties in town.
 - Policy: support community clean-up programs.
- Goal: Preserve safe, habitable, affordable housing.
- Goal: Mountain View will strive to be a distinctive, diverse, attractive and safe community.
 - Policy: Mountain View will pursue opportunities to keep the town a safe place to live.
 - Action: Mountain View will create design standards which will allow for diverse structures yet retains the scale and basic design features which help Mountain View retain its character.

Commercial Land Use

- Goal: Pursue economic opportunities that are in the best interest of the town and its citizens.
 - Policy: Mountain View will be open to partnerships and Intergovernmental Agreements with surrounding communities, Jefferson County, and public/private economic development groups which enhance and protect the commercial interests of Mountain View.
- Goal: Pursue economic opportunities that are sustainable through time.
 - Policy: Mountain View will not support demolition of existing commercial structures without the developer documenting feasibility and financing for a replacement structure, use and proposed time frame.
- Goal: Pursue redevelopment of existing commercial areas and structures where it is in the best interest of the town and its citizens.

-
- Policy: Mountain View will not support redevelopment of commercial to residential, religious, non-profit or lesser commercial without the developer demonstrating no significant loss of tax base.
 - Goal: Create a healthy, vibrant, pedestrian friendly commercial area.
 - Policy: Mountain View will create design standards that allow for diverse commercial structures yet creates a similar theme among buildings...

School Site Land Use

- Goal: Preserve existing structure
- Goal: redevelop of the schoolhouse shall not create a traffic or parking hazard on Eaton or Fenton Streets.

Transportation

- Goal: Minimize impacts of potential expansion of 44th Ave and Sheridan Blvd.
- Goal: Keep traffic levels on residential streets low.
- Goal: Support transportation alternatives to the automobile.
 - Policy: Mountain View shall support bus and mass transit service improvements....

Implementation

Mountain View is a part of the Mile High Compact, which agrees to consistently enforce the plan relative to land use issues. The plan also is a basis for sound development in an attempt to provide a prosperous future. It will be re-evaluated periodically for its effectiveness and revised every five (5) years. Amendments may be initiated by the landowner or the town and must be compatible with existing land uses, promote goodness to the public, and not over-burden the towns infrastructure or reduce tax base.

1.6 Mitigation Actions

The following actions were prioritized using the process found in Section 5.3.1 Prioritization Process.

1. Storm Water Drainage

Issue/Background: Storm water drains from the adjoining jurisdiction into the Town on the southern border. This is due to the natural slope of the land which is from south to north at a rate of about 1 foot vertically to 100 ft. horizontally. The water follows the streets and flows across W. 41st Avenue onto the adjoining property. Because the streets in the adjoining city do not match the street pattern in our town this is private property. There is a storm sewer across the street, but the inlets are not placed to intercept the flow. If additional work could be done, the water could be diverted into the storm sewer. This would solve a lot of the problem.

Other Alternatives: This would require a berm system along West 41st Avenue. This would be much more expensive. As it would require more construction and would not do the job as well.

Responsible Office: Public Works

Priority (High, Medium, Low): Low

Cost Estimate: \$100,000

Benefits (Avoided Losses): Would lower potential for soil erosion, and this would prevent water pollution.

Potential Funding: Urban Drainage and Flood Control District, FEMA

Schedule: 2016-2020

STATUS: This project was identified in 2010 and has been deferred due to funding needs.



1.1 Community Profile

Denver Water is an Article XX home-rule municipality governed by a board of five commissioners appointed by the Mayor as per Article X of the Denver City Charter. Denver Water provides water to approximately 1.5 million people in the Denver metropolitan areas and is a property owner in Jefferson County. Denver Water is the State's oldest and largest water utility, established in 1918. It is funded by water rates and new tap fees, as opposed to taxes. Denver Water is run by a five-member Board of Water Commissioners. A designated CEO/Manager is appointed by the Board to execute its policies and orders. Denver Water's service area (Figure 1) encompasses the communities of Wheat Ridge, Lakeside, Mountain View, Edgewater and Lakewood. Denver Water also services the following communities in Jefferson County, not covered in this plan: Dakota Ridge, Ken Caryl, and Columbine. Denver Water does not serve Arvada, Fairmount, Pleasant View, Golden or Morrison.

1.1.1 Hazard Summary

A hazard identification and vulnerability analysis was completed for Denver Water using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Worksheet, which was distributed to each participating municipality or special district to complete at the kickoff meeting in August 2015. Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County. Table 1 summarizes Denver Water's hazards based on input provided during the planning and data collection process.

Information from the Data Collection Worksheet is summarized in Table 1 with all the hazards listed that could impact anywhere in Denver Water's service area. The purpose of this exercise was to identify and rank the hazards and vulnerabilities unique to this jurisdiction. The hazard significance listed is based on Denver Water HMPC member input from the Data Collection Worksheet and the risk assessment developed during the planning process (refer to Chapter 4 of the base plan). The risk assessment was a more detailed qualitative analysis with better available data that varied.

Figure 1. Denver Water Service Area

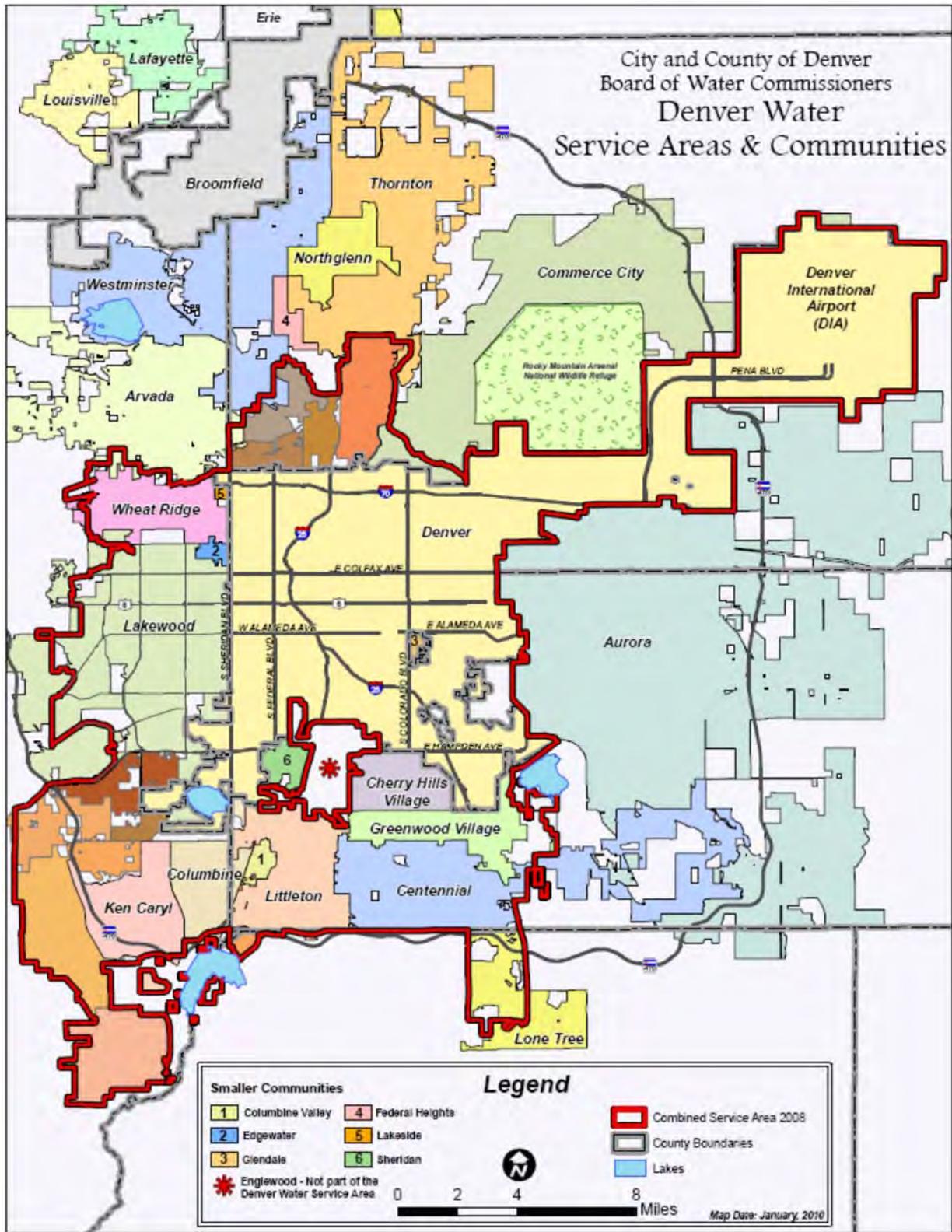


Table 1. Denver Water – Hazard Summaries

Hazard	Geographic Extent	Potential of Future Occurrence	Potential Severity Magnitude	Overall Significance
Avalanche	Limited	Low	Low	Low
Dam Failure	Limited	Low	High	High
Drought	Significant	High	Low	High
Earthquake	Significant	Low	Low	High
Erosion and Deposition	Limited	Medium	Low	Low
Expansive Soils	Limited	Medium	Low	Low
Extreme Temperatures	Extensive	Medium	Low	Low
Flood	Significant	Low	Medium	Medium
Hailstorm	Significant	Medium	Medium	Low
Landslide, Debris flow, Rockfall	Limited	Low	Low	Low
Lightning	Significant	Medium	Low	Low
Severe Winter Storms	Extensive	Medium	Low	Low
Subsidence	Limited	Medium	Low	Low
Tornado	Limited	Medium	Low	Low
Wildfire	Extensive	High	Low	Low
Windstorm	Significant	Medium	Low	Low
Geographic Extent <u>Negligible:</u> Less than 10 percent of planning area or isolated single-point occurrences <u>Limited:</u> 10 to 25 percent of the planning area or limited single-point occurrences <u>Significant:</u> 25 to 75 percent of planning area or frequent single-point occurrences <u>Extensive:</u> 75 to 100 percent of planning area or consistent single-point occurrences		Probability of Future Occurrences <u>Unlikely:</u> Less than 1 percent probability of occurrence in the next year, or has a recurrence interval of greater than every 100 years. <u>Occasional:</u> Between a 1 and 10 percent probability of occurrence in the next year, or has a recurrence interval of 11 to 100 years. <u>Likely:</u> Between 10 and 90 percent probability of occurrence in the next year, or has a recurrence interval of 1 to 10 years <u>Highly Likely:</u> Between 90 and 100 percent probability of occurrence in the next year, or has a recurrence interval of less than 1 year.		
Potential Magnitude/Severity <u>Negligible:</u> Less than 10 percent of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first aid or within the response capability of the jurisdiction. <u>Limited:</u> 10 to 25 percent of property is severely damaged, facilities and services are unavailable for between 1 and 7 days, injuries and illnesses require sophisticated medical support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities. <u>Critical:</u> 25 to 50 percent of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period of time, or result in many permanent disabilities and a few deaths. <u>Catastrophic:</u> More than 50 percent of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the medical response system is overwhelmed for an extended period of time or many deaths occur.		Overall Significance <u>Low:</u> Two or more of the criteria fall in the lower classifications or the event has a minimal impact on the planning area. This rating is also sometimes used for hazards with a minimal or unknown record of occurrences and impacts or for hazards with minimal mitigation potential. <u>Medium:</u> The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is also sometimes utilized for hazards with a high impact rating but an extremely low occurrence rating. <u>High:</u> The criteria consistently fall along the high ranges of the classification and the event exerts significant and frequent impacts on the planning area. This rating is also sometimes utilized for hazards with a high psychological impact or for hazards that the jurisdiction identifies as particularly relevant.		

1.1.2 Vulnerability Assessment

The intent of this section is to assess Denver Water’s vulnerability separately from that of the planning area as a whole, which has already been addressed in the Vulnerability Assessment in the main plan. For more information about how hazards affect the County as a whole, see Risk Assessment.

District Asset Inventory

Table 2 lists critical facilities and other community assets identified as important to protect in the event of a disaster.

Table 2. Denver Water Assets

Name of Asset	Facility Type	Replacement Value	Hazard Specific Info/Comments
Cheesman Dam and Reservoir	Dam and reservoir	\$300 million	
Cheesman Dam Valve House	Valve house	\$30 million	
Conduit 20 Diversion Dam (Marston Intake Dam)	Dam	\$15 million	
Conduit 26	Conduit	\$4 million (1,900 ft buried pipe)	
Foothills Spray Application Pump Station	Pump station	\$1 million	
Foothills Treatment Plant	Treatment Plant	\$600 million	
Foothills Overflow Holding Pond	Pond	\$5 million	
High Line Canal Diversion Dam	Dam	\$5 million	
High Line Canal Waterton Canyon	Canal		
Lone Tree Pump Station	Pump station	\$10 million	
Lone Tree Treated Reservoir No. 1	Reservoir		
Lone Tree Treated Reservoir No. 2	Reservoir		
Platte Canyon Dam and Reservoir	Dam and reservoir	\$25 million	
Strontia Springs Dam and Reservoir	Dam and reservoir	\$400 million	

Source: Denver Water

Vulnerability by Hazard

This section examines those existing and future structures and other assets at risk to hazards ranked of moderate or high significance that vary from the risks facing the entire planning area and estimates potential losses. This section focuses on wildfire impacts to watersheds.

An estimate of the vulnerability of Denver Water to each identified hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow.

Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.

Drought

Vulnerability to Drought

Geographic Extent - Significant

Potential of Future Occurrence—High

Potential Magnitude—Low

Overall Vulnerability—High

Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue for agricultural, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so too will the demand for water.

Based on Annex B in the State Drought Mitigation and Response Plan the majority of Denver Water's supplies come from the South Platte, Blue, Williams Fork, and Fraser River watersheds, but supplies are also provided from the South Boulder Creek, Ralston Creek and Bear Creek, watersheds.

During the 2002 drought, Denver Water experienced a variety of drought-related impacts including the reduction in storage reserves, disruption of water supplies, loss of revenue from reduction in water sales, increased costs to respond to the drought and degraded water quality. An indirect impact was the Hayman wildfire that caused significant erosion and disrupted South Platte River supplies. Denver Water primarily responded to the drought through mandatory water restrictions and an effective drought public education campaign encouraging wise water use and conservation. Despite the 2002 drought impacts mentioned above, Denver Water was able to meet the essential needs of its service area during 2002.

The most significant qualitative impacts associated with drought in Denver Water are those related to water intensive activities such as wildfire protection and municipal usage. Mandatory conservation measures are typically implemented by the municipalities during extended droughts. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

Development Trends

Drought vulnerability will increase with future development as there will be increased demands for limited water resources. Denver Water can mitigate drought impact by supporting water conservation measures such as water use audits, wastewater reuse, and water efficient transmission.

Earthquake

Vulnerability to Earthquake

Geographic Extent - Significant

Potential of Future Occurrence—Low

Potential Magnitude—Low

Overall Vulnerability—High

Ground shaking is the primary earthquake hazard, but cascading impacts can include landslides, rockfall, dam failure and ground failure. Many factors affect the survivability of structures and systems from earthquake-caused ground motions. These factors include proximity to the fault, direction of rupture, epicenter location and depth, magnitude, local geologic and soils conditions, types and quality of construction, building configurations and heights, and comparable factors that relate to utility, transportation, and other network systems. Ground motions become structurally damaging when average peak accelerations reach 10 to 15% of gravity, average peak velocities reach 8 to 12 centimeters per second, and when the Modified Mercalli Intensity Scale is about VII (18-34% peak ground acceleration), which is considered to be very strong (general alarm; walls crack; plaster falls).

Potential earthquake impacts specific to Denver Water were not available but the primary concern is damage to water infrastructure and dams. The HAZUS-MH 2.1 analysis provided in Section 4.3.4 in the base plan is countywide and does not differentiate water infrastructure impacts specific to Denver Water.

Development Trends

Damage to dams caused by earthquakes would be of particular concern to the Denver Water. Utilizing high development standards for dams and developing and exercising EAPs can help mitigate the impact of damages caused by earthquakes.

Flood: Dam Failure

Vulnerability to Dam Failure

Geographic Extent - Limited

Potential of Future Occurrence—Low

Potential Magnitude—High

Overall Vulnerability—High

A catastrophic dam failure would challenge local response capabilities and require timely evacuations to save lives in Denver Water’s service area. Impacts to life safety would depend on the warning time available and the resources to notify and evacuate the public. Major loss of life could result as well as potentially catastrophic effects to roads, bridges, and homes. Associated water quality and health concerns could also be an issue. Due to Homeland Security concerns, specific impacts are not included here. The economic impacts of a failure of a Denver Water-owned dam to the district would be considerable, in addition to water supply consequences that could impact multiple jurisdictions.

Development Trends

Flooding due to a dam failure event is likely to exceed the special flood hazard areas regulated through local floodplain ordinances. Denver Water should work with municipalities that are considering permitting development downstream of the high and significant hazard dams in Jefferson County. Low hazard dams could become significant or high hazard dams if development occurs below them. Regular monitoring of dams, exercising and updating of EAPs, and rapid response to problems when detected at dams are ways to mitigate the potential impacts of these rare, but potentially catastrophic, events

Flood: 100/500-Year

Vulnerability to 100/500-Year Flooding

Geographic Extent - Limited

Potential of Future Occurrence—Low

Potential Magnitude—High

Overall Vulnerability—High

The Planning Area, including Denver Water’s service area within the County, is prone to very intense rainfall. Floods have resulted from storms covering large areas with heavy general rainfall as well as from storms covering small area with extremely intense rainfall.

Development Trends

The risk of flooding to future development can be minimized through flood ordinances and zoning. The individual municipalities ultimately have authority over these ordinances. Denver Water can

utilize GIS mapping and floodplain mapping to ensure that future facilities are located outside of flood hazard areas.

Wildfire

Vulnerability to Wildfire

Geographic Extent - Extensive

Potential of Future Occurrence—High

Potential Magnitude—Low

Overall Vulnerability—Low

Watersheds and the numerous associated reservoirs in Denver Water’s service area in Jefferson County could be significantly impacted by high severity wildfire. For example, the damage to Strontia Springs Reservoir caused by siltation from the 1996 Buffalo Creek Fire took fifteen years to complete and cost Denver Water over \$30 million.

Watersheds can be considered as assets in their own right. Consultation with those water supply agencies with facilities, reservoirs, and properties should be included in mitigation discussions, and are in fact required to take part since the passage of Colorado House Bill 09-1162. Further consultation with members of a Burned Area Emergency Response Team may provide further guidance in mitigating and preparing for the effects of wildfire in a watershed.

Large wildfires have occurred in Denver Water’s service area in Jefferson County. From May 21-29, 2002, the Schoonover Fire burned 23 acres of Denver Water property near Cheesman Reservoir. In June of that same year, the Hayman Fire burned 4,245 acres of Denver Water property. More recently, the Foothills Fire burned four acres of Denver Water property near the Foothills Water Treatment Plant on July 4, 2014.

Development Trends

Continued growth of Jefferson County’s population will generally mean an expanded WUI and potential exposure of buildings, water infrastructure, and people. Additional water infrastructure in the WUI should be built with fire resistance in mind.

1.1.3 Growth and Development Trends

Denver Water does not have authority to manage growth or development within its district.

1.1.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. The capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

Regulatory Mitigation Capabilities

Regulatory mitigation capabilities include the planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities. Table 3 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Denver Water. Many of the regulatory capabilities used by local jurisdictions are not applicable to Denver Water.

Table 3. Denver Water—Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General or Comprehensive plan	N/A	
Zoning ordinance	N/A	
Subdivision ordinance	N/A	
Growth management ordinance	N/A	
Floodplain ordinance	N/A	
Other special purpose ordinance (stormwater, steep slope, wildfire)	N/A	
Building code	N/A	
Fire department ISO rating	N/A	
Erosion or sediment control program	N/A	
Stormwater management program	N/A	
Site plan review requirements	N/A	
Capital improvements plan	Yes	
Economic development plan	N/A	
Local emergency operations plan	Yes	Denver Water Emergency Management began developing an EOP in August 2012. Emergency manager brought on board to implement a comprehensive emergency management program that will interface with local jurisdictions
Other special plans	Yes	Drought Response Plan FERC requires Emergency Action Plans (EAPs) on all dams. Also have treatment and distribution plans.
Flood insurance study or other engineering study for streams	N/A	
Elevation certificates (for floodplain development)	N/A	
Other		

Administrative/Technical Mitigation Capabilities

Table 4 identifies the personnel responsible for activities related to mitigation and loss prevention in Denver Water.

Table 4. Denver Water—Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	N/A	Planning	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Engineering	
Planner/engineer/scientist with an understanding of natural hazards	Yes		Drought planners
Personnel skilled in GIS	Yes	IT/GIS	
Full time building official	N/A		
Floodplain manager	N/A		
Emergency manager	Yes	Operations & Maintenance – Manager of Emergency Response	
Grant writer			
Other personnel			
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	Yes	IT/GIS	
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Yes	IT	Everbridge
Other			

Fiscal Mitigation Capabilities

Fiscal mitigation capabilities are financial tools or resources that Denver Water could or already does use to help fund mitigation activities. Denver Water has received funding for watershed improvements from the Colorado State Forest Service.

Mitigation Outreach and Partnerships

Denver Water has public education programs related to water conservation, drought response, water quality, and a very active youth education program focusing on a variety of water-related topics. Additionally, Denver Water has a public affairs division that provides media relations, social media, marketing, publications, internal communication, stakeholder relations, government relations, community outreach, and website communications for both our combined service area

of 1.3 million people and for the communities where Denver Water’s watersheds and facilities are located.

Per the 2013 State Drought Plan Denver Water has also partnered with the Colorado State Forest Service, US Forest Service, local counties, and other municipal and industrial providers to develop watershed management plans, which will develop specific forest management practices for reducing wildfire risks with the intention of reducing water supply impact during future wildfires. Denver Water’s board of directors has also adopted a policy to review and consider any proposed “cooperative action” that regions outside its service area may bring during periods of drought. Denver Water staff has subsequently discussed future possibilities for cooperative actions with suburban water suppliers in the south, northwest and northeast regions, Summit County, Grand County, Eagle County, and the City of Aurora.

Denver Water has partnered with USFS to improve forest and watershed conditions in parts of Colorado by implementing hazardous fuels treatments and removing hazardous biomass. Forests play a role in protecting areas important to surface drinking water. USFS maps these areas using GIS before working with Denver Water on fuels treatment projects. This effort is part of the Forests to Faucets program. The projected outcome of this project is 943 acres of hazardous fuels treatments with 54,795 tons of biomass removed or dispersed in the Colorado River headwaters.

Past Mitigation Efforts

Drought vulnerability is tempered by the fact that Denver Water owns one of the most senior urban water rights portfolios along the Front Range. Denver Water has also taken additional drought mitigation actions since 2002 to further improve water supply reliability. As of 2013, Denver Water is in the permitting process for enlarging the Gross Reservoir to help resolve three major water supply challenges: a future water shortfall, the risk of running out of water in a future drought, and an imbalance in the collection system.

1.1.5 Mitigation Goals and Objectives

Denver Water has adopted the hazard mitigation goals and objectives developed by the HMPC and described in the Mitigation Strategy section.

1.1.6 Mitigation Actions

Denver Water identified and prioritized the following mitigation actions based on the risk assessment. Background information on how each action will be implemented and administered, such as ideas for implementation, responsible agency, potential funding, estimated cost, and timeline also are included.

Denver Water Action #1

Action Title: Flood inundation maps

Hazard: Flood

Priority: High

Project Description, Issue & Background: New maps of Cheesman, Strontia, Platte Canyon and Robert's Tunnel reservoirs need to be updated to include the FEMA and FERC requirements of high waters, 100/500 storm waters, etc. and this will include a hydrology study and the critical infrastructure.

Ideas for Implementation:

Other Alternatives: No action

Responsible Agency: Denver Water

Partners:

Potential Funding: Internal

Cost Estimate: \$80,000

Benefits: (Losses Avoided) Pre-planning efforts for catastrophic dam failure. Warning, evacuation planning, etc.

Timeline: 2016-2021

Status: New in 2015

Denver Water Action #2

Action Title: Watershed protection

Hazard: Wildfire

Priority: High

Project Description, Issue & Background: Continue with the watershed protection plan with United State Forest Service (USFS). This project entails forest hazardous fuels reduction in the Pike National Forest and is based on contract acreage with the USFS. The Pike National Forest includes Jefferson, Douglas, Teller and Park counties. There will be over 25,000 acres treated in this project.

Ideas for Implementation:

Other Alternatives: No action

Responsible Agency: Denver Water

Partners: Including both what the USFS is paying for and what DW is contributing

Potential Funding: Internal

Cost Estimate:

Benefits: (Losses Avoided) Reduce potential frequency and magnitude of wildfires in project area

Timeline: Completed through 2017 or earlier.

Status: New in 2015

Denver Water Action #3

Action Title:	Training/exercising at Foothills Treatment Plant
Hazard:	Wildfire
Priority:	Medium
Project Description, Issue & Background:	Roll out emergency response plan training and conduct tabletop and functional exercises with local first response agencies at the Foothills treatment plant.
Ideas for Implementation:	
Other Alternatives:	No action
Responsible Agency:	Denver Water
Partners:	Jefferson County OEM/Sheriff/West Metro Fire
Potential Funding:	Internal
Cost Estimate:	\$10,000
Benefits: (Losses Avoided)	Pre-planning and response coordination
Timeline:	To be completed between 2016-2020
Status:	New in 2015

Denver Water Action #4

Action Title:	Public education and outreach
Hazard:	Dam failure and drought
Priority:	Medium
Project Description, Issue & Background:	Continue with public education and outreach efforts on dam safety, water conservation, drought, etc. Producing presentations, brochures, etc.
Ideas for Implementation:	
Other Alternatives:	No action
Responsible Agency:	Denver Water
Partners:	Jefferson County OEM
Potential Funding:	Internal
Cost Estimate:	Low
Benefits: (Losses Avoided)	Pre-planning and response coordination
Timeline:	To be completed between 2016-2020
Status:	New in 2015

Denver Water Action #5

Action Title:	Sediment removal from Strontia Springs Dam
Priority:	Low to Medium
Project Description, Issue & Background:	Flush sediment from the reservoir. Sediment run-off due to several major forest fires followed by regular storm events has caused a build-up of sediment within the reservoir. Continued sediment inflow without a plan to remove it efficiently can become a long-term Dam Safety and Operational issue if the sediment plume reaches the dam.
Ideas for Implementation:	Install new slide gates on the upstream and downstream sides of the river bypass tunnel which was left in place after the construction of the dam. Once the gates are in place, the concrete plug within the tunnel can be removed and the reservoir will be flushed to remove accumulated sediment. The flushing can then occur on regular intervals to control the level of sediment accumulation.
Other Alternatives:	No action
Responsible Agency:	Denver Water
Partners:	City of Aurora
Potential Funding:	Internal
Cost Estimate:	\$8,000,000
Benefits: (Losses Avoided)	Pre-planning and response coordination
Timeline:	Estimated completion between 2016-2021, pending modeling to confirm idea above and any necessary permitting.
Status:	New in 2015

Denver Water Action #6

Action Title: Defensible space in Waterton Canyon

Priority: Low to Medium

Project Description, Issue & Background: To establish defensible space around critical infrastructure on Denver Water properties located in Waterton Canyon.

Ideas for Implementation:

Other Alternatives: No action

Responsible Agency: Denver Water

Partners:

Potential Funding: Internal

Cost Estimate: \$10,000

**Benefits:
(Losses Avoided)** Reduce wildfire risk and magnitude

Timeline: Estimated completion between 2016-2021

Status: New in 2015



ANNEX J

FAIRMOUNT FIRE PROTECTION DISTRICT

1.1 Community Profile

The community of Fairmount is located between the towns of Golden, Arvada, and Wheat Ridge in the northern region of Jefferson County, see service area map in Figure 1. The community has experienced rapid growth, as have the needs for fire, paramedical and emergency response. 2013 American Community Survey estimates 7,918 residents. The Fairmount Fire Protection District is a combination department currently employing 24 career firefighters and staff, and over 50 volunteer firefighters.

1.1.1 Hazard Summary

A hazard identification and vulnerability analysis was completed for Fairmount Fire Protection District using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Worksheet, which was distributed to each newly participating municipality or special district to complete at the kickoff meeting in August 2015. Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County. Table 1 summarizes Fairmount Fire Protection District's hazards based on input provided during the planning and data collection process.

Information from the Data Collection Worksheet is summarized in Table 1 with all the hazards listed that could impact anywhere in Fairmount Fire Protection District's service area. The purpose of this exercise was to identify and rank the hazards and vulnerabilities unique to this jurisdiction. The hazard significance listed is based on Fairmount Fire Protection District HMPC member input from the Data Collection Worksheet and the risk assessment developed during the planning process (refer to Chapter 4 of the base plan).

Figure 1. Fairmount Fire Protection District Service Area

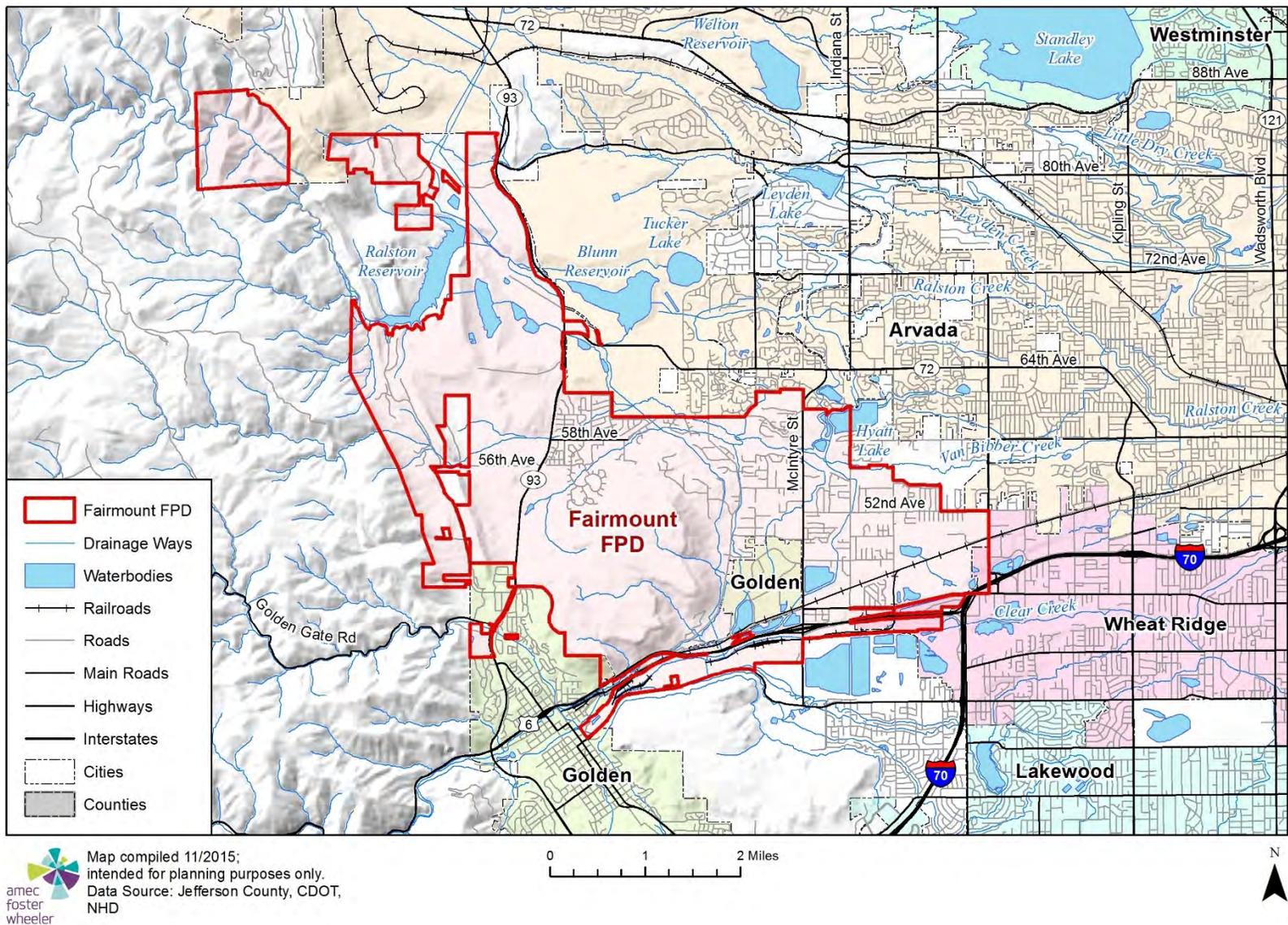


Table 1. Fairmount Fire Protection District Hazard Summaries

Hazard	Geographic Extent	Potential of Future Occurrence	Potential Severity Magnitude	Overall Significance
Avalanche	Negligible	Unlikely	Negligible	Low
Dam Failure	Significant	Occasional	Critical	High
Drought	Significant	Likely	Limited	Medium
Earthquake	Significant	Unlikely	Critical	Medium
Erosion and Deposition	Limited	Likely	Limited	Medium
Expansive Soils	Significant	Likely	Limited	Medium
Extreme Temperatures	Extensive	Likely	Limited	Low
Flood	Limited	Likely	Critical	High
Hailstorm	Significant	Likely	Critical	High
Landslide, Debris flow, Rockfall	Limited	Likely	Negligible	Medium
Lightning	Limited	Likely	Limited	Medium
Severe Winter Storms	Extensive	Likely	Critical	High
Subsidence	Limited	Occasional	Limited	Medium
Tornado	Limited	Likely	Limited	Medium
Wildfire	Significant	Likely	Critical	Medium
Windstorm	Significant	Likely	Limited	Medium
<p>Geographic Extent <u>Negligible:</u> Less than 10 percent of planning area or isolated single-point occurrences <u>Limited:</u> 10 to 25 percent of the planning area or limited single-point occurrences <u>Significant:</u> 25 to 75 percent of planning area or frequent single-point occurrences <u>Extensive:</u> 75 to 100 percent of planning area or consistent single-point occurrences</p>		<p>Probability of Future Occurrences <u>Unlikely:</u> Less than 1 percent probability of occurrence in the next year, or has a recurrence interval of greater than every 100 years. <u>Occasional:</u> Between a 1 and 10 percent probability of occurrence in the next year, or has a recurrence interval of 11 to 100 years. <u>Likely:</u> Between 10 and 90 percent probability of occurrence in the next year, or has a recurrence interval of 1 to 10 years <u>Highly Likely:</u> Between 90 and 100 percent probability of occurrence in the next year, or has a recurrence interval of less than 1 year.</p>		
<p>Potential Magnitude/Severity <u>Negligible:</u> Less than 10 percent of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first aid or within the response capability of the jurisdiction. <u>Limited:</u> 10 to 25 percent of property is severely damaged, facilities and services are unavailable for between 1 and 7 days, injuries and illnesses require sophisticated medical support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities. <u>Critical:</u> 25 to 50 percent of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period of time, or result in many permanent disabilities and a few deaths. <u>Catastrophic:</u> More than 50 percent of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the medical response system is overwhelmed for an extended period of time or many deaths occur.</p>		<p>Overall Significance <u>Low:</u> Two or more of the criteria fall in the lower classifications or the event has a minimal impact on the planning area. This rating is also sometimes used for hazards with a minimal or unknown record of occurrences and impacts or for hazards with minimal mitigation potential. <u>Medium:</u> The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is also sometimes utilized for hazards with a high impact rating but an extremely low occurrence rating. <u>High:</u> The criteria consistently fall along the high ranges of the classification and the event exerts significant and frequent impacts on the planning area. This rating is also sometimes utilized for hazards with a high psychological impact or for hazards that the jurisdiction identifies as particularly relevant.</p>		

1.1.2 Vulnerability Assessment

The intent of this section is to assess Fairmount Fire Protection District’s vulnerability separately from that of the planning area as a whole, which has already been addressed in the Vulnerability Assessment in the main plan. For more information about how hazards affect the County as a whole, see Risk Assessment.

District Asset Inventory

Table 2 lists critical facilities and other community assets identified as important to protect in the event of a disaster. This table lists all assets within the District boundaries, not just District owned or maintained assets.

Table 2. Fairmount Fire Protection District Critical Facilities and Other Community Assets

Name of Asset	Type*	Replacement value	Occupancy/capacity	Hazard Specific issues
Kaiser Permanente Medical Office	EI	200,000,000.	350	Immobility, medical gases
Fairmount Fire Station 31	EI, VF	5,000,000.	65	Diesel fuel tank on site. Haz Mat occupancy immediately located nearby and rail line ¼ mile away
Fairmount Fire Station 32	EI	1,500,000.	10	High Tension Power Towers nearby
Fairmount Fire Station 33	EI	3,500,000.	20	Adjacent to I-70 & Hwy 58
Fairmount Fire Training Center	EI, VF	3,000,000.	50	Jeffco Bomb Squad Bunkers on property
Ralston Reservoir-Denver Water Board	NA, VF, EI, HM	1,000,000,000.	N/A	Explosives kept in nearby bunkers. On site 24/7 management and surveillance. Flood potential if dam fails, highly hazardous, massive danger to downstream community
Raw Water Conduits (2) crossing through the jurisdiction to the Moffat Water Treatment Plant	NA, VF, EI	100,000,000.	N/A	Infrastructure near 100 years old. Scheduled for replacement in the next five years. Both conduits run underground through fire station 31s parking lot
Treated Water Storage Tanks (4) North Table Mountain W&S	NA, VF, EI	100,000,000.	N/A	Locked gate and scalable barbed wire fencing are the only protections in place
North Table Mountain Water Treatment Plant	NA, VF, EI, HM	100,000,000.	N/A	Locked gates and doors, surveillance and barbed wire fencing
Fairmount Reservoir (NTM W&S)	NA, VF, EI	50,000,000.	N/A	Surrounded by barbed wire fencing, surveillance. Flooding danger to community if reservoir were to fail.

Name of Asset	Type*	Replacement value	Occupancy/capacity	Hazard Specific issues
Church Ditch (raw water supply)	NA, VF, EI	150,000,000.	N/A	Gates control flow manually
Hazen Research & Hoffman Laboratories	HM	40,000,000.	80	Scalable barbed wire fence, surveillance. Significant hazardous material on site
MillerCoors Brewery	HM,VF	500,000,000.	500	A very large quantity of ammonia and other hazardous materials on site
MillerCoors Dechlorination Bldg	HM	85,000,000.	20	Large supply of hazardous materials on site
MillerCoors RMMC Container Plant	HM	400,000,000.	250	Large supply of hazardous materials on site
MillerCoors Commodities – Grain Silos	HM	30,000,000.	6	Very large confined space hazard. Potential grain/dust explosion hazard
MillerCoors Endline Manufacturing	HM	250,000,000.	100	Large quantity of hazardous material on site
MillerCoors Golden Distribution Center	VF	150,000,000.	250	Large quantity of hazardous material on site
MillerCoors Packaging Plant	HM	350,000,000.	350	Large quantity of hazardous material on site
MillerCoors STP1 General Waste Treatment Plant	HM,VF	100,000,000.	6	Large quantity of hazardous material on site
MillerCoors STP2 Process Waste Treatment Plant	HM.VF	100,000,000.	5	Large quantity of hazardous material on site
MillerCoors Tank Glass Lining Plant (GLP)	HM	180,000,000.	85	Large quantity of hazardous material on site
Coors Tek 1	HM	5,200,000.	90	Moderate quantity of hazardous materials on site
Coors Tek 2	HM	4,500,000.	80	Moderate quantity of hazardous materials on site
MillerCoors Transload & Security	EI, HM, VF,	200,000,000.	250	Large quantity of hazardous material on site
International Paper Plant	HM	180,000,000.	85	Moderate quantity of hazardous materials on site
Ball Container Plant	HM	200,000,000.	90	Moderate quantity of hazardous materials on site
Fairmount Elementary School	VF	30,000,000.	625	Life hazard, occupied by 600 children + adults M-F
Compass Montessori School (grades K-12)	VF	28,000,000.	532	Life hazard, occupied by 500 children + adults M-F
Drake Middle School	VF	39,000,000.	625	Life hazard, occupied by 650 children + adults M-F
Cornerstone Montessori School	VF	900,000.	65	Life hazard, occupied by 100 children + adults M-F
Denver Kickers' Club	VF	1,600,000.	125	Life hazard, occupied by 60 children + adults S-S And some evenings
Golden Elks Club	VF	850,000.	50	Life hazard, occupied by 50-100 adults on various evenings
Weatherford Laboratories	HM	2,300,000.	85	Moderate quantities of chemicals on site
Codi Manufacturing	HM	8,000,000.	35	Moderate quantities of chemicals on site and welding operations

Name of Asset	Type*	Replacement value	Occupancy/capacity	Hazard Specific issues
Columbia Sanitary Services	HM	1,300,000.	8	Moderate quantities of sewage treatment chemicals on site
Colorado Railroad Museum	NA	50,000,000.	350	Moderate quantities of diesel fuel and other chemicals, and welding operations on site Life safety hazard, up to 200+ guests on-site during all days and evenings
Coors Family Mansion	NA	4,500,000.	N/A	Historic significance, 100 year old structure, unprotected
Conoco Fuel Stations (2)	HM	4,000,000.	50	20,000 gallons of various fuels stored on site
Epilog Laser	HM	250,000,000.	75	Moderate amount of hazardous materials on site
Golden Valley Recreation Center and Tony Grampas Park	VF	40,000,000.	100	Life safety hazard, gym and ball fields
Horizon Coach Lines/Coach USA	HM, EI, VF	75,000,000.	45	Diesel vehicles (buses), repair and refueling operation
In The Zone Restaurant & Bar	VF	1,150,000.	125	Life Safety hazard, 200+ patrons, mostly evenings and nights
KCs Autobody	HM	860,000.	N/A	Moderate amount of hazardous materials, including welding, preparation and painting
Kong Company	HM	240,000,000.	60	Large amount of rubber, plastics, molding/extrusion machinery, moderate amount of hazardous materials on site
Natural Grocers Warehouse & Distribution Center	VF	165,000,000.	125	Computer room with clean agent suppression system, large refrigeration units, high pile storage
New Hope Lutheran Church	VF	600,000.	65	Life hazard assembly occupancy
Olson Engineering & Mfg.	HM	1,000,000.	35	Moderate quantity of hazardous materials on site
Quanda Pumps	HM	60,000,000.	60	Moderate quantity of hazardous materials on site
Quanda Corporate	VF	6,000,000.	25	
Republic Services – Foothills Landfill	HM, VF, EI	18,000,000.	50	Moderate quantity of hazardous materials on site, including explosive charges
Stevens & Sons Greenhouse	HM	1,600,000.	35	Moderate quantity of hazardous materials on site
Asphalt Paving Corporate	VF	26,000,000.	40	Trucks and paving machinery on site (moderate amount of hazardous materials)

Name of Asset	Type*	Replacement value	Occupancy/capacity	Hazard Specific issues
Asphalt Paving Quarry Ops	VF, HM, EI	250,000,000.	65	Large quantity of hazardous materials on site
Kelley Trucking, Inc.	VF, HM, EI	280,000,000.	100	Large quantity of hazardous materials on site, including above ground fuel tanks, 30+ vehicles and heavy equipment, welding and vehicle maintenance operations
Tagawa Greenhouses (2)	HM, VF	1,800,000.	80	Moderate quantity of hazardous materials on site
Applewood Automotive Service Center	HM	1,200,000.	8	Moderate quantity of hazardous materials on site
Subapros, Inc.	HM	1,450,000.	10	Moderate quantity of hazardous materials on site
Apria Healthcare	HM, VF	8,000,000.	18	Large quantity of hazardous materials (oxygen) on site and in vehicles
Auto Works	HM	1,200,000.	12	Moderate quantity of hazardous materials on site
AV-Tech	VF, EI	48,000,000.	30	Small quantity of hazardous materials on site, emergency vehicle prep and storage can be large at any given time
Centerline Solutions (2)	VF	126,000,000.	65	Moderate quantity of hazardous materials on site
Chiropractic Center of Life	EI	980,000.	12	
City Floral Greenhouse	HM	1,045,000.	50	Moderate quantity of hazardous materials on site
Denver Industrial Pumps	HM	8,400,000.	45	Moderate quantity of hazardous materials on site
Clear Creek (4 miles long)	NA, VF, EI	250,000,000.	N/A	Flows through the district 9included MillerCoors property, unimpeded year-round
State Highway 58 (4 miles long)	NA, VF, EI	1,450,000,000.	N/A	Very large quantities of haz mats passing through the area on the state highway via tankers, dump trucks and reefers daily
Interstate Highway 70 (½ mile long)	NA, VF, EI	1,125,000,000.	N/A	Very large quantities of haz mats passing through the area on the interstate highway via tankers, dump trucks and reefers daily
VanBibber Creek	NA, VF	100,000,000.	N/A	Gates control flow manually
Fairmount Bible Church	VF	985,000.	50	Life hazard evenings and Sundays (assembly occupancy)
Greenbrier Rail Services (Mfg)	HM	45,000,000.	35	Large quantity of haz mats and welding operations on site

Name of Asset	Type*	Replacement value	Occupancy/capacity	Hazard Specific issues
Burlington Northern Rail Line	HM, EI	1,200,000,000.	N/A	Very large quantity of haz mats passing through the area on the rail cars and tankers daily
Total estimated replacement value		\$10,620,000,000		

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: natural assets

Vulnerability by Hazard

This section examines those existing and future structures and other assets at risk to hazards ranked of moderate or high significance that vary from the risks facing the entire planning area and estimates potential losses.

Wildfire

Fairmount Fire Protection District does have exposure risk to wildfire both in terms of critical facilities and parcels/structures in WUI communities.

According to the GIS based analysis of wildfire, Fairmount FPD has a total of 8 critical facilities at risk to wildfire (see Table 3) and 76 improved parcels in the WUI communities of Indian Head, North Assessment Area and Pine Ridge totaling over \$73 million in value at risk (see Table 4).

Table 3. Fairmount Fire Protection District Critical Facilities At-Risk to Wildfire by Type

Fire Type	Category	Facility Type	Facility Count
Active Crown Fire	High Potential Loss Facilities	HAZMAT	1
	Total		1
Passive Crown Fire	High Potential Loss Facilities	Day Care Center	1
	Transportation and Lifelines	Communication	1
	Total		2
Surface Fire	High Potential Loss Facilities	HAZMAT	3
	Transportation and Lifelines	Bridge	1
	Total		4
Grand Total			8

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, Fairmount Fire CWPP

Table 4. Fairmount Fire Protection District WUI Communities and Values At-Risk

WUI Hazard Class	Improved Parcels	Improved Value	Content Value	Total Value	WUI Community
Extreme	0	\$0	\$0	\$0	-
Very High	0	\$0	\$0	\$0	-
High	13	\$4,983,200	\$2,491,600	\$7,474,800	Indian Head
Moderate	30	\$18,731,013	\$9,365,507	\$28,096,520	North Assessment Area, Pine Ridge
Low	0	\$0	\$0	\$0	-
n/a	33	\$25,179,768	\$12,589,884	\$37,769,652	-
Total	76	\$48,893,981	\$24,446,991	\$73,340,972	

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, Fairmount Fire CWPP

Other Hazards

In the case of other hazards that are not specific to geography such as drought, hailstorms, winter storms, earthquake, lightning, tornado and windstorm the entire building inventory and population in the City is potentially exposed. That is the reason for the asset inventory provided in section 1.3. It should be noted that no hazard in this plan is expected to cause widespread impacts to this inventory.

1.1.3 Growth and Development Trends

The mixed rural/urban area in the Fairmount community was organized into a fire protection district in 1962. The District is undergoing a transition as the area urbanizes, with approximately 30% of the land mass of the Fairmount community remaining rural as of 2015. The industrial area is primarily concentrated along the southern most edge of the district, which is also serviced by State Highway 58 and Interstate 70, as well as the Burlington Northern Railway. This concentration of infrastructure and transportation is highly vulnerable to hazards due to the potential of loss of life and critical services for the adjacent communities of Golden, Arvada, Wheat Ridge and Unincorporated Jefferson County.

Residential development along State Highway 93 continues at a fast pace adding homes and population to the communities of Fairmount, Arvada and Golden.

1.1.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. The capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

Regulatory Mitigation Capabilities

Regulatory mitigation capabilities include the planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities. Table 5 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Fairmount Fire. Many of the regulatory capabilities used by local jurisdictions are not applicable to the District.

Table 5. Fairmount Fire Protection District Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General or Comprehensive plan	County	
Zoning ordinance	County	
Subdivision ordinance	County	
Growth management ordinance	County	
Floodplain ordinance	County	
Other special purpose ordinance (stormwater, steep slope, wildfire)	County	
Building code	County and FFPD	
Fire department ISO rating	4/5	
Erosion or sediment control program	County	
Stormwater management program	County	
Site plan review requirements	County and FFPD	
Capital improvements plan	FFPD	
Economic development plan	County	
Local emergency operations plan	County	
Other special plans	FFPD	
Flood insurance study or other engineering study for streams	County	
Elevation certificates (for floodplain development)	County	
Other		

Administrative/Technical Mitigation Capabilities

Table 6 identifies the personnel responsible for activities related to mitigation and loss prevention for Fairmount Fire Protection District.

Table 6. Fairmount Fire Protection District Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Yes	County	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	County	
Planner/engineer/scientist with an understanding of natural hazards	Yes	County	
Personnel skilled in GIS	Yes	County	
Full time building official	Yes	County	FFPD for Fire Code
Floodplain manager	Yes	County	
Emergency manager	Yes	County	
Grant writer	No		
Other personnel			
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	Yes	County	
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Yes	County and West Metro Communications Center	
Other			

Fiscal Mitigation Capabilities

Fiscal mitigation capabilities are financial tools or resources that Fairmount Fire Protection District could or already does use to help fund mitigation activities. Table 7 lists the fiscal mitigation capabilities available to Fairmount Fire Protection District.

Table 7. Fairmount Fire Protection District Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Unknown	
Capital improvements project funding	Unknown	
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric services	No	
Impact fees for new development	Yes	
Incur debt through general obligation bonds	Yes	
Incur debt through special tax bonds	No	
Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	
Other		

1.1.5 Mitigation Goals and Objectives

Fairmount Fire Protection District has adopted the hazard mitigation goals and objectives developed by the HMPC and described in the Mitigation Strategy section.

1.1.6 Mitigation Actions

The District identified and prioritized the following mitigation actions based on the risk assessment. Background information on how each action will be implemented and administered, such as ideas for implementation, responsible agency, potential funding, estimated cost, and timeline also are included.

1. Update Community Wildfire Protection Plan

Issue/Background: The current plan was completed in 2012 and is in need of review and update.

Other Alternatives: None

Responsible Office: Fairmount Fire Protection District

Priority (High, Medium, Low): Low

Cost Estimate: \$5,000

Benefits (Avoided Losses): Hazard identification and mitigation.

Potential Funding: Firewise or district property taxes

Schedule: Complete by 2018

STATUS: New in 2015

2. Standards of Cover

Issue/Background: A formal Standards of Cover needs analysis is needed to validate the needed response necessary to address existing hazards and current response needs. The Commission on Fire Accreditation International (CFAI) defines the process, known as “deployment analysis,” as written procedure which determines the distribution and concentration of fixed and mobile resources of an organization. The purpose for completing such a document is to assist the agency in ensuring a safe and effective response force for fire suppression, emergency medical services, and specialty response situations.

Other Alternatives: ISO evaluation every 10 years. This only addresses a fire response, where as a Standard of Cover addresses all hazards response.

Responsible Office: Fairmount Fire Protection District

Priority (High, Medium, Low): Medium

Cost Estimate: 50 personnel hours

Benefits (Avoided Losses): To ensure the proper response is available to mitigate identified hazards.

Potential Funding: Property taxes

Schedule: Completed by 2017

STATUS: New in 2015

ANNEX K

JEFFERSON CONSERVATION DISTRICT

1.1 Community Profile

The powers and duties of conservation districts differ from other special districts. The Jefferson Conservation District (JCD) has the responsibility to manage resources in the county in a way that preserves the environment and protects local communities, specifically through its work with voluntary private landowners.

The conservation district model was created as part of the response to the ecological crisis known as the Dust Bowl. The success of the conservation district model lies in providing technical assistance to private landowners who are willing to undertake an active, voluntary role in the stewardship of their land. Though originally focused on erosion control, today's conservation districts address a broad array of natural resource issues on private lands.

The Jefferson Conservation District was formed in 1942 and is located west of Denver, and includes Jefferson, Gilpin and Clear Creek Counties¹. The ecologies located in the district include prairies, forests, and tundra environments. The District includes significant development in forested areas, which increases the wildfire risks in those regions. JCD serves a population of over 189,000 residents and focuses on wildfire mitigation, forest health, source water protection, urban agriculture, and noxious weed eradication.

1.1.1 Hazard Summary

A hazard identification and vulnerability analysis was completed for the Jefferson Conservation District using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County. Information from the Data Collection Guide is summarized in Table 1 with all the hazards listed that could impact anywhere in Jefferson County. The purpose of this exercise was to identify and rank the hazards and vulnerabilities unique to the JCD.

¹ <http://www.jeffersonconservationdistrict.org/about-jcd/>

For this plan update, the JCD’s planning team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the District.

The data in Table 1 reflect the most significant hazards for the JCD. They are: dam failure, hailstorm, severe winter storms and wildfire.

The hazard significance listed is based on JCD HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (refer to Chapter 4 of the base plan). The risk assessment was a more detailed qualitative analysis with better available data that varied.

Table 1. Jefferson Conservation District – Hazard Summaries

Hazard	Geographic Extent	Potential of Future Occurrence	Potential Severity Magnitude	Overall Significance
Avalanche	Negligible/Limited	Unlikely	Negligible	Low
Dam Failure	Significant	Occasional	Critical	High
Drought	Extensive	Likely	Limited	Medium
Earthquake	Significant	Unlikely	Catastrophic	Medium
Erosion and Deposition	Significant	Likely	Critical	Medium
Expansive Soils	Extensive	Likely	Limited	Medium
Extreme Temperatures	Extensive	Likely	Limited	Low
Flood	Limited	Likely	Critical	Medium
Hailstorm	Significant	Likely	Critical	High
Landslide, Debris flow, Rockfall	Limited	Likely	Negligible	Medium
Lightning	Limited	Highly Likely	Critical	Medium
Severe Winter Storms	Extensive	Likely	Critical	High
Subsidence	Limited	Occasional	Limited	Medium
Tornado	Limited	Likely	Limited	Medium
Wildfire	Significant	Likely	Critical	High
Windstorm	Extensive	Likely	Negligible	Med

Hazard	Geographic Extent	Potential of Future Occurrence	Potential Severity Magnitude	Overall Significance
Geographic Extent <u>Negligible:</u> Less than 10 percent of planning area or isolated single-point occurrences <u>Limited:</u> 10 to 25 percent of the planning area or limited single-point occurrences <u>Significant:</u> 25 to 75 percent of planning area or frequent single-point occurrences <u>Extensive:</u> 75 to 100 percent of planning area or consistent single-point occurrences		Probability of Future Occurrences <u>Unlikely:</u> Less than 1 percent probability of occurrence in the next year, or has a recurrence interval of greater than every 100 years. <u>Occasional:</u> Between a 1 and 10 percent probability of occurrence in the next year, or has a recurrence interval of 11 to 100 years. <u>Likely:</u> Between 10 and 90 percent probability of occurrence in the next year, or has a recurrence interval of 1 to 10 years <u>Highly Likely:</u> Between 90 and 100 percent probability of occurrence in the next year, or has a recurrence interval of less than 1 year.		
Potential Magnitude/Severity <u>Negligible:</u> Less than 10 percent of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first aid or within the response capability of the jurisdiction. <u>Limited:</u> 10 to 25 percent of property is severely damaged, facilities and services are unavailable for between 1 and 7 days, injuries and illnesses require sophisticated medical support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities. <u>Critical:</u> 25 to 50 percent of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period of time, or result in many permanent disabilities and a few deaths. <u>Catastrophic:</u> More than 50 percent of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the medical response system is overwhelmed for an extended period of time or many deaths occur.		Overall Significance <u>Low:</u> Two or more of the criteria fall in the lower classifications or the event has a minimal impact on the planning area. This rating is also sometimes used for hazards with a minimal or unknown record of occurrences and impacts or for hazards with minimal mitigation potential. <u>Medium:</u> The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is also sometimes utilized for hazards with a high impact rating but an extremely low occurrence rating. <u>High:</u> The criteria consistently fall along the high ranges of the classification and the event exerts significant and frequent impacts on the planning area. This rating is also sometimes utilized for hazards with a high psychological impact or for hazards that the jurisdiction identifies as particularly relevant.		

1.1.2 Vulnerability Assessment

The intent of this section is to assess Jefferson Conservation District's vulnerability separately from that of the planning area as a whole, which has already been addressed in the Vulnerability Assessment in the main plan. For more information about how hazards affect the County as a whole, see the Risk Assessment in the Base Plan.

District Asset Inventory

Table 2 lists critical facilities and other community assets identified as important to protect in the event of a disaster.

Table 2. Jefferson Conservation District Critical Facilities and Other Community Assets

Name of Asset	Type*	Replacement value	Occupancy/capacity**	Hazard Specific issues
Admin. Building	EI	Unknown	B	Earthquake, Expansive Soils, Hailstorm, Tornado

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: natural assets

** B = Business and S-1 = Moderate Hazard Storage Facility per International Fire Code Occupancy classification.

1.1.3 Growth and Development Trends

This section examines those existing and future structures and other assets at risk to hazards ranked of moderate or high significance that vary from the risks facing the entire planning area and estimates potential losses. As Table 3 indicates, the counties in the Conservation District continue to add population and housing units. Concerns about hazards, existing and future development are addressed by hazard in this section.

Table 3. Jefferson Conservation District — Housing and Population Growth

County	Housing Units 2010	Housing Units 2013	% Growth	Population 2010	Population 2014	% Growth
Jefferson	228,951	230,487	0.67%	534,583	558,503	4.50%
Clear Creek	5,632	5,672	0.71%	9,088	9,187	1.10%
Gilpin	3,489	3,519	0.86%	5,441	5,851	7.50%

Drought - Medium Hazard Significance

Future Development

Drought vulnerability will increase with future development, as there will be increased demands for limited water resources. Future growth in the unincorporated areas will mean more wells and more demands on limited groundwater and surface water resources.

In 2000, the USGS in conjunction with Jefferson County completed a study of mountain ground water resources in the Turkey Creek watershed. To achieve a balance between development and available water, the county created a zoning overlay district that regulates land uses in order to protect ground water supplies in the mountains.

Erosion and Deposition – Medium Hazard Significance

Future Development

JCD, and the Colorado Geological Survey, developed maps and GIS layers of areas with highly erodible soil, highly sensitive soil (thin soil not easily reclaimed when disturbed) and areas prone to postfire flooding and mudflows. JCD and CGS also developed associated land-use policies.

The maps and land-use policies were included in the Central Plains and Evergreen Community Plans which are both part of the Jefferson County Comprehensive Plan 2013. It is anticipated that the maps and policies will be included in updates to the general land-use plan and other community plans.

If policies are followed, future development should be protected from erosion and deposition hazards. When development is proposed, studies are required to determine the extent of potential

hazards; extensive mitigation may be required. JCD reviews new subdivision plans for erosion and deposition constraints and makes recommendations to Jefferson County for the elimination or mitigation of hazards.

Expansive Soils – Medium Hazard Significance

Existing Development

Two types of expansive materials are present within the District: Expansive soil and steeply dipping expansive bedrock. Both hazards are widely found in the plains but are rarely found in mountain areas. In the past, home warranty companies paid more claims in Jefferson County than any other county in the nation, mostly due to dipping bedrock damages. The County's adoption of the Dipping Bedrock Overlay Zone District and associated subdivision regulations, in 1995, has greatly reduced damages from expansive bedrock.

Most damages from expansive soils and bedrock occur during the first 7 to 10 years after building construction; however, a change in soil moisture can cause damages to older structures. When drought occurs, expansive soil can shrink, and then swell again following precipitation or irrigation. An old water or sewer line may fail and saturate soil. Thus, damages to existing buildings, pavements, roads, and utilities will continue to occur but damage rates should be significantly less than those experienced prior to 1995.

Future Development

Implementation of existing land-use planning regulations should reduce the risk of expansive bedrock impacts on future development. Continued improvements in building codes and construction techniques should help reduce damages from expansive soil.

JCD and CGS developed a countywide GIS layer and map of expansive soils. JCD reviews new subdivision plans for expansive soil and makes recommendations to Jefferson County for the elimination or mitigation of hazards. New development will be evaluated for expansive soil and bedrock constraints. Education on the hazard, particularly in regards to landscaping and maintenance concerns, will be needed to continue to reduce expansive soil and bedrock hazards.

Landslides, Debris Flows, Rockfall - Medium Hazard Significance

Existing Development

Wildfire causes physical and chemical changes to mountain watersheds, resulting in hydrophobic soil, decreased transpiration, decreased infiltration, altered water chemistry, and increased runoff. After a fire, peak flow flood potential is 10 to 10,000 times greater than pre-fire levels.

Post fire erosion rates may be up to more 100 times greater than on a well-vegetated watershed². Sediment from increased erosion, clogs, dams and changes water courses; adding to flooding, mud floods and debris flow hazards.

Residents living directly downslope of mountainous wildfire areas should be aware of hazards--debris flooding or mud flooding at and near the mouths of channels that drain burned-over, ashy slopes. JCD and CGS developed maps and GIS layers of areas prone to postfire hazards. This information can be used to help protect existing development following a fire.

Future Development

In addition to postfire mud flow and debris flow maps; JCD and CGS also developed associated land-use policies. The maps and land-use policies are included County comprehensive plans.

If policies are followed, future development should be better protected from postfire hazards. When development is proposed, studies are required to determine the extent of potential hazards; extensive mitigation may be required. JCD reviews new subdivision plans for erosion and deposition constraints and makes recommendations to Jefferson County for the elimination or mitigation of hazards.

Wildfire – High Hazard Significance

Existing Development

Since the District covers the entirety of Jefferson County, all of the critical facilities and parcels/buildings in the WUI communities could be considered ‘at-risk’. See the wildfire analysis in Section 4.3.

Community Wildfire Protection Plans (CWPP) have been developed for much of the County’s wildland urban interface. JCD is developing plans for areas not currently covered by a CWPP. Implementation of CWPPs should help protect existing development. However, the cost of implementation greatly exceeds existing resources. Even with the increase in the frequency, severity, and extent of wildfires, many private landowners are still reluctant to cut and thin trees. Continued public education is needed.

Future Development

Growth in the wildland urban interface has been significant in the past twenty years in Jefferson County. While this growth has recently slowed, there still remains potential for development of primary and secondary residences in wildfire hazard areas in the unincorporated County. Wildfire

² Radtke, K.W.H. 1983. Living More Safely in the Chaparral-Urban Interface, United States Department of Agriculture, Pacific Southwest Forest and Ranger Experimental Station

risk to future development in these areas will be tempered by the County’s land use regulations and implementation of CWPPs on a landscape scale.

JCD also helped develop the Community Wildfire Desk Guide and Toolkit³ - The NACD Community Wildfire Desk Guide and Toolkit are designed to be simple aids for use by conservation districts, communities and land managers. The desk guide provides information about mitigation activities prior to, during and after wildfire. Toolkit materials interact with and support this information and provide more thorough explanations and examples of activities.

1.1.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes the District’s regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities and then discusses these capabilities in further detail along with other mitigation efforts as they pertain to the National Flood Insurance Program’s Community Rating System (CRS). Although the CRS is flood-focused, this discussion also incorporates activities related to other hazards into the categories established by the CRS.

Regulatory Mitigation Capabilities

Table 4 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities, and indicates those that are in place in the District.

Table 4. Jefferson Conservation District — Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General or Comprehensive plan	Y	4
Zoning ordinance	N	
Subdivision ordinance	Y	1
Growth management ordinance	N	
Floodplain ordinance	N	1, 2
Other special purpose ordinance (stormwater, steep slope, wildfire)	Y	1, 2
Building code	N	
Fire department ISO rating	N	
Erosion or sediment control program	Y	1, 2

³ <http://www.nacdnet.org/policy/community-wildfire-desk-guide-and-toolkit>

Stormwater management program	Y	1, 2
Site plan review requirements	Y	1, 2
Capital improvements plan	N	
Economic development plan	N	
Local emergency operations plan	Y	3
Other special plans	N	
Flood insurance study or other engineering study for streams	N	
Elevation certificates (for floodplain development)	N	
1. Under C.R.S. § 30-28-136, the county must send subdivision applications to the conservation district for review and recommendations regarding soil suitability, flooding, and watershed protection		
2. Under 1041 powers, C.R.S. § 24-65.1, et seq., conservation districts provide technical assistance to local governments concerning resource data inventories, soils, soil suitability, erosion and sedimentation, floodwater problems, and watershed protection.		
3. The Jefferson Conservation District has been the sponsor for post-fire rehabilitation for the High Meadow and Buffalo Creek Fires under the NRCS Emergency Watershed Protection Program.		
4. JCD created maps of areas with highly erodible soils, sensitive soils, expansive soils and unstable slopes for Jefferson County.		

Administrative/Technical Mitigation Capabilities

Table 5 identifies the personnel responsible for activities related to mitigation and loss prevention for Jefferson Conservation District.

Table 5. Jefferson Conservation District — Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Yes	Staff/Board	1
Engineer/professional trained in construction practices related to buildings and/or infrastructure	No		1
Planner/engineer/scientist with an understanding of natural hazards	Yes	Staff/Board	1
Personnel skilled in GIS	Yes	GIS Technician	
Full time building official	No		
Floodplain manager	No		
Emergency manager	No		
Grant writer	Yes	Staff/Board	
Other personnel	Yes	Staff Foresters/Wildfire Professionals	1
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	Yes	GIS Technician	

Personnel Resources	Yes/No	Department/Position	Comments
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	No		
1. JCD also has technical service agreements to use USDA Natural Resources Conservation Service Technical Staff			

Fiscal Mitigation Capabilities

Table 6 Fiscal mitigation capabilities are financial tools or resources that Jefferson Conservation District could or already does use to help fund mitigation activities.

Table 6. Jefferson Conservation District — Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	No	
Capital improvements project funding	Yes	
Authority to levy taxes for specific purposes	Yes	Taxing Authority Subject to Voter Approval
Fees for water, sewer, gas, or electric services	No	
Impact fees for new development	Yes	
Incur debt through general obligation bonds	Yes	
Incur debt through special tax bonds	Yes	
Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	

Additional Mitigation Capabilities

Jefferson Conservation District conducts educational programs taught to residents, students, landowners, and other natural resources professionals. Particular programs include: Wildfire Mitigation and Forest Health, Post-Fire Erosion Control, Stormwater Management, Groundwater Protection, Sourcewater Protection, Defensible Space, Soil Hazards, and Construction Erosion Control.

1.1.5 Mitigation Goals and Objectives

Jefferson Conservation District has adopted the hazard mitigation goals and objectives developed by the HMPC and described in the Mitigation Strategy section.

1.1.6 Mitigation Actions

Jefferson Conservation District identified and prioritized the following mitigation actions based on the risk assessment conducted in the previous version of this plan (2010). This section provides updates on the actions identified in the 2010 plan.

1. Mitigation Project Title: Last Resort Creek and Kennedy Gulch Fuels Reduction

Issue/Background: The Last Resort Creek (72 acres in planning) and Kennedy Gulch (60 acres underway Dec 2015) projects are multi-resource benefit projects, meaning the prescription and operations strategy seek to address these issues: hazardous fuel reduction and utilization of removed fuels, post-disturbance landscape resiliency to protect water quality and infrastructure, community wildfire protection, and improved plant and habitat diversity. This holistic approach is supported by the newly formed Upper South Platte Partnership (USPP), which has identified these areas as high priority for post-fire soil loss and thus deserving of fuel reduction treatments. The USPP has been/will be involved with planning, technical guidance, and pre/post monitoring of these projects. Both projects occur in central Jefferson County in Last Resort Creek HUC12 watershed.

Other Alternatives: None

Responsible Office: Jefferson Conservation District

Priority (High, Medium, Low): High

Cost Estimate: \$2200/acre

Benefits (Avoided Losses): Fuel reduction near populated WUI, which translates into improved options for fire suppression; improved post-treatment plant and habitat diversity; Utilization of wood products and local logging industry; decreased potential for active crown fire in 90th percentile weather conditions.

Potential Funding: Grants and private dollars

Schedule: Kennedy Gulch: Dec 2015 – Dec 2016

Last Resort Creek: 2016 - 2017

STATUS: New in 2015

2. Mitigation Project Title: Educate Homeowners on Wildfire Hazards and Mitigation.

Issue/Background: According to wildfire exposure analysis, in the District, there are 24,001 residential structures in a moderate or higher wildfire hazard. JCD would conduct meetings with homeowners associations and display educational materials at community events. We would create YouTube videos and social media on the benefits of improving forest health and reducing wildfire risks. We would train HOA and neighborhood volunteers on how to present these issues to their neighbors.

Other Alternatives: None

Responsible Office: Jefferson Conservation District

Priority (High, Medium, Low): Medium to High

Cost Estimate: \$15,000 for handouts, pamphlets, banners. \$5,000 for “train the trainer”

Benefits (Avoided Losses): Reduction of losses to buildings and infrastructure from wildfire and postfire hazards.

Potential Funding: To be determined

Schedule: 2-3 years

STATUS: This project has not been completed as proposed, as JCD did not receive grant funds for this project. However, we have been involved in significant outreach and education efforts regarding forest health and wildfire mitigation, and this focus will continue into the future.

3. Mitigation Project Title: Doubleheader Ranch Hazardous Fuels Reduction

Issue/Background: Doubleheader Ranch is located within the Turkey Creek watershed (42 sq. miles), in Jefferson County, southwest of Denver. The watershed includes the communities of Conifer, Aspen Park, and Indian Hills, about 4,900 single-family homes, and major commercial centers. The watershed is steep and rocky with elevations ranging from 10,500 ft. to 5,600 ft. Turkey Creek flows into Bear Creek Reservoir.

Doubleheader is situated in a bowl on a south-facing slope just north of SH 285. Two-lane Doubleheader Ranch Rd. serves as primary ingress/egress for 106 homes. Slopes along the road range from 25 to 50%. The road contains steep sections and tight switchbacks. Southeast slope favors dryer open ponderosa stands. Some dense stands and beetle kill are found in the subdivision. A heavy Lodgepole stand is predominant at the north end of the subdivision. It has a high wildfire risk and hazard severity rating.

Lots sizes are about 1 acre or less. Many homes contain flammable siding and decks. The subdivision lacks emergency water supply and almost 60% of observed homes lack adequate d-space.

Areas along Doubleheader Ranch Road will receive a shaded fuel break that will extend about 100 feet along the sides of each road. Total will include about 60 acres; most of which is on steep slopes adjacent to small lots. Due to the high density of homes and steep slopes along

Other Alternatives: None

Responsible Office: Jefferson Conservation District and Jefferson County Emergency Management

Priority (High, Medium, Low): Medium to High

Cost Estimate: \$259,000

Benefits (Avoided Losses): Reduction of losses to buildings, critical facilities, and infrastructure from wildfire and post fire hazards.

Potential Funding: FEMA PDM Grant

Schedule: 2-3 years

STATUS: JCD did not complete this project, as other, higher priority projects were completed instead. This included treatment of 220 acres near the Brook Forest community, south of Evergreen, which is located in the tributary area of Bear Creek and Bear Creek Reservoir. These acres involved five private landowners and were completed over the span of three years. Goals of this project included wildfire mitigation, hazardous fuels reduction, and protecting against erosion and sedimentation into Bear Creek. Modeling using WEPP and RUSLE2 showed potential post-fire soil loss of 45-180 tons/ac/yr in the event of a severe fire. The acres will be complemented by planned future treatments on adjacent public lands under the jurisdiction of the U.S. Forest Service.

Projects Completed Since 2010

Mitigation Project Title: Sampson Road Wildfire Mitigation

Issue/Background: The Sampson Road community includes 25 residences. The primary access road grade is steep and restricted to a single lane for approximately 0.5 miles. This section includes blind turns. Fifty percent of the homes have less than 30' defensible space and 50% are located in heavy timber. The subdivision is adjacent to Lockheed Martin, a defense contractor and major county employer, and to major municipal water supplies. The wildland fire risk and hazard severity

rating is extreme. JCD did not receive funding for this project. However, the Sampson Road project was completed by Jefferson County.



ANNEX L

GOLDEN GATE FIRE PROTECTION DISTRICT

1.1 Community Profile

The Golden Gate Fire Protection District serves 1200 Colorado people living in 450 homes in an area of 50 square miles. See service area map in Figure 1. The District also serves various recreation areas including Centennial Cone Open Space Park, White Ranch Open Space Park, and Colorado Department of Wildlife lands. The Department is all-volunteer, consisting of a part-time fire chief and volunteer professionals. The Department operates two stations with two engines, two brush units, two water tenders, and one EUV.

1.1.1 Hazard Summary

A hazard identification and vulnerability analysis was completed for Golden Gate Fire District using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Worksheet, which was distributed to each participating municipality or special district to complete at the kickoff meeting in August 2015. Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County. Table 1 summarizes Golden Gate Fire District's hazards based on input provided during the planning and data collection process.

Information from the Data Collection Worksheet is summarized in Table 1 with all the hazards listed that could impact anywhere in Golden Gate Fire District's service area. The purpose of this exercise was to identify and rank the hazards and vulnerabilities unique to this jurisdiction. The hazard significance listed is based on Golden Gate Fire District HMPC member input from the Data Collection Worksheet and the risk assessment developed during the planning process (refer to Chapter 4 of the base plan).

Figure 1. Golden Gate Fire Protection District Service Area

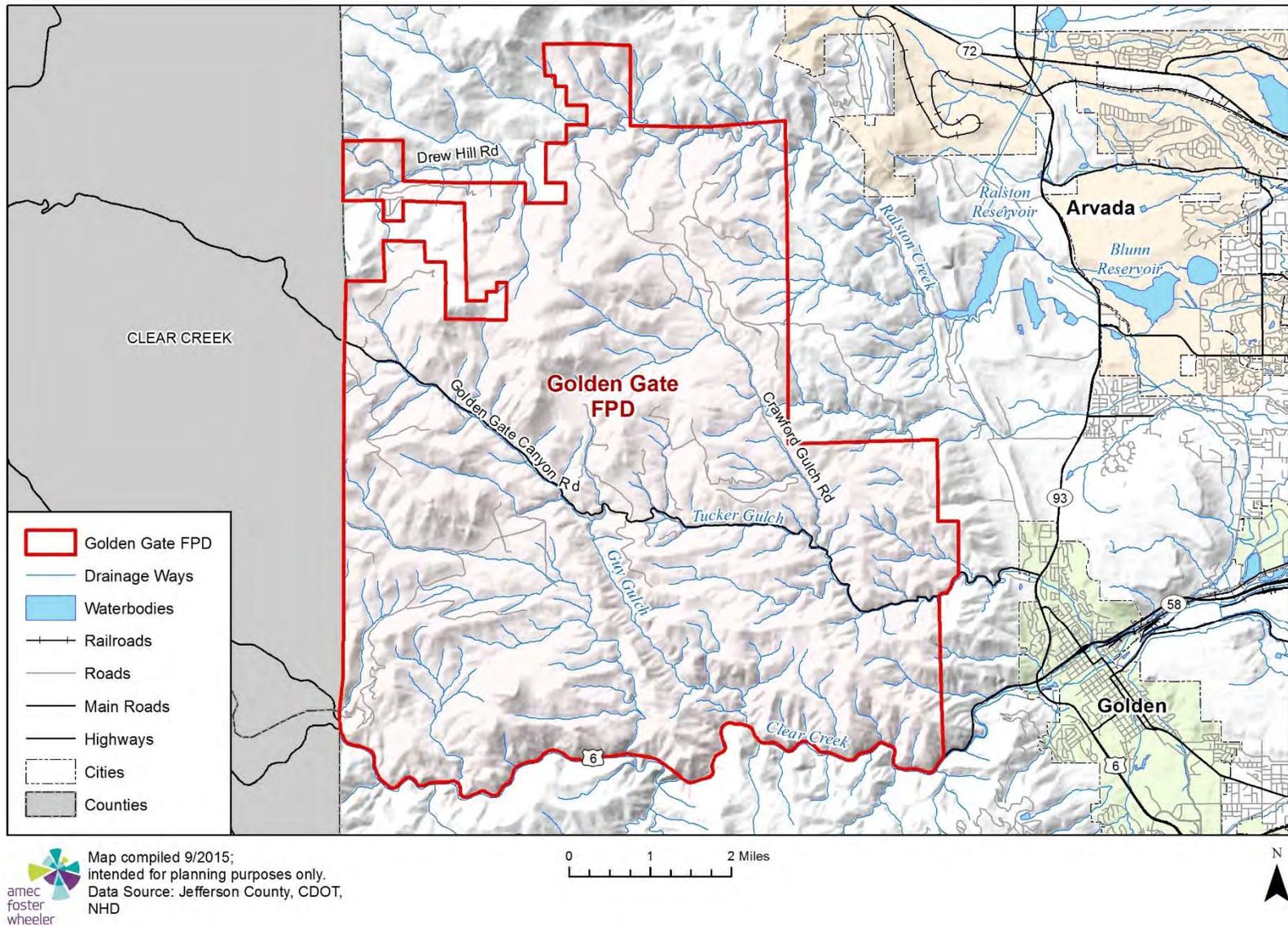


Table 1. Golden Gate Fire Protection District Hazard Summaries

Hazard	Geographic Extent	Potential of Future Occurrence	Potential Severity Magnitude	Overall Significance
Avalanche	Negligible	Occasional	Negligible	Low
Dam Failure	Negligible	Unlikely	Negligible	Low
Drought	Extensive	Likely	Limited	Medium
Earthquake	Significant	Unlikely	Limited	Low
Erosion and Deposition	Significant	Likely	Limited	Medium
Expansive Soils	Limited	Unlikely	Limited	Low
Extreme Temperatures	Extensive	Highly Likely	Negligible	Low
Flood	Significant	Likely	Limited	High
Hailstorm	Significant	Likely	Limited	Low
Landslide, Debris flow, Rockfall	Significant	Highly Likely	Limited	High
Lightning	Significant	Highly Likely	Limited	High
Severe Winter Storms	Extensive	Highly Likely	Limited	Medium
Subsidence	Negligible	Unlikely	Negligible	Low
Tornado	Negligible	Unlikely	Limited	Low
Wildfire	Extensive	Highly Likely	Critical	High
Windstorm	Extensive	Highly Likely	Negligible	Low
<p>Geographic Extent <u>Negligible:</u> Less than 10 percent of planning area or isolated single-point occurrences <u>Limited:</u> 10 to 25 percent of the planning area or limited single-point occurrences <u>Significant:</u> 25 to 75 percent of planning area or frequent single-point occurrences <u>Extensive:</u> 75 to 100 percent of planning area or consistent single-point occurrences</p>		<p>Probability of Future Occurrences <u>Unlikely:</u> Less than 1 percent probability of occurrence in the next year, or has a recurrence interval of greater than every 100 years. <u>Occasional:</u> Between a 1 and 10 percent probability of occurrence in the next year, or has a recurrence interval of 11 to 100 years. <u>Likely:</u> Between 10 and 90 percent probability of occurrence in the next year, or has a recurrence interval of 1 to 10 years <u>Highly Likely:</u> Between 90 and 100 percent probability of occurrence in the next year, or has a recurrence interval of less than 1 year.</p>		
<p>Potential Magnitude/Severity <u>Negligible:</u> Less than 10 percent of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first aid or within the response capability of the jurisdiction. <u>Limited:</u> 10 to 25 percent of property is severely damaged, facilities and services are unavailable for between 1 and 7 days, injuries and illnesses require sophisticated medical support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities. <u>Critical:</u> 25 to 50 percent of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period of time, or result in many permanent disabilities and a few deaths. <u>Catastrophic:</u> More than 50 percent of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the medical response system is overwhelmed for an extended period of time or many deaths occur.</p>		<p>Overall Significance <u>Low:</u> Two or more of the criteria fall in the lower classifications or the event has a minimal impact on the planning area. This rating is also sometimes used for hazards with a minimal or unknown record of occurrences and impacts or for hazards with minimal mitigation potential. <u>Medium:</u> The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is also sometimes utilized for hazards with a high impact rating but an extremely low occurrence rating. <u>High:</u> The criteria consistently fall along the high ranges of the classification and the event exerts significant and frequent impacts on the planning area. This rating is also sometimes utilized for hazards with a high psychological impact or for hazards that the jurisdiction identifies as particularly relevant.</p>		

Previous Hazard Events

Through the Data Collection Guide, the Fire Protection District noted specific historic hazard events to include in the community profile. These events have been incorporated into the appropriate hazard chapters in the base plan. These events had a particular impact on the community beyond the impacts and events recorded in the Jefferson County Hazard Mitigation Plan. This is not a comprehensive summary of past incidents, as the hazard profiles collected in the main Mitigation Plan include other events that may have historically impacted the jurisdiction.

Elk Creek Fire - May 14-15, 1991

The Elk Creek fire in the Golden Gate FPD burned 102 acres. The steep terrain with limited access lead to the use of hand crews formed from 80+ firefighters from 15 departments and ranging across multiple counties. The fire was managed jointly by the FPDs and the Jefferson County Sheriff's Office's newly formed Incident Management Group (IMG).

Flash Flood - June 27, 2004

A deluge of very heavy rain from nearly stationary thunderstorms caused flooding and flash flooding problems over parts of Jefferson County. In Jefferson County, an automated rain gauge north of Golden measure 3.6 inches of rain in one hour. Numerous homes were flooded in Golden, including one that was 146 years old. The home was listed as a complete loss. In addition, State Highway 93 had to be closed from the Pine Ridge subdivision (near 6th Ave and Hwy 93) to Golden Gate Canyon Road. At the height of the storm, about 4 feet of water covered Colorado 93 through Golden, forcing its temporary closure. Rockfall and debris flows were also reported in Golden Gate Canyon.

Centennial Cone Fire - July 21-23, 2006

The Centennial Cone fire burned in the no-man's land adjacent to the Golden Gate FPD. The fire, which burned 22 acres, remained entirely contained within the open space park. However, the significant fire activity in steep terrain with no road access during the height of the 2006 national fire season limited the initial attack. The fire threatened U.S. Highway 6 in Clear Creek Canyon and those subdivisions. Limited air resources helped slow the spread of the fire, and an interagency "hotshot" hand crew supplemented local fire resources on the second day for a direct attack. Summer monsoons helped reduce fire danger on day three as the fire was controlled.

Indian Gulch Fire – March 20-25, 2011

The Indian Gulch Fire started on March 20, 2011 in the area of Mount Galbraith, between Clear Creek Canyon and Golden Gate Canyon, 0.5 miles West of Golden, Colorado and burned 1,570 acres. The fire was 100% contained on March 25, 2011.

1.1.2 Vulnerability Assessment

The intent of this section is to assess Golden Gate Fire District’s vulnerability separately from that of the planning area as a whole, which has already been addressed in the Vulnerability Assessment in the main plan. For more information about how hazards affect the County as a whole, see Risk Assessment.

District Asset Inventory

Table 2 lists critical facilities and other community assets identified as important to protect in the event of a disaster.

Table 2. Golden Gate Fire Protection District Critical Facilities and Other Community Assets

Name of Asset	Type*	Replacement value	Occupancy/capacity	Hazard Specific issues
Station #1	EI		Fire Station	
Station #2	EI		Fire Station	
Golden Gate Canyon Road	EI		Canyon Road	Main District Access
Robinson Hill Road	EI		Canyon Road	Main District Access
Crawford Gulch Road	EI		Access	Main District Access
Douglas Mountain Drive	EI		Access	Main District Access

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: natural assets

Vulnerability by Hazard

This section examines those existing and future structures and other assets at risk to hazards ranked of moderate or high significance that vary from the risks facing the entire planning area and estimates potential losses.

Vulnerable Populations

The District is home to a high population of senior adults. Evacuation of some residents will be required in an emergency situation which poses a potential challenge in winter weather with steep incline, native surface roads.

Wildfire

Golden Gate Fire Protection District does have exposure risk to wildfire both in terms of critical facilities and parcels/structures in WUI communities.

According to the GIS based analysis of wildfire described in Section 4.3, Golden Gate FPD has a total of 4 critical facilities at risk to wildfire (see Table 3) and 377 improved parcels in the WUI communities of Bear Paw, Bear Road/Lower Canyon, Douglas Mtn South, Geneva Glen, North Ranch, Rye Gulch, The Grange, Thea Gulch, Douglas Mtn North, Drew Hill, Guy Hill,

Horseradish Gulch, Red School Ranch, Robinson Hill East & West, Window Rock totaling over \$176 million in value at risk (see Table 4).

Table 3. Golden Gate Fire District Critical Facilities At-Risk to Wildfire by Type

Fire Type	Category	Facility Type	Facility Count
Active Crown Fire	Transportation and Lifelines	Communication	1
	Total		1
Passive Crown Fire	Transportation and Lifelines	Communication	2
	Total		2
Surface Fire	High Potential Loss Facilities	Government Facility	1
	Total		1
Grand Total			4

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, Golden Gate Fire CWPP

Table 4. Golden Gate Fire District WUI Communities and Values At-Risk

WUI Hazard Class	Improved Parcels	Improved Value	Content Value	Total Value	WUI Community
Extreme	0	\$0	\$0	\$0	-
Very High	0	\$0	\$0	\$0	-
High	110	\$32,943,597	\$16,471,799	\$49,415,396	Bear Paw, Bear Road/Lower Canyon, Douglas Mtn South, Geneva Glen, North Ranch, Rye Gulch, The Grange, Thea Gulch
Moderate	183	\$58,794,095	\$29,397,048	\$88,191,143	Douglas Mtn North, Drew Hill, Guy Hill, Horseradish Gulch, Red School Ranch, Robinson Hill East & West, Window Rock
Low	0	\$0	\$0	\$0	-
n/a	84	\$25,755,077	\$12,877,539	\$38,632,616	-
Total	377	\$117,492,769	\$58,746,385	\$176,239,154	

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, Golden Gate Fire CWPP

Other Hazards

In the case of other hazards that are not specific to geography such as drought, hailstorms, winter storms, earthquake, lightning, tornado and windstorm the entire building inventory and population in the District is potentially exposed. That is the reason for the asset inventory provided in section 1.3. It should be noted that no hazard in this plan is expected to cause widespread impacts to this inventory.

1.1.3 Growth and Development Trends

Growth is limited as most land is privately held. There are only 4 non-residential properties which include the 2 fire stations and public grange building. There is limited subdividing of land for development. There is also augmentation of parkland by Jefferson County Open Space including Centennial Cone and the proposed Douglas Mountain open space of 964 acres.

1.1.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. The capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

Regulatory Mitigation Capabilities

Regulatory mitigation capabilities include the planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities. Table 5 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Golden Gate Fire. Many of the regulatory capabilities used by local jurisdictions are not applicable to the District.

Table 5. Golden Gate Fire Protection District Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General or Comprehensive plan	County	
Zoning ordinance	County	Unincorporated Jefferson County
Subdivision ordinance	Yes	Limited small HOA's for informational purpose only
Growth management ordinance	No	
Floodplain ordinance	County	
Other special purpose ordinance (stormwater, steep slope, wildfire)	County	
Building code	Yes	2003 IFC Adopted, currently reviewing 2015 code
Fire department ISO rating	9	
Erosion or sediment control program	No	
Stormwater management program	No	
Site plan review requirements	Yes	County
Capital improvements plan	Yes	County
Economic development plan	No	
Local emergency operations plan		

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
Other special plans	Yes	2011 CWPP
Flood insurance study or other engineering study for streams	No	
Elevation certificates (for floodplain development)	No	
Other	Yes	Burn permits, driveway inspection

Community Wildfire Protection Plan - 2011

Golden Gate FPD has a Community Wildfire Protection Plan (CWPP) last updated in 2011. The CWPP was developed for the Golden Gate FPD with guidance and support from Jefferson County Division of Emergency Management, Colorado State Forest Service and the United States Forest Service. The CWPP profiles Golden Gate FPD by outlining its specific risks and then provides a number of recommended actions (Section 5.2) to achieve reduction of vulnerabilities.

Administrative/Technical Mitigation Capabilities

Table 6 identifies the personnel responsible for activities related to mitigation and loss prevention for Golden Gate Fire Protection District.

Table 6. Golden Gate Fire District Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Yes	County	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	County	
Planner/engineer/scientist with an understanding of natural hazards	Yes	County	
Personnel skilled in GIS	Yes	County	
Full time building official	Yes	County	
Floodplain manager	Yes	County	
Emergency manager	Yes	County	
Grant writer	Yes	Fire Board	
Other personnel	Yes	Fire Board and Fire Chief	

Personnel Resources	Yes/No	Department/Position	Comments
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	Yes	County	
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Yes	County	
Other			

Fiscal Mitigation Capabilities

Fiscal mitigation capabilities are financial tools or resources that Golden Gate Fire District could or already does use to help fund mitigation activities. Table 7 lists the fiscal mitigation capabilities available to Golden Gate Fire District.

Table 7. Golden Gate Fire District Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	No	
Capital improvements project funding	Unknown	Verify with County
Authority to levy taxes for specific purposes	Unknown	Verify with County
Fees for water, sewer, gas, or electric services	No	
Impact fees for new development	Unknown	Verify with County
Incur debt through general obligation bonds	No	
Incur debt through special tax bonds	No	
Incur debt through private activities	No	
Withhold spending in hazard prone areas	Yes	
Other		

Mitigation Outreach and Partnerships

The District does send informational notices/reminders via email about fire mitigation practices and other safety related topics.

Past Mitigation Efforts/Projects

A grant was awarded in 2015 to provide backup power to the District's fire stations. In 2016, Jefferson County purchasing will manage the bid process for the procurement and installation of 2 generators for each fire station.

A grant was received in 2015 for new Fire Bunker Gear and Gear Washer for all Fire Fighters. This grant has been processed and new gear was handed out in November 2015.

1.1.5 Mitigation Goals and Objectives

Golden Gate Fire District has adopted the hazard mitigation goals and objectives developed by the HMPC and described in the Mitigation Strategy section.

1.1.6 Mitigation Actions

Golden Gate Fire District identified and prioritized the following mitigation actions based on the risk assessment. Background information on how each action will be implemented and administered, such as ideas for implementation, responsible agency, potential funding, estimated cost, and timeline also are included.

#1 - Public Education on Wildfire Mitigation and Firewise Workshop

Priority:	Medium
Issue/Background:	Continued education for the community in the effort to mitigate wildfire hazards
Ideas for Implementation:	Outreach through community emails, newsletters, and workshops
Responsible Agency:	Golden Gate Fire District
Partners:	
Potential Funding:	Mainly through donations of both time and dollars.
Cost Estimate:	Low other than volunteers' time
Benefits: (Losses Avoided)	Education of what steps to be taken for mitigation and prevention
Timeline:	Ongoing with monthly / yearly topics
Status:	New in 2016

#2 – Improve Wildland Fire Resources

Priority:	High
Issue/Background:	Working with a 100% volunteer department requires continued efforts to add resources to the department and community.
Ideas for Implementation:	Recruit/retain firefighters, acquire new equipment, add 3 rd fire station, additional cisterns, FEMA fire mitigation grant
Responsible Agency:	Golden Gate Fire District
Partners:	Jefferson County, FEMA
Potential Funding:	Through continued donation efforts and drives, along with application and grant awards
Cost Estimate:	TBD on a case by case basis
Benefits: (Losses Avoided)	Resources will affect the responsiveness of the department. Additional Fire Fighters will spread individuals across the district adding new skills. Equipment, Stations, and Cisterns add more ability to respond and minimize risk and damage from emergency events.
Timeline:	Ongoing
Status:	New in 2016

ANNEX M

PLEASANT VIEW METRO DISTRICT

1.1 Community Profile

Pleasant View Metropolitan District is a census-designated place (CDP) in Jefferson County, Colorado. The District is made up of two separate CDPs: East Pleasant View (CDP) and West Pleasant View (CDP). For purposes of this plan, the two will be treated as one entity, see Figure 1. The combined population was 4,196 as of the 2010 census.

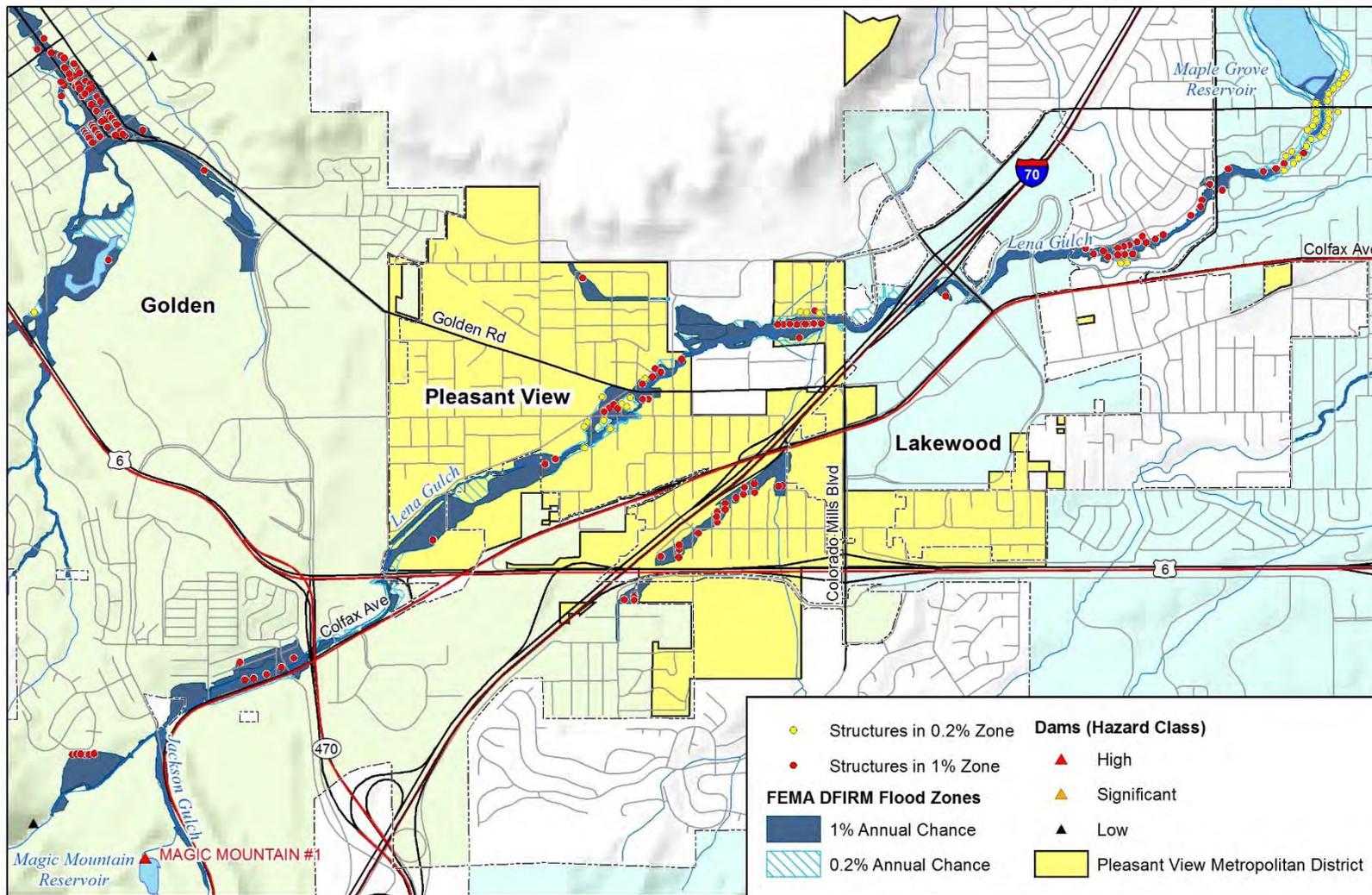
1.1.1 Hazard Summary

A hazard identification and vulnerability analysis was completed for the Pleasant View Metropolitan District using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County. Table 1 summarizes Pleasant View Metropolitan District's hazards. For the 2015 plan update, the Pleasant View Metropolitan District's planning team members were asked to revisit and validate or update the matrix based on the current experience and perspective of the district.

The hazard significance listed in Table 1 is based on Pleasant View Metropolitan District HMPC member input and the risk assessment developed during the planning process (refer to Chapter 4 of the base plan). Based on this the most significant hazard for the Pleasant View Metropolitan District is flood.

Figure 1. Pleasant View Metropolitan District FEMA Flood Hazards and At-Risk Properties



amec
foster
wheeler

Map compiled 10/2015;
intended for planning purposes only.
Data Source: Jefferson County, CDOT,
NHD, FEMA DFIRM 02/05/2014

0 0.5 1 Miles



Table 1. Pleasant View Metropolitan District – Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Avalanche	Unlikely	Limited	Negligible	Low
Dam Failure	Unlikely	Limited	Negligible	Low
Drought	Likely	Significant	Negligible	Medium
Earthquake	Unlikely	Limited	Negligible	Low
Erosion and Deposition	Unlikely	Limited	Negligible	Low
Expansive Soils	Unlikely	Limited	Negligible	Low
Extreme Temperatures	Occasional	Significant	Negligible	Low
Flood	Occasional	Significant	Limited	High
Hailstorm	Occasional	Significant	Limited	Medium
Landslide, Debris flow, Rockfall	Unlikely	Limited	Negligible	Low
Lightning	Occasional	Limited	Negligible	Low
Severe Winter Storms	Occasional	Significant	Negligible	Medium
Subsidence	Unlikely	Limited	Negligible	Low
Tornado	Unlikely	Limited	Limited	Low
Wildfire	Likely	Limited	Negligible	Low
Windstorm	Likely	Limited	Negligible	Low
Frequency of Occurrence: Highly Likely: Near 100% probability in next year. Likely: Between 10 and 100% probability in next year or at least one chance in ten years. Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years. Unlikely: Less than 1% probability in next 100 years.		Potential Magnitude: Catastrophic: Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50% of property is severely damaged Critical: Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 25% of property is severely damaged Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged Negligible: Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.		
Spatial Extent: Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		Significance: Low, Medium, High		

Previous Hazard Events

Pleasant View Metropolitan District was impacted by the severe storms in September 2013 that caused flooding in many parts of Colorado. The waters of Lena Gulch running through both Camp George West Community Park and Westblade Park flooded. No damage was reported in the parks except for debris and the erosion and widening of the gulch walls.

Vulnerability to Specific Hazards

This section details vulnerability to specific hazards, where quantifiable, and where it differs from that of the overall County. The results of detailed GIS analyses used to estimate potential for future losses are presented here, in addition to maps of hazard areas. For a discussion of the methodology used to develop the loss estimates refer to Section 4.3 of the Base Plan.

Flood

According to the GIS vulnerability assessment conducted for this plan update, Pleasant View has some flood risk in terms of the potential for loss of life and damage to property, see Figure 1.

Pleasant View has 45 improved parcels in the 1% annual chance floodplain, 2 of which are commercial, 3 of which are industrial, one of which is mixed use and 39 of which are residential.

In the 0.2% annual chance floodplain, Pleasant View has 13 properties, 2 of which are commercial and 11 of which are residential.

Note that this is based on computer modeling that may not reflect site specific mitigation activities.

Dam Failure

The Magic Mountain #1 dam in Golden (see Figure 1) is upstream from Pleasant View and, if breached, could inundate the Lena Gulch Drainage and numerous properties in the District.

Other Hazards

Pleasant View has no wildfire or geologic hazard risk. In the case of other hazards that are not specific to geography such as drought, hailstorms, winter storms, lightning, tornado, and windstorm the entire building inventory and population in the District is potentially exposed. That is the reason for the asset inventory provided in Section 1.3. It should be noted that no hazard in this plan is expected to cause widespread impacts to this inventory.

1.1.2 District Assets

Table 2 is an inventory of assets identified by the District's planning team. This inventory includes critical facilities. For more information about how "critical facility" is defined in this plan, see Section 4.3 Vulnerability Assessment.

Table 2. Pleasant View Metropolitan District’s Assets and Critical Facilities

Name of Asset	Type	Replacement Value (\$)	Occupancy/Capacity #**	Hazard Specific Info
Pleasant View Fire Department	EI	2.0 mil	B	None

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: natural assets

** B = Business per International Fire Code Occupancy classification.

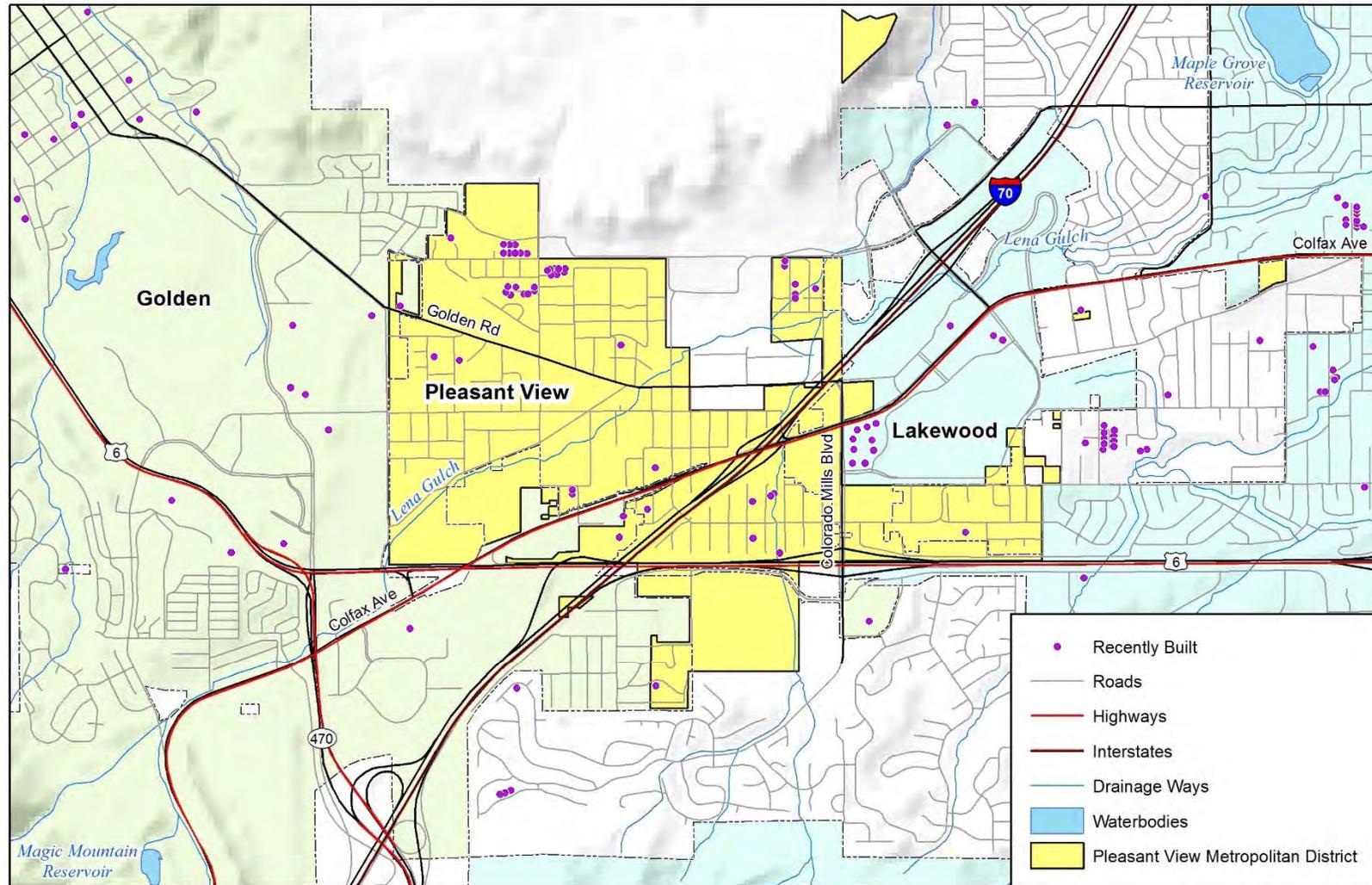
1.1.3 Growth and Development Trends

Pleasant View is surrounded by Golden to the West and Lakewood to the east making expansion of the jurisdiction impossible. There is, however, some limited infill happening in the district. See Figure 2.

Development around Pleasant View continues with the completion of the West Line RTD light rail transit corridor, the Colorado Mills Mall, the Jefferson County municipal facility and redevelopment of parts of the National Renewable Energy Laboratory (NREL).

All of these factors add population and activity to the area, which could increase exposure to hazards.

Figure 2. Pleasant View Metropolitan District Recently Built 2009 to 2015




 Map compiled 10/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD

0 0.5 1 Miles



1.1.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes Pleasant View’s regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities and then discusses these capabilities in further detail along with other mitigation efforts as they pertain to the National Flood Insurance Program’s Community Rating System (CRS). Although the CRS is flood-focused, this discussion also incorporates activities related to other hazards into the categories established by the CRS.

Mitigation Capabilities Summary

Table 3 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the District.

Table 3. Pleasant View Metropolitan District’s Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General or Comprehensive plan	Yes	Jefferson County
Zoning ordinance	Yes	Jefferson County
Subdivision ordinance	Yes	Jefferson County
Growth management ordinance	Yes	Jefferson County
Floodplain ordinance	Yes	Jefferson County
Other special purpose ordinance (stormwater, steep slope, wildfire)	Yes	Jefferson County
Building code	Yes	Jefferson County
Fire department ISO rating	5	ISO Rating
Erosion or sediment control program	No	
Stormwater management program	Yes	Urban Drainage & Flood Dist.
Site plan review requirements		
Capital improvements plan	No	
Economic development plan	No	
Local emergency operations plan	Yes	Jefferson County
Other special plans		
Flood insurance study or other engineering study for streams	Yes	Jefferson County
Elevation certificates (for floodplain development)	Yes	Jefferson County
BCEGS Ratings	N/A	

Table 4 identifies the personnel responsible for mitigation and loss prevention activities as well as related data and systems in the District.

Table 4. Pleasant View Metropolitan District’s Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	No		Jefferson County
Engineer/professional trained in construction practices related to buildings and/or infrastructure	No		Jefferson County
Planner/engineer/scientist with an understanding of natural hazards	No		Jefferson County
Personnel skilled in GIS	No		Jefferson County
Full time building official	No		Jefferson County
Floodplain manager	No		Jefferson County
Emergency manager	No		Jefferson County
Grant writer	No		Jefferson County
Other personnel	No		Jefferson County
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	No		Jefferson County
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	No		Jefferson County

Table 5 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 5. Pleasant View Metropolitan District’s Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	No	
Capital improvements project funding	No	
Authority to levy taxes for specific purposes	Yes	Voter Approval Needed
Fees for water, sewer, gas, or electric services	No	
Impact fees for new development	No	
Incur debt through general obligation bonds	Yes	Voter Approval Needed
Incur debt through special tax bonds	Yes	Voter Approval Needed
Incur debt through private activities	No	
Withhold spending in hazard-prone areas	No	

1.1.5 Mitigation Actions

This section of the Jefferson County Hazard Mitigation Plan provides updates on the actions originally identified in the 2010 plan and includes revisions identified in 2015-2016.

1. Flood mitigation of Lena Gulch through West Blade Park located at 16780 Mt Vernon Road.

Issue/Background: Pleasant View Metropolitan District is a small community that provided Fire/Rescue and Park/Recreation services to approximately 4600 residents. The District maintains and operates (4) four parks within our community. Two of these parks have Lena Gulch that runs directly through them. Lena Gulch runs through West Blade Park has had flood mitigation work done on the west side and also further down on the east side. The water flow from the west side of the park has been improved and the issues in that area have been corrected, but once it leaves this area and enters the park property on the west side the water flows is restricted. This causes a backup and potential for flooding of properties downstream. This is a concern to the District because of the potential of loss of life and or property. The District wants to protect our residents from the possible dangers of flooding and be proactive in the process of mitigating this hazard.

Priority: Medium to High

Cost: To be determined

Benefits (avoided losses): Reduced property loss from floods, and continue working on way to improve the flood danger throughout our Community.

STATUS: This project has been deferred. Some preliminary work has been completed and there have been some discussions with other entities concerning the maintenance of this specific stretch of Lena Gulch.

Projects Completed Since 2010

Flood mitigation of Lena Gulch through Pleasant View Community Park at Camp George West located at 1220 Kilmer St.

Issue/Background: Pleasant View Metropolitan District is a small community that provided Fire/Rescue and Park/Recreation services to approximately 4600 residents. The District maintains and operates (4) four parks within our community. Two of these parks have Lena Gulch that runs directly through them. Lena Gulch runs through Pleasant View Community Park at Camp George West has had flood mitigation work done on the west side and also further down on the east side. The water flow from the west side of the park has been improved and the issues in that area have been corrected, but once it leaves this area and enters the park property on the west side the water flows is restricted. This causes a backup and potential for flooding of properties downstream. This

is a concern to the District because of the potential of loss of life and or property. The District wants to protect our residents from the possible dangers of flooding and be proactive in the process of mitigating this hazard.

Priority: Medium to High

Cost: \$14,250

Benefits (avoided losses): Reduced property loss from floods, and continue working on way to improve the flood danger throughout the Community.

STATUS: This project has been completed. To help reduce the severity of loss from future flooding, the District has removed much of the woody debris from within the waterway. Periodic maintenance will be needed to manage woody debris.



ANNEX N

NORTH FORK FIRE PROTECTION DISTRICT

1.1 Community Profile

North Fork Volunteer Fire Department provides fire suppression, fire prevention services and emergency medical care to the residents and visitors of the North Fork Fire Protection District. The district is approximately 250 square miles in area with close to 1,700 residents. See service area map in Figure 1.

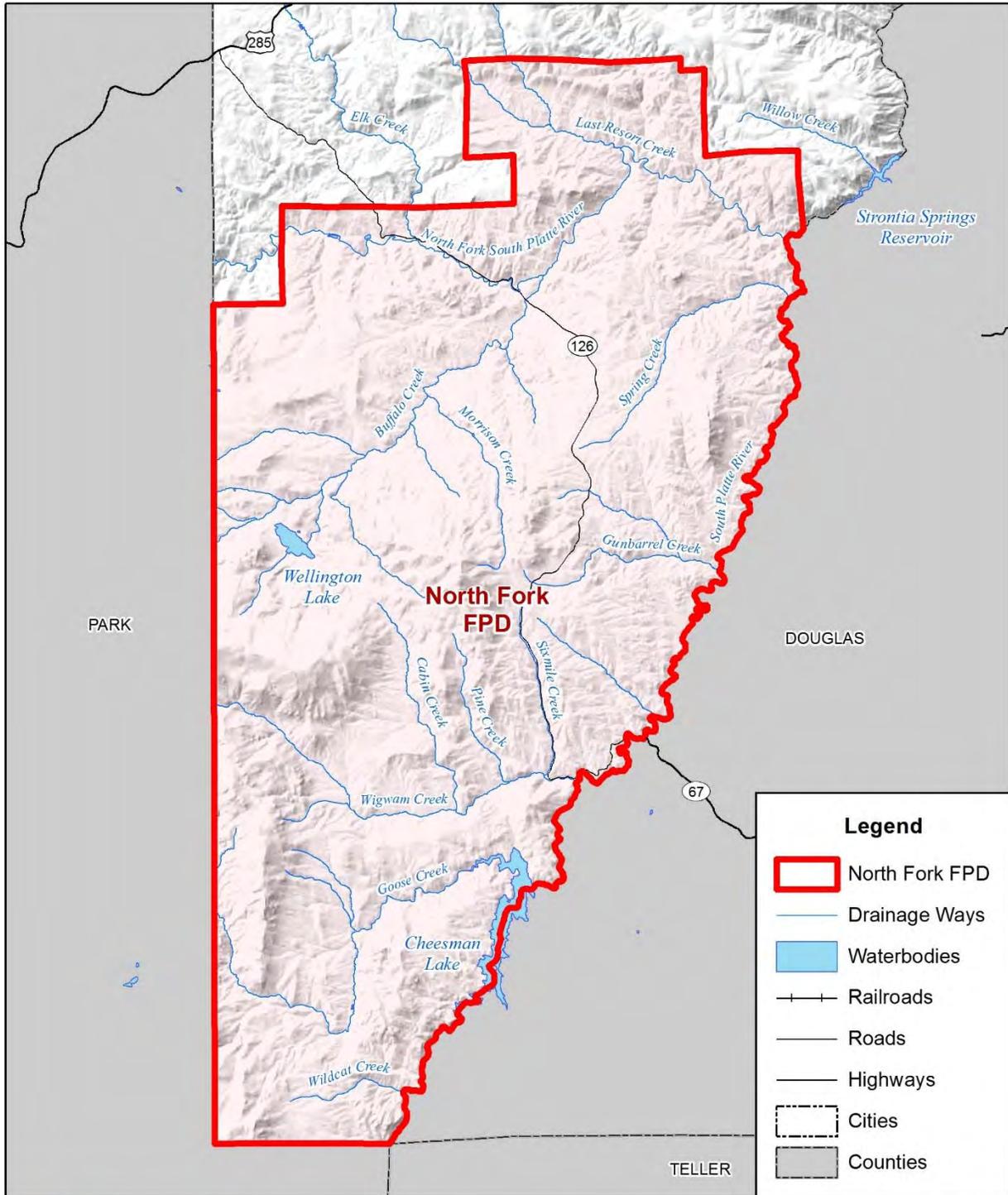
1.1.1 Hazard Summary

A hazard identification and vulnerability analysis was completed for the North Fork Fire Protection District using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County. Table 9 summarizes North Fork Fire Protection District's hazards. For the 2015 plan update, the North Fork Fire Protection District's planning team members were asked to revisit and validate or update the matrix based on the current experience and perspective of the district.

The hazard significance listed in Table 1 is based on North Fork Fire Protection District HMPC member input and the risk assessment developed during the planning process (refer to Chapter 4 of the base plan). Based on this the most significant hazards for the North Fork Fire Protection District are flood and wildfire.

Figure 1. North Fork Fire Protection District Service Area



Map compiled 11/2015;
intended for planning purposes only.
Data Source: Jefferson County, CDOT,
NHD

0 2.5 5 Miles



Table 1. North Fork Fire Protection District – Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Avalanche	Unlikely	Limited	Negligible	Low
Dam Failure	Occasional	Limited	Catastrophic	Medium
Drought	Likely	Limited	Negligible	Low
Earthquake	Unlikely	Limited	Negligible	Low
Erosion and Deposition	Likely	Limited	Negligible	Low
Expansive soils	Unlikely	Limited	Negligible	Low
Extreme Temperatures	Occasional	Limited	Negligible	Low
Flood	Likely	Limited	Catastrophic	High
Hailstorm	Occasional	Limited	Negligible	Low
Landslide, Debris flow, Rockfall	Likely	Limited	Limited	Medium
Lightning	Highly Likely	Significant	Negligible	Medium
Severe Winter Storms	Highly Likely	Significant	Limited	Medium
Subsidence	Unlikely	Limited	Negligible	Low
Tornado	Unlikely	Limited	Negligible	Low
Wildfire	Highly Likely	Extensive	Catastrophic	High
Windstorm	Likely	Limited	Limited	Medium
Frequency of Occurrence: Highly Likely: Near 100% probability in next year. Likely: Between 10 and 100% probability in next year or at least one chance in ten years. Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years. Unlikely: Less than 1% probability in next 100 years.		Potential Magnitude: Catastrophic: Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50% of property is severely damaged Critical: Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 25% of property is severely damaged Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged Negligible: Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.		
Spatial Extent: Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		Significance: Low, Medium, High		

Previous Hazard Events

Through the Data Collection Guide, the Fire Protection District noted specific historic hazard events to include in the community profile. These events have been incorporated into the appropriate hazard chapters in the base plan. These events had a particular impact on the community beyond the impacts and events recorded in the Jefferson County Hazard Mitigation Plan. This is not a comprehensive summary of past incidents, as the hazard profiles collected in the main Mitigation Plan include other events that may have historically impacted the jurisdiction.

Buffalo Creek Fire - May 18-25, 1996

The Buffalo Creek fire burned approximately 10,400 acres. High winds caused extreme fire behavior, leading to a 10 mile run in only six hours. 10 homes or other outbuildings were lost. This fire marked the first large WUI fire in the Front Range. Costs for the fire were estimated at \$3,835,000.

Hayman Fire - June 8-Mid July, 2002

The Hayman Fire burned more than 138,000 acres. The human caused fire expanded on the second day for a historic 19-mile run and 70,000 acres. Multiple evacuations over a two-week period were required as the fire made additional ‘runs’ in multiple counties. Over 150 homes and structures were lost, and large areas of damage were caused to Cheeseman Reservoir and South Platte Watershed areas.

Lower North Fork Fire - March 26-31, 2012

The Lower North Fork wildfire south of Conifer scorched a total of 4,150 acres. Strong southwest winds ahead of an approaching cold front produced high to extreme fire danger across the Front Range Foothills and Palmer Divide. As a result, a 50-acre prescribed burn that had been conducted the previous week reignited in the foothills of Jefferson County, southwest of Denver. The strong wind gusts carried embers from the interior of the burn area, across containment lines and into very dry fuels which initiated the wildfire. It then spread into the crowns of the trees and driven by the strong winds, quickly advanced to the northeast onto private lands. Local firefighters immediately responded to the wildfire, but were unable to contain it, due to the extreme winds and dry and abundant fuels.

The combination of very strong winds, record warm temperatures and extremely dry conditions for month of March; all contributed to a rapid increase in fire growth during the afternoon of March 26th. A total of 900 homes were evacuated on the 26th. The fire destroyed 27 homes and resulted in the deaths of three local residents. The property damage alone was estimated to be \$11 million. The wildfire was not 100 percent contained until April 2nd.

1.1.2 Vulnerability Assessment

The intent of this section is to assess North Fork Fire Protection District’s vulnerability separately from that of the planning area as a whole, which has already been addressed in the Vulnerability Assessment in the main plan. For more information about how hazards affect the County as a whole, see Risk Assessment.

District Asset Inventory

Table 2 is a detailed inventory of assets identified by the District’s planning team. This inventory includes critical facilities. For more information about how “critical facility” is defined in this plan, see Section 4.3 Vulnerability Assessment.

Table 2. North Fork Fire Protection District’s Assets

Name of Asset	Type	Replacement Value (\$)	Occupancy/Capacity #**	Hazard Specific Info
North Fork Station One	EI	\$750,000	B	None
North Fork Station Two	EI	\$500,000	B	None
North Fork Station Three	EI	\$300,000	B	None

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: natural assets

** B = Business per International Fire Code Occupancy classification.

Vulnerability by Hazard

This section examines those existing and future structures and other assets at risk to hazards ranked of moderate or high significance that vary from the risks facing the entire planning area and estimates potential losses.

Wildfire

North Fork Fire Protection District does have exposure risk to wildfire both in terms of critical facilities and parcels/structures in WUI communities.

According to the GIS based analysis of wildfire, North Fork FPD has a total of 6 critical facilities at risk to wildfire (see Table 3) and 552 improved parcels in the WUI communities of Buffalo Creek Intermix & WUI, Foxton Longview Intermix & WUI, Pine Grove Intermix, Oxyoke Swayback Trumbull Deckers Intermix, Spring Creek Intermix and Shiloh totaling over \$167 million in value at risk (see Table 4).

Table 3. North Fork Fire Protection District Critical Facilities At-Risk to Wildfire by Type

Fire Type	Category	Facility Type	Facility Count
Active Crown Fire	Transportation and Lifelines	Bridge	1
	Transportation and Lifelines	Communication	1
	Total		2
Passive Crown Fire	High Potential Loss Facilities	PK-12 School	1
	Transportation and Lifelines	Bridge	1
	Total		2
Surface Fire	Transportation and Lifelines	Bridge	1
	Transportation and Lifelines	Waste Water Facility	1
	Total		2

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, North Fork Fire CWPP

Table 4. North Fork Fire District WUI Communities and Values At-Risk

WUI Hazard Class	Improved Parcels	Improved Value	Content Value	Total Value	WUI Community
Extreme	13	\$6,028,400	\$3,014,200	\$9,042,600	Shiloh
Very High	0	\$0	\$0	\$0	-
High	358	\$47,912,708	\$23,956,354	\$71,869,062	Buffalo Creek Intermix & WUI, Foxtan Longview Intermix & WUI, Pine Grove Intermix
Moderate	96	\$21,798,560	\$10,899,280	\$32,697,840	Oxyoke Swayback Trumbull Deckers Intermix, Spring Creek Intermix
Low	0	\$0	\$0	\$0	-
n/a	85	\$35,815,647	\$17,907,824	\$53,723,471	-
Total	552	\$111,555,315	\$55,777,658	\$167,332,973	

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, North Fork Fire CWPP

Other Hazards

In the case of other hazards that are not specific to geography such as drought, hailstorms, winter storms, earthquake, lightning, tornado and windstorm the entire building inventory and population in the District is potentially exposed. That is the reason for the asset inventory provided in section 1.3. It should be noted that no hazard in this plan is expected to cause widespread impacts to this inventory.

1.1.3 Growth and Development Trends

North Fork Fire Protection District lies to the southwest of Littleton. The District has seen approximately 1/3 or more of its acreage burned by wildfire in the past 10 years. Limited growth is anticipated due to intermix of private lands in the Pike National Forest. The North Fork Fire Protection District continues to provide fire and emergency services to large portion of the watershed of the Denver Metropolitan area. This includes Cheesman Reservoir, Wellington Lake, several miles of the South Platte River and North Fork of the South Platte.

1.1.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes the District’s regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities and then discusses these capabilities in further detail along with other mitigation efforts as they pertain to the National Flood Insurance Program’s Community Rating System (CRS). Although the CRS is flood-focused, this discussion also incorporates activities related to other hazards into the categories established by the CRS.

Mitigation Capabilities Summary

North Fork Fire Protection District's Regulatory Mitigation Capabilities include a wildfire ordinance (2003 Urban Interface Fire Code) and a building code (Jefferson County Building Code). The District has a Fire Department ISO rating of 6.

Table 5 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 5. North Fork Fire Protection District's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Y	Remodel Station 2
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	Y	Voter approval needed
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	N	
Incur debt through general obligation bonds	Y	Voter approval needed
Incur debt through special tax bonds	Y	Voter approval needed
Incur debt through private activities	N	
Withhold spending in hazard-prone areas	N	

Additional Capabilities

Public Education Programs: General fire safety programs which include wildland fire mitigation and preparedness.

ISO Rating

The Department maintains an ISO 6 rating for all properties within 5 miles of any fire station.

Community Wildfire Protection Plan - 2011

The 2011 North Fork CWPP provides an overview of the District, outlines the methodology used for assessing risk in the District and lists a number of treatment options (such as: machine mowing, prescribed burning, brush mastication, timber mastication, manual thinning and felling) and specific actions aimed at reducing overall wildfire risk.

1.1.5 Mitigation Actions

This section of the Jefferson County Hazard Mitigation Plan provides updates on the actions originally identified in the 2010 plan and new actions identified in 2016.

1. Mitigation Project Title: Public Outreach and Education on Wildfire Mitigation

Issue/Background: Following recommendations set forth in the North Fork 2011 CWPP we would like to improve our Community Education Program. This will involve informing the public of the inherent risk of wildland fire in the area through community meetings and distribution of educational materials. Education is important to prepare citizens for wildfire and to teach them about taking mitigation action on their own properties to minimize wildfire impacts.

Other Alternatives: No viable alternatives.

Responsible Office: North Fork Fire Protection District

Priority: High

Cost Estimate: \$6,000 over 5 years.

Benefits (Avoided Losses): Improve personal safety in the event of a wildfire. Reduction in homes/property loss due to wildfire.

Potential Funding: Grant funding

Schedule: Within 2 years

STATUS: New in 2016

2. Mitigation Project Title: Recruit & Retain additional Volunteer Firefighters

Issue/Background: The North Fork Fire Department has a current roster of 25 firefighters. Several members are nearing retirement. The District has identified the need to maintain staffing of 25-35 firefighters. The Department covers a large geographic area with small population base. Maintaining adequate staffing level is difficult. The District would like to add 10 additional firefighters.

Other Alternatives: No viable alternatives.

Responsible Office: North Fork Fire Protection District

Priority: High

Cost Estimate: \$30,000

Benefits (Avoided Losses): Adequate staffing levels are imperative to insure prompt initial attack in wildland and structural settings.

Potential Funding: Operating budget. Grant funding will also be pursued.

Schedule: Within 3-4 years

STATUS: The North Fork Fire Protection has been able to maintain staffing of 25 firefighters but unable to add the additional 10 firefighters. There have been several factors that have contributed to being unable to reach this goal. There is a very limited population base within our District to recruit and retain volunteer firefighters from. The last several years of a slow economy has impacted our general operating revenues leaving little funds to implement the recruiting and equipping new volunteer firefighters. Career staffing is financially impossible to achieve this goal. This project will continue to be a high priority for our District in the future.

ANNEX O

LOOKOUT MOUNTAIN WATER DISTRICT

1.1 Community Profile

Lookout Mountain Water District (LMWD) is a Special District as governed by Title 32 of the Colorado Revised Statutes. In terms of a system it is comprised of tap owners and property owners included in the District's boundaries, the Board of Directors, and the contractors and consultants who provide operation and management. The District is managed by a five member board of directors. It has no employees. Operations are handled by a contracted secretary-administrator and a contracted operations manager. Its assets include the land, rights to water within its reservoirs, a treatment facility, and components of the distribution system, such as the main pipeline and meters. Water from LMWD is distributed to about 500 households, governmental agencies and businesses by gravity flows. The District serves treated water through a 14 to 20 inch diameter pipeline owned by LWMD, and several branch lines, variously owned throughout the District's extent. See Figure 1.

1.1.1 Hazard Summary

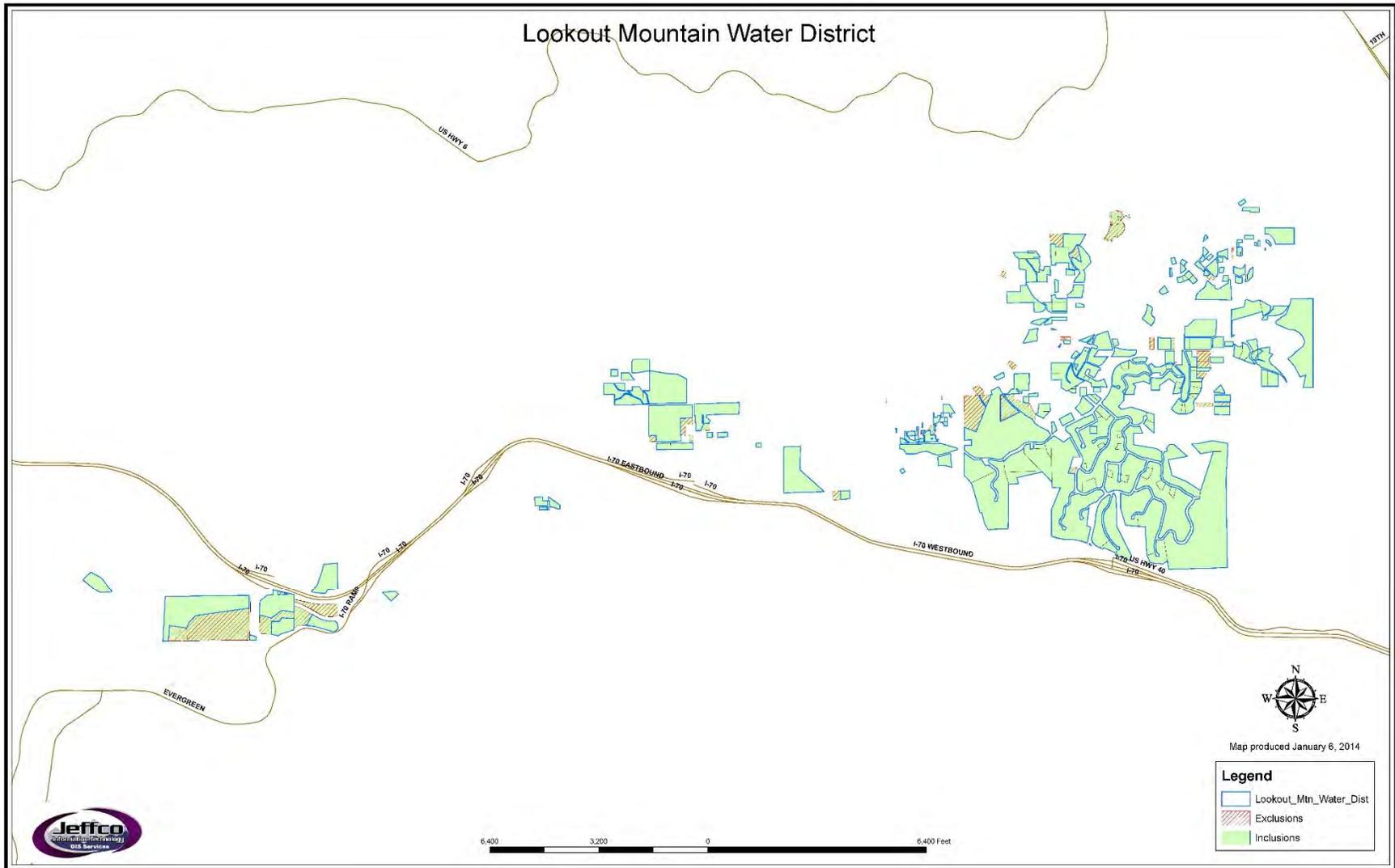
A hazard identification and vulnerability analysis was completed for the LMWD using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County.

For this plan update, the LMWD planning team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the District.

The data in Table 1 reflect the most significant hazards for the District. They are: dam failure, flood and drought.

Figure 1. Lookout Mountain Water District Service Area



The hazard significance listed is based on Lookout Mountain Water District HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (refer to Chapter 4 of the base plan). The risk assessment was a more detailed qualitative analysis with better available data that varied.

Table 1. Lookout Mountain Water District – Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Avalanche	Unlikely	Limited	Limited	Low
Dam Failure	Unlikely	Limited	Limited	High
Drought	Likely	Extensive	Catastrophic	High
Earthquake	Unlikely	Limited	Limited	Low
Erosion and Deposition	Occasional	Limited	Limited	Low
Expansive Soils	Occasional	Limited	Limited	Low
Extreme Temperatures	Occasional	Extensive	Limited	Low
Flood	Occasional	Limited	Limited	High
Hailstorm	Highly Likely	Extensive	Negligible	Medium
Landslide, Debris flow, Rockfall	Likely	Limited	Negligible	Low
Lightning	Highly Likely	Significant	Limited	Low
Severe Winter Storms	Highly Likely	Extensive	Limited	Medium
Subsidence	Occasional	Limited	Negligible	Low
Tornado	Occasional	Limited	Critical	Low
Wildfire	Highly Likely	Significant	Critical	High
Windstorm	Highly Likely	Significant	Limited	Low
Frequency of Occurrence: Highly Likely: Near 100% probability in next year. Likely: Between 10 and 100% probability in next year or at least one chance in ten years. Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years. Unlikely: Less than 1% probability in next 100 years.		Potential Magnitude: Catastrophic: Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50% of property is severely damaged Critical: Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 25% of property is severely damaged Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged Negligible: Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.		
Spatial Extent: Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		Significance: Low, Medium, High		

Vulnerability to Specific Hazards

This section details vulnerability to specific hazards, where quantifiable, and where it differs from that of the overall County. The results of detailed GIS analyses used to estimate potential for future losses are presented here, in addition to maps of hazard areas. For a discussion of the methodology used to develop the loss estimates refer to Section 4.3 of the Base Plan.

Flooding

According to the LMWD, flooding affects the LMWD in elevation ranges from 11,500 feet on Squaw Mountain to 7,200 feet on the western extent of the District. The District is hampered in identifying a total of flood-prone areas by repeated cross-drainage topography and diversion points which intersect overland flows. The flood pattern is generally confined from the lower Beaver Brook Dam, along Beaver Brook, until its confluence with Clear Creek, near Tunnel 2 on Highway 6, well north of the District's service area in Jefferson County.

Dam Failure

LMWD owns and operates 2 storage dams for water supply purposes and one for augmentation. Two are located in Clear Creek County, and one is located in Jefferson County. Lookout Mountain Dam is profiled in Table 4.3 in Section 4.3.2. All three of these dams are classified as high hazard dams. Two dams are used for water supply purposes for the District and one is used for augmentation. Each dam has an emergency action plan (EAP). The Lookout Mountain dam is above Golden. The water held by the dam is released by the District for water rights purposes. Normally there is less than 80 acre feet of water stored in the reservoir. There are no structures below the dam until after the water flows beyond Highway US 6, which is significantly below the dam. The Lookout Mountain Reservoir Dam had a discharge pipe misalignment in 1974. This problem was corrected by sliplining and no further problems have occurred.

Drought

With its semiarid conditions, drought is a natural part of the Colorado climate cycle. The drought issue is further compounded by water rights specific to a region. A reduction in water quality deterioration is a problem related to drought, as well as the speed at which dead and fallen trees dry out and become particularly dangerous as fuel sources in wildfires. Drought may also weaken trees in areas already affected by mountain pine beetle infestations. An ongoing drought which inhibits natural plant growth cycles may increase susceptibility of the area to wildfire for a period of time. Drought impacts increase with the length of a drought. A multi-year drought could impact the District's ability to provide water in the service area, as storage capacity in the District's reservoirs along Beaver Brook is limited. Since LMWD is the only source of water for over 500 homes and businesses, a prolonged drought that dries out the system would be a catastrophe.

Wildfire

Wildfire in and around the District can cause erosion and sedimentation, which would adversely impact source water quality.

1.1.2 District Assets

Table 2 is a detailed inventory of assets identified by the District’s planning team. This inventory includes critical facilities. For more information about how “critical facility” is defined in this plan, see Section 4.3 Vulnerability Assessment.

Table 2. Lookout Mountain Water District’s Assets

Name of Asset	Type	Replacement Value (\$)	Occupancy/Capacity #	Hazard Specific Info
Upper Beaver Brook reservoir and dam	EI	\$10 million		
Lower Beaver Brook reservoir and dam	EI	\$10 million		
LMWD water treatment plant	EI	\$5 million		
LMWD main pipeline	EI	\$20 million		
Lookout Mountain Water District Storage Tank	EI	\$3 million	1 million gallons of potable water	
Lookout Mountain Dam	EI	\$10 million		

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: natural assets

1.1.3 Growth and Development Trends

The District is almost 90% built out to its authorized 550 water taps. Future growth is limited by the size of the small catchment basin that feeds the District’s main reservoirs.

1.1.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes Lookout Mountain Water District’s regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities and then discusses these capabilities in further detail along with other mitigation efforts as they pertain to the National Flood Insurance Program’s Community Rating System (CRS). Although the CRS is flood-focused, this discussion also incorporates activities related to other hazards into the categories established by the CRS.

Mitigation Capabilities Summary

Table 3 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the District.

Table 3. Lookout Mountain Water District’s Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General or Comprehensive plan	No	
Zoning ordinance	No	
Subdivision ordinance	No	
Growth management ordinance	No	
Floodplain ordinance	No	
Other special purpose ordinance (stormwater, steep slope, wildfire)	Yes	Dam Safety (EAPs)
Building code	No	
Fire department ISO rating	No	
Erosion or sediment control program	No	
Stormwater management program	No	
Site plan review requirements	No	
Capital improvements plan	No	
Economic development plan	No	
Local emergency operations plan	No	
Other special plans	No	
Flood insurance study or other engineering study for streams	No	
Elevation certificates (for floodplain development)	No	

Table 4 identifies the personnel responsible for mitigation and loss prevention activities as well as related data and systems in the District.

Table 4. Lookout Mountain Water District’s Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	No		
Engineer/professional trained in construction practices related to buildings and/or infrastructure	No		
Planner/engineer/scientist with an understanding of natural hazards	No		
Personnel skilled in GIS	No		
Full time building official	No		
Floodplain manager	No		
Emergency manager	No	Clear Creek County Jefferson County	
Grant writer	No		
Other personnel	No		
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	No		
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	No		

Table 5 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 5. Lookout Mountain Water District’s Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	No	
Capital improvements project funding	Yes	
Authority to levy taxes for specific purposes	Yes	Voter Approval Needed
Fees for water, sewer, gas, or electric services	Yes	
Impact fees for new development	No	
Incur debt through general obligation bonds	Yes	Voter Approval Needed
Incur debt through special tax bonds	No	
Incur debt through private activities	No	
Withhold spending in hazard-prone areas	No	

Additional Capabilities

- Lookout Mountain Water District structures their rates for conservation. Water restrictions are implemented when needed. The District also conducts ongoing conservation outreach for its clients.
- All clay pipe was removed by 1989.
- Meters on lateral line connections have been installed.

1.1.5 Mitigation Actions

This section of the Jefferson County Hazard Mitigation Plan provides updates on the actions originally identified in the 2010 plan and identifies new projects from the 2015/2016 planning process.

1. Conduct a Leak Detection Survey

Background: A leak detection survey is needed along 48,000 linear feet of the main pipeline and the lateral pipelines served by it. In 2009, the Water Commissioner ordered a payback of 117 acre feet of water that the District consumed over the 2008-2009 winter season, but was not legally entitled to. About 33 acre feet of the 117 acre feet was due to leaks in the distribution pipelines that have been repaired once located (325,851 gallons = 1 acre foot).

Other Alternatives: No action.

Responsible Office: Lookout Mountain Water District

Priority: Low/Medium

Cost Estimate: To be determined.

Timeline: Within 5 years.

Benefits (losses Avoided): The District would maintain higher water levels in each reservoir, keeping more water available in the event of drought.

STATUS: New in 2015. Completed with ongoing efforts to reduce losses.

2. Modify or replace Lookout Mountain Dam

Background: Lookout Mountain Dam was constructed in 1903 as a holding basin for the City of Golden water system. The dam and its reservoir no longer perform this function and are used for augmentation/exchange on Clear Creek. Due to operating and legal inefficiencies, this dam needs

upgrades and a relocation of its water discharge to a point upstream of the intakes of superior water rights holders.

Other Alternatives: Purchase water for augmentation

Responsible Office: LMWD

Priority: high

Cost estimate: \$1-10 million

Benefits (losses Avoided): avoid the need to purchase water for release in drought years

Potential Funding: CWCB, FEMA

Timeline: 5 – 10 years

Status: New in 2015. Planning underway; funding needs to be identified

3. Expand storage capacity at upper Beaver Brook reservoir

Background: LMWD has determined that an additional 140 acre feet of water can be stored in Upper Beaver Brook reservoir if the reservoir level can be raised by 10’ with a labyrinth weir in the spillway. The additional stored water will enable LMWD to weather a multi-year drought.

Other alternatives: Purchase water for release from other Clear Creek water rights holders

Responsible Office: LMWD

Priority: high

Cost estimate: \$3 million

Timeline: within the next 2 years

Potential Funding: CWCB loan

Benefits: the expansion will increase drinking water storage capacity by about 50% and increase the ability of LMWD to supply water during a multi-year drought

Status: New in 2015. Planning and financing in process, construction scheduled to begin summer 2016

4. Repair lower Beaver Brook Dam

Background: The Lower Beaver Brook dam has been identified as having deficiencies due to changing Colorado state standards and the addition of fulltime downstream residents. The state engineer and LMWD are in discussions about the scope of the repairs and their timetable.

Other alternatives: none

Responsible Office: Lookout Mountain Water District

Priority: high

Cost Estimate: \$1-10 million

Timeline: within 5-10 years

Potential Funding: FEMA, CWCB

Benefits: continued use of a critical infrastructure component

Status: New in 2015. Planning underway, funding needs to be identified.

5. Upgrade water distribution pipelines on Lookout Mountain to improve wildfire fighting capabilities

Background: Aside from the LMWD main water pipeline, less than half of the lateral pipelines that distribute water into the neighborhoods of Lookout Mountain are capable of supplying enough water to fight a large wildfire and/or to provide structure protection during a wildfire event. In other words, hydrants cannot be supported where needed. These lateral pipelines should be upgraded from their current undersized 1 to 4" diameter to 8" diameter pipe. Some additional lines will also be needed for underserved areas. These undersized distribution lines have a combined total length of over 9 miles. Hydrants will need to be installed at recommended intervals along the new or upgraded pipelines.

Other alternatives: Water tanker trucks/aircraft

Responsible Office: LMWD

Priority: High

Cost Estimate: \$5-9 million

Timeline: within 5-10 years

Potential Funding: FEMA

Benefits: \$+500 million (estimated value of structures on Lookout Mountain) + value of lives saved

Status: New in 2015. Formation of a new Special Fire Hydrant District with taxing authority-unprecedented; no provision in current state law.

6. Partial Renovation and Improvement to Sections of the Main Pipeline

Background: The infrastructure of LMWD is aging and is in need of updating. Infrastructure costs are quite large, while the District is small, and has very limited opportunities to expand. Annual renovations and improvements will allow the District to increase efficiency over time.

Other Alternatives: No action.

Responsible Office: Lookout Mountain Water District

Priority: Low/Medium

Cost Estimate: To be determined

Timeline: Annually, dependent on fund availability

Benefits (losses Avoided): Leaks that are not detectable because of cracks in the aged line will be fixed. This will lead to greater efficiency in the water delivery structure, and will aid the district during times of low reservoir levels.

STATUS: Partially completed with ongoing maintenance on an as-needed schedule.

ANNEX P

INDIAN HILLS FIRE PROTECTION DISTRICT

1.1 Community Profile

Indian Hills is a census-designated place (CDP) and a U.S. Post Office in Jefferson County, Colorado. The population was 1,280 at the 2010 census. According to the United States Census Bureau, the CDP has a total area of 4.7 square miles, all of it land. The Indian Hills Fire Protection District service area is displayed in Figure 1.

1.1.1 Hazard Summary

A hazard identification and vulnerability analysis was completed for the Indian Hills Fire Protection District using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County. Table 4 summarizes Indian Hills Fire Protection District's hazards. For the 2015 plan update, the Indian Hills Fire Protection District's planning team members were asked to revisit and validate or update the matrix based on the current experience and perspective of the district.

The hazard significance listed in Table 1 is based on Indian Hills Fire Protection District HMPC member input and the risk assessment developed during the planning process (refer to Chapter 4 of the base plan). Based on this the most significant hazards for the Indian Hills Fire Protection District are hailstorm, lightning, severe winter storms and wildfire.

Figure 1. Indian Hills Fire Protection District Service Area

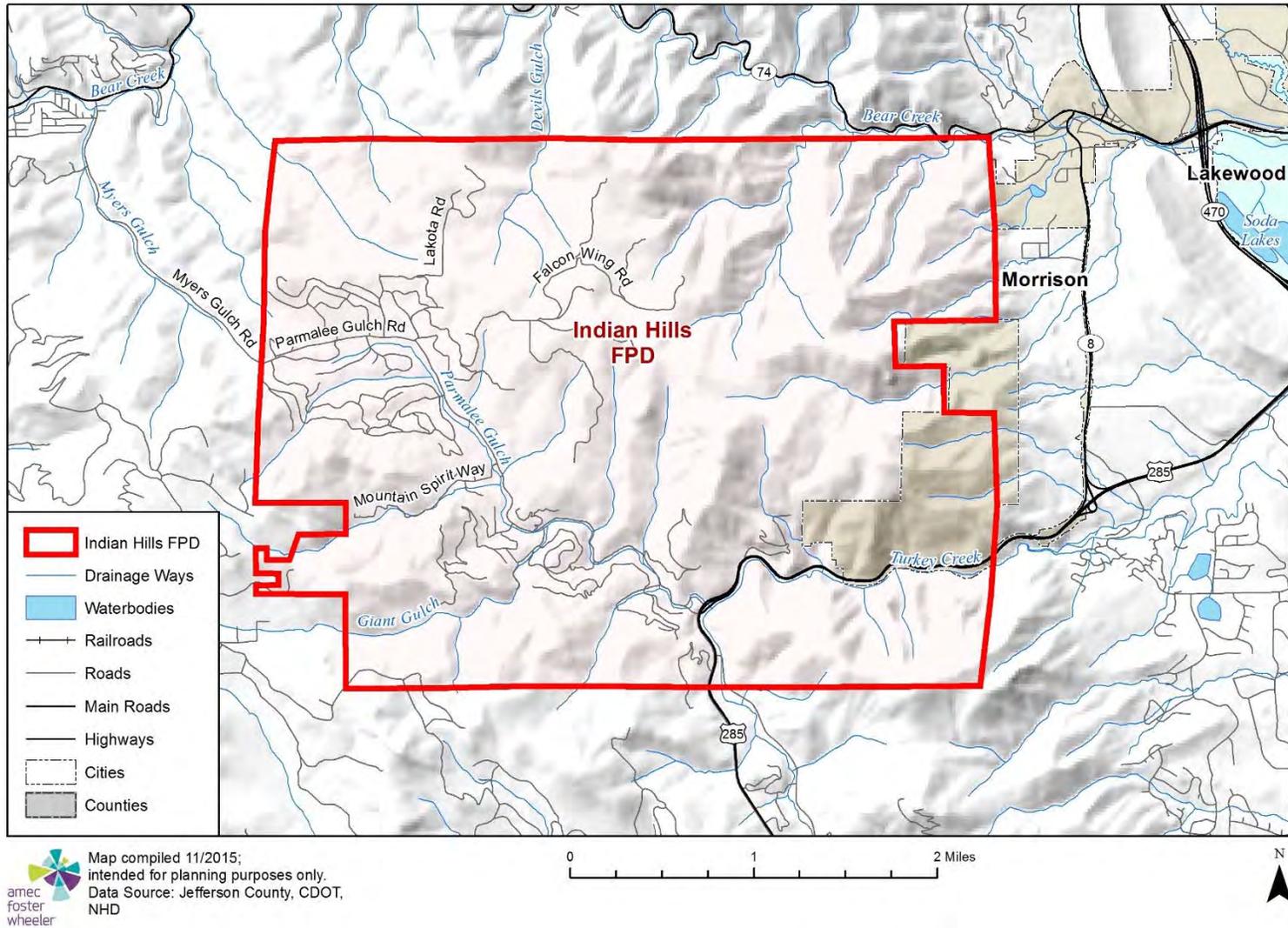


Table 1. Indian Hills Fire Protection District – Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Avalanche	Unlikely	Limited	Negligible	Low
Dam Failure	Unlikely	Limited	Negligible	Low
Drought	Likely	Extensive	Limited	Medium
Earthquake	Unlikely	Extensive	Catastrophic	Low
Erosion and Deposition	Occasionally	Significant	Limited	Low
Expansive Soils	Unlikely	Limited	Negligible	Low
Extreme Temperatures	Likely	Extensive	Limited	Medium
Flood	Occasionally	Limited	Limited	Medium
Hailstorm	Likely	Extensive	Negligible	High
Landslide, Debris flows, Rockfall	Occasionally	Limited	Negligible	Medium
Lightning	Highly Likely	Extensive	Negligible	High
Severe Winter Storms	Highly Likely	Extensive	Limited	High
Subsidence	Occasionally	Significant	Negligible	Low
Tornado	Unlikely	Extensive	Catastrophic	Low
Wildfire	Highly Likely	Extensive	Catastrophic	High
Windstorm	Likely	Extensive	Limited	Medium
Frequency of Occurrence: Highly Likely: Near 100% probability in next year. Likely: Between 10 and 100% probability in next year or at least one chance in ten years. Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years. Unlikely: Less than 1% probability in next 100 years.		Potential Magnitude: Catastrophic: Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50% of property is severely damaged Critical: Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 25% of property is severely damaged Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged Negligible: Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.		
Spatial Extent: Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		Significance: Low, Medium, High		

Previous Hazard Events

Through the Data Collection Guide, the District noted specific historic hazard events to include in the community profile. These events have been incorporated into the appropriate hazard chapters in the base plan. These events had a particular impact on the community beyond the impacts and events recorded in the Jefferson County Hazard Mitigation Plan. This is not a comprehensive summary of past incidents, as the hazard profiles collected in the main Mitigation Plan include other events that may have historically impacted the jurisdiction.

1.1.2 Vulnerability Assessment

The intent of this section is to assess the District’s vulnerability separately from that of the planning area as a whole, which has already been addressed in the Vulnerability Assessment in the main plan. For more information about how hazards affect the County as a whole, see the Risk Assessment in Chapter 4.

District Asset Inventory

Table 2 is a detailed inventory of assets identified by the District’s planning team. This inventory includes critical facilities. For more information about how “critical facility” is defined in this plan, see Section 4.3 Vulnerability Assessment.

Table 2. Indian Hills Fire Protection District Assets

Name of Asset	Type	Address	Replacement Value (\$)	Occupancy/ Capacity #**	Hazard Specific Vulnerability
Indian Hills Fire One Station	EI	4476 Parmalee Gulch Rd	\$2,000,000	B	Fire, wind, flooding, terrorism
Indian Hills Water Department	EI			B	Fire, wind, flooding, terrorism, Hazmat
Parmalee Elementary	VF	4460 Parmalee Gulch Rd			

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: natural assets

** B = Business per International Fire Code Occupancy classification.

Vulnerability by Hazard

This section examines those existing and future structures and other assets at risk to hazards ranked of moderate or high significance that vary from the risks facing the entire planning area and estimates potential losses.

Wildfire

Indian Hills Fire Protection District does have exposure risk to wildfire both in terms of critical facilities and parcels/structures in WUI communities.

According to the GIS based analysis of wildfire, Indian Hills FPD has a total of 3 critical facilities at risk to wildfire (see **Error! Reference source not found.**) and 710 improved parcels in the WUI communities of 285 Area, Bear Mtn Vista, Lower & Upper Indian Hills, Pine Valley Estates totaling over \$345 million in value at risk (see Table 4). All of these WUI communities have a ‘High’ hazard ranking.

Table 3. Indian Hills Fire Protection District Critical Facilities At-Risk to Wildfire by Type

Fire Type	Category	Facility Type	Facility Count
Active Crown Fire	Transportation and Lifelines	Aircraft Facility	1
	Total		1
Passive Crown Fire	Transportation and Lifelines	Communication	1
	Total		1
Surface Fire	Transportation and Lifelines	Aircraft Facility	1
	Total		1

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, Indian Hills Fire CWPP

Table 4. Indian Hills Fire District WUI Communities and Values At-Risk

WUI Hazard Class	Improved Parcels	Improved Value	Content Value	Total Value	WUI Community
Extreme	0	\$0	\$0	\$0	-
Very High	0	\$0	\$0	\$0	-
High	689	\$186,303,220	\$93,151,610	\$279,454,830	285 Area, Bear Mtn Vista, Lower & Upper Indian Hills, Pine Valley Estates
Moderate	0	\$0	\$0	\$0	-
Low	0	\$0	\$0	\$0	-
n/a	21	\$43,731,462	\$21,865,731	\$65,597,193	-
Total	710	\$230,034,682	\$115,017,341	\$345,052,023	

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, Indian Hills Fire CWPP

Other Hazards

In the case of other hazards that are not specific to geography such as drought, hailstorms, winter storms, earthquake, lightning, tornado and windstorm the entire building inventory and population in the District is potentially exposed. That is the reason for the asset inventory provided in section 1.3. It should be noted that no hazard in this plan is expected to cause widespread impacts to this inventory.

1.1.3 Growth and Development Trends

Maintaining the mountain community character of Indian Hills is a primary concern of residents. New development, both commercial and residential, needs to be well planned and designed in order to meet the unique and sometimes restrictive environment of the mountains. An issue of particular concern is platting. Many of the areas in Indian Hills were platted in the 1920's and 1930's. These plats created individual lots, many of which are as small as 50' x 50' in size. As individual lots, they do not meet current buildable standards for septic/leach fields or setbacks. The consequences of continuing to allow building on these old plats in the mountains are the obvious continued degradation of water supplies, and overcrowding of County and community roads. Features that make Indian Hills unique are its open space, visual resources, historic sites, rural character and abundance of wildlife. New development in Indian Hills needs to take all of these characteristics into consideration in order to plan wisely for the future.

The Indian Hills Community Plan was approved by the Jefferson County Planning Commission on July 24th, 2013. It guides the land use rules and regulations for the Indian Hills Community. General land use recommendations take into consideration forest health and fire mitigation practices.

Since adoption of the Jefferson County Comprehensive Master Plan in 2010, both the policies in the Indian Hills Community Plan and policies in the Comprehensive Master Plan apply to land use proposals. Specific policies in the Community Plan are still applicable, but general policies in the Comprehensive Master Plan now take precedent over the general policies in the Community Plan.

1.1.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes the District's regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities and then discusses these capabilities in further detail along with other mitigation efforts as they pertain to the National Flood Insurance Program's Community Rating System (CRS). Although the CRS is flood-focused, this discussion also incorporates activities related to other hazards into the categories established by the CRS.

Mitigation Capabilities Summary

Table 5 lists planning and land management a tool typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the District.

Table 5. Indian Hills Fire Protection District’s Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General or Comprehensive plan	No	Jeffco Comp. Plan, Indian Hills Community Plan
Zoning ordinance	No	Jeffco
Subdivision ordinance	No	Jeffco
Growth management ordinance	No	Jeffco
Floodplain ordinance	No	Jeffco
Other special purpose ordinance (stormwater, steep slope, wildfire)	No	Jeffco
Building code	Yes	Jeffco
Fire department ISO rating	6	officemanager@ihfr.org
Erosion or sediment control program	No	Jeffco
Stormwater management program	No	Jeffco
Site plan review requirements	Yes	Jeffco
Capital improvements plan	No	
Economic development plan	No	Jeffco
Local emergency operations plan	No	Jeffco
Other special plans	Yes	CWPP (2007)
Flood insurance study or other engineering study for streams	No	Jeffco
Elevation certificates (for floodplain development)	No	Jeffco

Table 6 identifies the personnel responsible for mitigation and loss prevention activities as well as related data and systems in the District.

Table 6. Indian Hills Fire Protection District’s Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	No		Jeffco
Engineer/professional trained in construction practices related to buildings and/or infrastructure	No		Jeffco
Planner/engineer/scientist with an understanding of natural hazards	No		Jeffco
Personnel skilled in GIS	No		Jeffco
Full time building official	No	Part Time Fire Marshall	ranrud@intercanyonfire.org
Floodplain manager	No		Jeffco
Emergency manager	No		Jeffco
Grant writer	Yes	Fire Chief	

Personnel Resources	Yes/No	Department/Position	Comments
Other personnel			
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	No		Jeffco
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	No		Jeffco

Table 7 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 7. Indian Hills Fire Protection District's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	N	
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	Y	With voter approval
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	Y	Jeffco
Incur debt through general obligation bonds	Y	With voter approval
Incur debt through special tax bonds	Y	With voter approval
Incur debt through private activities	N	
Withhold spending in hazard-prone areas	N	

1.1.5 Mitigation Actions

This section of the Jefferson County Hazard Mitigation Plan provides updates on the actions originally identified in the 2010 plan. The 2010 plan indicated one mitigation action titled 'Community Emergency Response Team (CERT) Training Program.' The project included training a citizens based team that is trained to assist the community during a major incident or disaster when local emergency responders may be overwhelmed. The project was noted as ongoing during the 2016 update but was replaced with the following project which has more of a focus on hazard mitigation.

1. Mitigation Project Title: Update CWPP to reflect changing conditions and new development

Issue/Background: This project will update the local Community Wildfire Protection Plan (CWPP) to reflect changing conditions and new development. The current plan is out of date and with the new development and changing conditions the accuracy of the data is questionable. Implementation would most likely require the hiring of a specific consulting firm to gather data and create a new plan. This project would be done in coordination with a similar project sponsored by Jefferson County.

Other Alternatives: Continue to rely on outdated plan

Responsible Office: Indian Hills Fire Protection District in partnership with Jefferson County OEM

Priority (High, Medium, Low): Medium

Cost Estimate: To be determined but approximately \$ 15-40K

Benefits (Avoided Losses): Better data will ultimately lead to better mitigation activities, better planning, and ultimately a more effective response.

Potential Funding: Grant funding – state and federal

Schedule: 2016-2018



ANNEX Q

EVERGREEN FIRE PROTECTION DISTRICT

1.1 Community Profile

The Evergreen Fire Protection District (EFPD), situated approximately 30 miles west of Denver on the eastern slopes of Mount Evans. The elevation of Evergreen is approximately 7,500 feet and the elevation within the fire district ranges from 6,720 to 10,500 feet. As its name implies, Evergreen is a heavily forested region that is dissected by streams and expansive grassy meadows. Evergreen Fire/Rescue (EFR) serves nearly 40,000 residents across EFPD's more than 120 square miles. See Figure 1. Subdivision characteristics range from rugged ridge top developments to luxury fairway homes. Commercial development is primarily service oriented and concentrated along primary roadways.

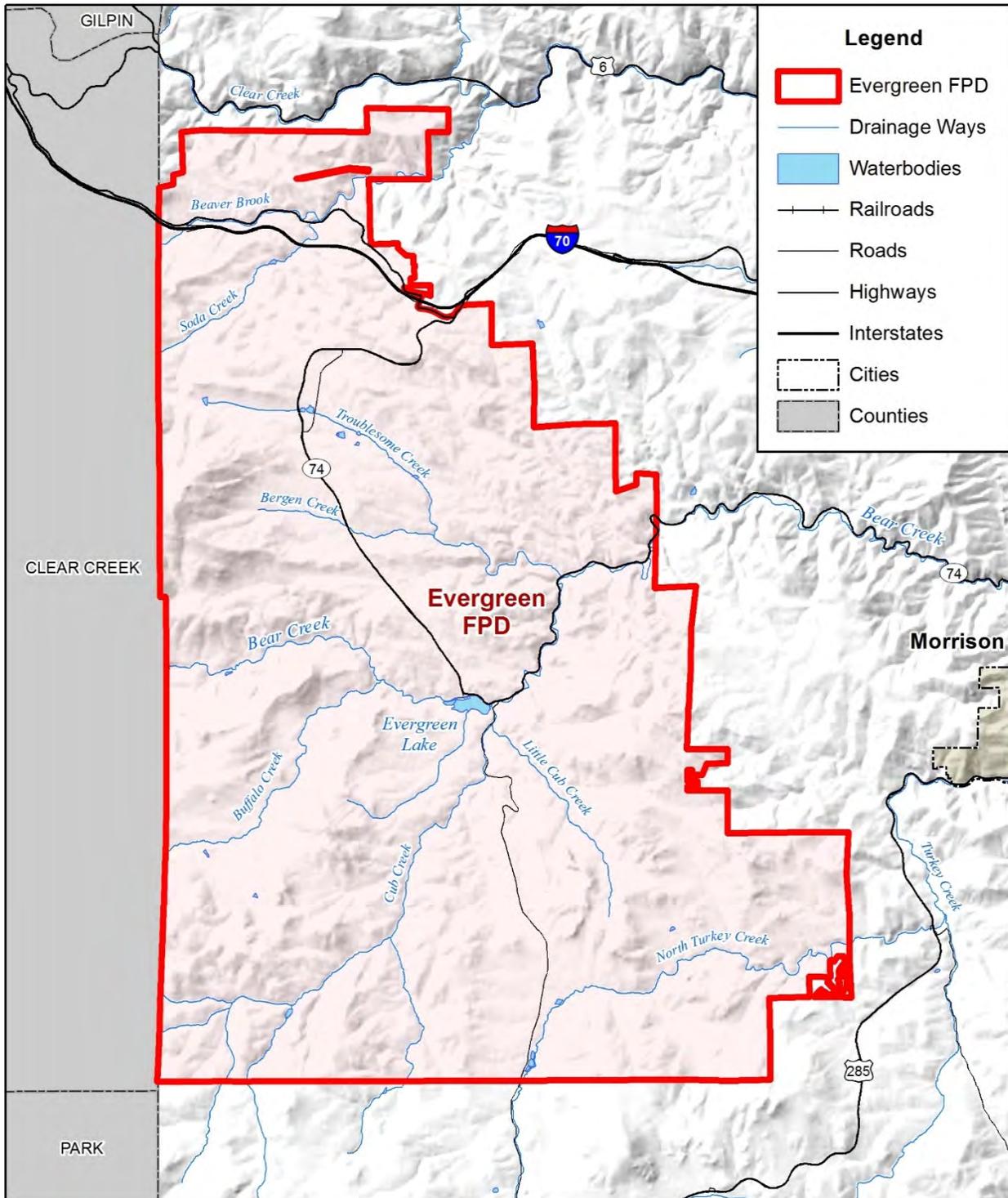
1.1.1 Hazard Summary

A hazard identification and vulnerability analysis was completed for the Evergreen Fire Protection District using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County. Table 1 summarizes Evergreen Fire Protection District's hazards. For the 2015 plan update, the Evergreen Fire Protection District's planning team members were asked to revisit and validate or update the matrix based on the current experience and perspective of the district.

The hazard significance listed in Table 1 is based on Evergreen Fire Protection District HMPC member input and the risk assessment developed during the planning process (refer to Chapter 4 of the base plan). Based on this the most significant hazards for the Evergreen Fire Protection District are hailstorm, lightning and wildfire.

Figure 1. Evergreen Fire Protection District Service Area




 Map compiled 11/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD



Table 1. Evergreen Fire Protection District – Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Avalanche	Occasional	Significant	Negligible	Low
Dam Failure	Occasional	Limited	Limited	Low
Drought	Likely	Extensive	Negligible	Low-Medium
Earthquake	Unlikely	Significant	Limited	Medium
Erosion and Deposition	Likely	Significant	Limited	Low-Medium
Expansive Soils	Unlikely	Limited	Negligible	Low
Extreme Temperatures	Likely	Extensive	Negligible	Low
Flood	Likely	Significant	Limited	Low-Medium
Hailstorm	Highly Likely	Extensive	Limited	Med-High
Landslide, Debris flow, Rockfall	Highly Likely	Significant	Negligible	Low
Lightning	Highly Likely	Extensive	Negligible	Med-High
Severe Winter Storms	Highly Likely	Extensive	Neg-Limit	Low-Med
Subsidence	Occasional	Limited	Negligible	Low
Tornado	Unlikely	Limited	Negligible	Low
Wildfire	Highly Likely	Extensive	Critical	Med-High
Windstorm	Likely	Extensive	Negligible	Med
Frequency of Occurrence: Highly Likely: Near 100% probability in next year. Likely: Between 10 and 100% probability in next year or at least one chance in ten years. Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years. Unlikely: Less than 1% probability in next 100 years.		Potential Magnitude: Catastrophic: Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50% of property is severely damaged Critical: Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 25% of property is severely damaged Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged Negligible: Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.		
Spatial Extent: Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		Significance: Low, Medium, High		

Previous Hazard Events

Through the Data Collection Guide, the Fire Protection District noted specific historic hazard events to include in the community profile. These events have been incorporated into the appropriate hazard chapters in the base plan. These events had a particular impact on the community beyond the impacts and events recorded in the Jefferson County Hazard Mitigation Plan. This is not a comprehensive summary of past incidents, as the hazard profiles collected in the main Mitigation Plan include other events that may have historically impacted the jurisdiction.

March 2011 Soda Creek Road

In March of 2011 a wildfire ignited near South Soda Creek Road by suspected human cause. The fire burned 6 acres, threatened 7 structures and forced approx. 200 evacuations before it was contained by the 62 volunteer fire fighters that responded to the call.

April 2011 Highway 103

In April of 2011 a wildfire of unknown origin burned approximately 10 acres near Highway 103 and Evergreen Parkway. Five different fire agencies responded to the call which caused evacuation of several homes in the vicinity.

June 2013 Blue Bell Lane

In June of 2013 a wildfire in private property near the Arapaho National Forest burned between 25-35 acres causing residents in 143 homes to be evacuated, but no structures were ultimately damaged. The cause of the blaze was unknown.

1.1.2 Vulnerability Assessment

The intent of this section is to assess the District's vulnerability separately from that of the planning area as a whole, which has already been addressed in the Vulnerability Assessment in the main plan. For more information about how hazards affect the County as a whole, see Risk Assessment.

District Asset Inventory

Table 2 is a detailed inventory of assets identified by the District’s planning team. This inventory includes critical facilities. For more information about how “critical facility” is defined in this plan, see Section 4.3 Vulnerability Assessment.

Table 2. Evergreen Fire Protection District’s Assets

Name of Asset	Type	Replacement Value (\$)	Occupancy/Capacity #**	Hazard Specific Info
Admin. Building	EI	Unknown	B	None
Station 1	EI	Unknown	B	None
Station 2	EI	Unknown	B	None
Station 3	EI	Unknown	B	None
Station 4	EI	Unknown	B	None
Station 5	EI	Unknown	B	None
Station 6	EI	Unknown	B	None
Station 7	EI	Unknown	B	None
Station 8	EI	Unknown	B	None
Training Tower	EI	Unknown	S-2	None
Maintenance	EI	Unknown	S-1	None

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: natural assets

** B = Business and S-1 = Moderate Hazard Storage Facility per International Fire Code Occupancy classification.

Vulnerability by Hazard

This section examines those existing and future structures and other assets at risk to hazards ranked of moderate or high significance that vary from the risks facing the entire planning area and estimates potential losses.

Wildfire

Evergreen Fire Protection District does have exposure risk to wildfire both in terms of critical facilities and parcels/structures in WUI communities.

According to the GIS based analysis of wildfire, Evergreen FPD has a total of 34 critical facilities at risk to wildfire (see **Error! Reference source not found.**) and 8,851 improved parcels in numerous WUI communities totaling over \$4.5 billion in value at risk (see Table 4), including \$229 M and 557 parcels in the communities designated as ‘Extreme’ hazard ranking.

Table 3. Evergreen Fire Protection District Critical Facilities At-Risk to Wildfire by Type

Fire Type	Category	Facility Type	Facility Count
	Transportation and Lifelines	Bridge	2
	Transportation and Lifelines	Communication	2
	Total		4
Passive Crown Fire	High Potential Loss Facilities	Long Term Care Facility	1
	High Potential Loss Facilities	Private School	1
	Transportation and Lifelines	Bridge	10
	Transportation and Lifelines	Waste Water Facility	2
	Total		14
Surface Fire	Essential Facilities	Fire Station	1
	High Potential Loss Facilities	Government Facility	1
	High Potential Loss Facilities	Long Term Care Facility	2
	High Potential Loss Facilities	PK-12 School	3
	High Potential Loss Facilities	Private School	1
	Transportation and Lifelines	Bridge	3
	Transportation and Lifelines	Communication	3
Total		12	

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, Evergreen Fire CWPP, HSIP Freedom, Jefferson County, HAZUS

Table 4. Evergreen Fire District WUI Communities and Values At-Risk

WUI Hazard Class	Improved Parcels	Improved Value	Content Value	Total Value	WUI Community
Extreme	557	\$152,984,240	\$76,492,120	\$229,476,360	Brook Forest Estates, Buffalo Park Estates, Rosedale Acres
Very High	0	\$0	\$0	\$0	-
High	5,970	\$1,931,746,161	\$965,873,081	\$2,897,619,242	Bear Mtn Vista, Cub Creek Ranch, Doubleheader Ranch, El Pinal Acres, Estates of Blue Creek, Evergreen Meadows East & West, Evergreen Park Estates, Greystone Estates, Herzman Mesa, Hidden Valley, Hiwan Hills, Independence Heights, Kittredge, Pine Valley Estates, Rainbow Hill, Soda Creek, Tanoa, The Ridge at Hiwan
Moderate	1,512	\$524,750,865	\$262,375,433	\$787,126,298	Greenwood, Hagen Ranch, Hiwan Country Club, Homesteader West, North Turkey Creek, Spring Ranch, Wah Kenney Park
Low	0	\$0	\$0	\$0	-
n/a	812	\$410,374,338	\$205,187,169	\$615,561,507	-
Total	8,851	\$3,019,855,604	\$1,509,927,802	\$4,529,783,406	

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, Evergreen Fire CWPP

Other Hazards

In the case of other hazards that are not specific to geography such as drought, hailstorms, winter storms, earthquake, lightning, tornado and windstorm the entire building inventory and population in the District is potentially exposed. That is the reason for the asset inventory provided in section 1.3. It should be noted that no hazard in this plan is expected to cause widespread impacts to this inventory.

1.1.3 Growth and Development Trends

Development within the District continues to grow. To achieve a balance between natural and man-made environments, housing recommendations have been related to the natural features of the mountain environment, e.g., ground water and septic suitability constraints, transportation constraints, geologic and flood hazards, slope, meadows, wildlife, vegetation, and scenic views.

When development is proposed, the characteristics of the site are identified and development impacts are evaluated. It is during the development review process that the wildlife and visually

sensitive areas are identified, the ability of the roads to carry additional traffic is determined, the water and sanitation concerns are noted, and the availability of services is identified.

The Evergreen Area Community Plan (2005) created and identified policies to ensure certain high hazard areas had special regulations. These regulations regard development in:

- Meadows and areas with low screening potential
- Geologic hazard areas
- Flood hazard areas
- Wildfire hazard areas

The Plan also created slope standards, as well as density and location standards.

There are two subdivisions under construction in the District, as of 2015. There is also sporadic individual home construction outside planned subdivisions. In the past 5 years, approximately 40 homes, 3 commercial buildings and one church have been built¹.

All new homes go through the Jefferson County or Clear Creek County defensible space and hazard mitigation process. For the most part commercial properties are just tenant finishes and re-classifications of occupancies.

It should be noted that since adoption of the Jefferson County Comprehensive Master Plan in 2010, both the policies in the Conifer/285 Corridor Area/Evergreen Area Community Plan and policies in the Comprehensive Master Plan apply to land use proposals. Specific policies in the Community Plan are still applicable, but general policies in the Comprehensive Master Plan now take precedent over the general policies in the Community Plan.

1.1.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes the District's regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities and then discusses these capabilities in further detail along with other mitigation efforts as they pertain to the National Flood Insurance Program's Community Rating System (CRS). Although the CRS is flood-focused, this discussion also incorporates activities related to other hazards into the categories established by the CRS.

¹ Evergreen Fire Protection District Fire Marshal

Mitigation Capabilities Summary

Table 5 identifies financial tools or resources that Evergreen Fire Protection District could potentially use to help fund mitigation activities.

Table 5. Evergreen Fire Protection District’s Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	N	
Capital improvements project funding	Y	Capital improvement projects are budgeted annually and listed in Strategic Plan
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	Y	EFR has a fee schedule in place for project review of commercial and residential construction projects
Incur debt through general obligation bonds	Y	
Incur debt through special tax bonds	Y	
Incur debt through private activities	N	
Withhold spending in hazard-prone areas	N	

Additional Mitigation Capabilities

Evergreen Fire Protection District conducts Fire Safety Programs taught to residences/students. Particular programs include: Hands on Fire Extinguisher Training for public and to Middle school students, CPR, Wildfire Awareness, Home fire safety and Senior Safety.

Evergreen FPD CWPP

The District has a Community Wildfire Protection Plan, dated 2007. The plan was developed for the District with guidance and support from the Jefferson County Division of Emergency Management, Colorado State Forest Service, and U.S. Forest Service. The CWPP was developed according to the guidelines set forth by the Healthy Forests Restoration Act (2003) and the Colorado State Forest Service’s Minimum Standards for Community Wildfire Protection Plans (2004).

Evergreen Fire Rescue Strategic Plan – 2014

This document was developed to guide the organization into the future with a strategy that will allow EFR to adapt to the changing environment of the community, the employees and volunteer firefighters and the needs of our and visitors. The plan includes a Standard of Cover (SOC) and a Risk Assessment (RA) to help the District identify how well it is providing emergency services to the community and what risks are within the community.

ISO Rating

Evergreen Fire District has multiple classifications. Effective as of January 1, 2011: Any property within five road miles of Station 1 (4751 Highway 73), Station 2 (1802 Bergen Parkway), Station 3 (6940 Highway 73), Station 5 (53 Echo Lake Dr.), Station 6 (26370 Hwy 74), Station 7 (157 County 65), or Station 8 (33377 Forest Estates Rd) are rated as a Class 6. Property within 5 miles of Station 1, 2, 6, or 7 AND within 1,000 feet of a fire hydrant has an ISO rating of 5. Brook Forest and Marshdale Elementary school fire hydrants are not recognized by ISO. Any property beyond 5 road miles from any of fire station is a 10. The District earned a Class 5 Rating because of high quality equipment and high level of training. The District's strategic plan identifies ways to further improve this rating.

Clear Creek County CWPIP

Evergreen Fire responds to Clear Creek County's Community Wildfire Protection Implementation Plan (CWPIP), a plan that is similar to CWPPs in that it identifies vulnerabilities and provides guidance for mitigating the impacts of wildfires.

Wildfire Forum

For the past 3 years Evergreen FPD has been hosting a wildfire forum to inform the public on wildfire mitigation programs available to them from local and state agencies.

Wildfire Training Exercises

Evergreen Fire Rescue has hosted and taken part in annual wildland fire training exercises held on residential property in the host fire district. Local homeowners have observed the exercises and were given advice on how to mitigate their property.

Slash Collection in Clear Creek

Clear Creek County has a free slash collection site in Idaho Springs that the residents of Clear Creek County and in EFD may use. Jefferson County in 2014/2015 had slash collection sites throughout the County and used EFD's Fire Station #8, Forest Estates and Brook Forest for two weekend events.

1.1.5 Mitigation Actions

This section of the Jefferson County Hazard Mitigation Plan provides updates on the actions originally identified in the 2010 plan.

1. Mitigation Project Title: Educate the Public on Wildfire Mitigation.

Issue/Background: Per the CWPP most of EFD (123 square miles) has an Extreme or High hazard rating. We would conduct meetings with homeowners associations, public and display

booths at Wal-Mart, Home Depot and local grocery stores and hand out flyers, pamphlets, etc. We would also work with a few homeowners in our district on displaying their home to show what has been done for mitigation on their property and take photos, do a video and/or ask a local TV station to do a story on this.

Continuation of wildfire mitigation training for our Community Education person, who will be conducting the public training.

Other Alternatives: None

Responsible Office: Evergreen Fire/Rescue Fire Prevention Section

Priority (High, Medium, Low): Medium to High

Cost Estimate: \$8000 for handouts, pamphlets, banners and hiring a consultant to continue working with Homeowner Associations to create CWPIP's \$1000 for training personnel

Benefits (Avoided Losses): Reduction of homes/property loss due to wildfires.

Potential Funding: Grants and private donations*

Schedule: Within 2 years

STATUS: Numerous implementations, including: Information table in atrium of main EFD building that provides information to public and over 2,000 visitors.

During annual Safety & Health Day, EFD has a booth with Wildfire mitigation information from Jefferson County and Colorado State Forest Service.

Currently expanding public information notification. Applying for grants. Conducting annual Wildfire Forums open to the public to get this information out and the homeowners can talk to mitigation specialists, Colorado State forest service and JeffCo emergency management personnel. Coordinator of JeffCo Slash collection program. CWPIP coordinator will be available to talk to HOA's and homeowners about developing a CWPIP for Extreme and High risk areas. For new CWPIP's in 2016, \$5000 has been budgeted.

* EFD has received a private donation to work on CWPIP programs for homeowner associations/subdivisions. EFD currently have two areas be worked on. Through the private donation the District has hired a consultant to work on these CWPIP's. Consultant has completed CWPIP for Clear Creek County that also covers part of our EF district in Clear Creek County.

2. Mitigation Project Title: Wildfire Mitigation Projects

Issue/Background: Per the CWPP most of EFD (123 square miles) has an Extreme or High hazard rating. Mitigation projects are essential to reduce risks to life and property.

Other Alternatives: None

Responsible Office: Evergreen Fire/Rescue Fire Prevention Section

Priority (High, Medium, Low): High

Cost Estimate: \$12,000

Benefits (Avoided Losses): Increased resiliency to wildfires.

Potential Funding: State, FireWise

Schedule: Current and ongoing

STATUS: Numerous implementations, including: Denver Mountain parks, Colorado State Forest Service and US Forest Service have conducted mitigation projects on their property in the Evergreen Fire Protection District. Priority will be to have CWPIP's for Extreme areas 1st then High areas. Depends on the individual HOA's who request a CWPIP be completed.

Developed evacuation routes and maps for 11 housing areas in the Fire District.

Also, working with JeffCo Slash collection POC and have set up two collection weekends at our Fire Station #8.



ANNEX R

WEST METRO

FIRE PROTECTION DISTRICT

1.1 Community Profile

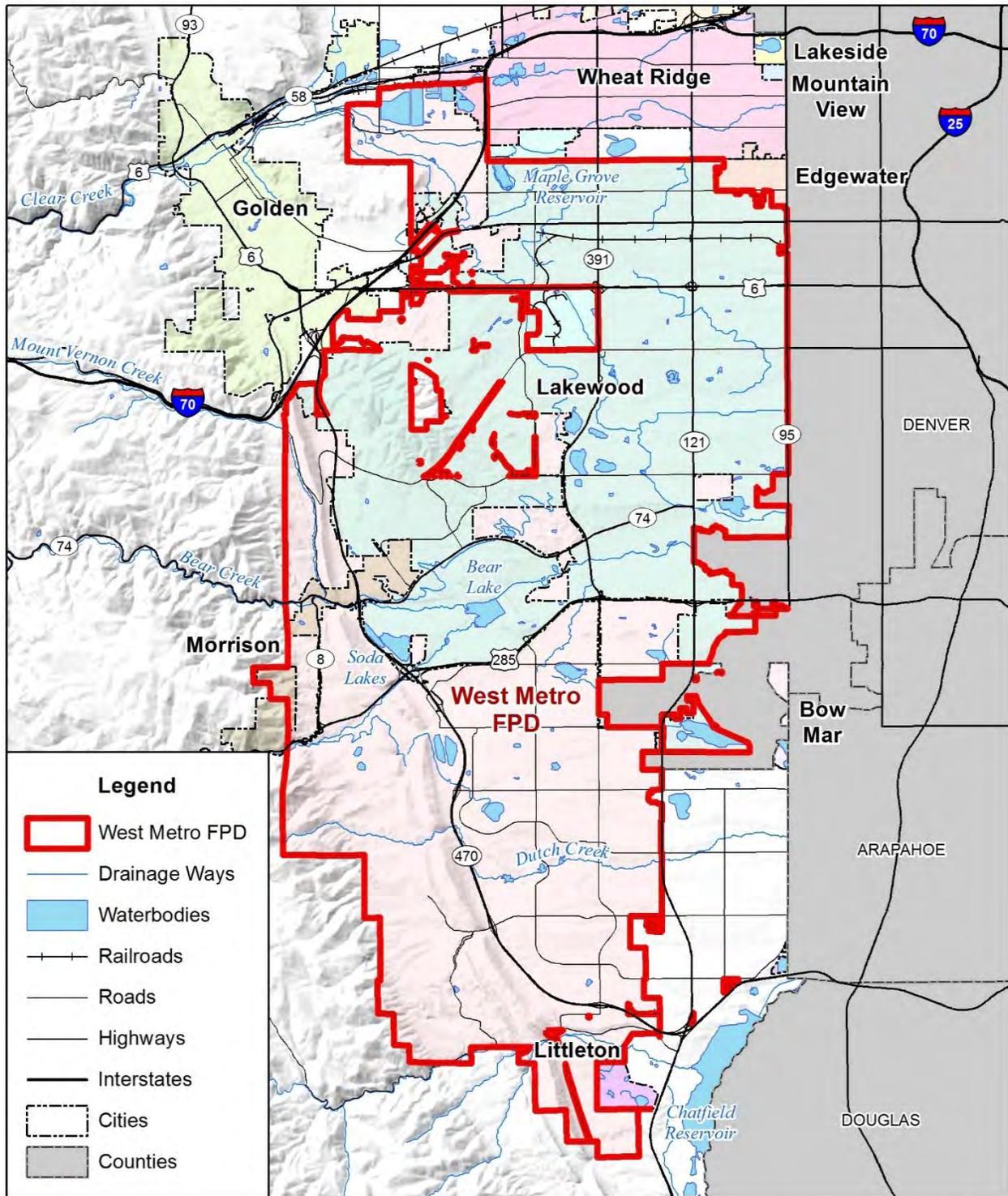
West Metro Fire Protection District was created January 1, 1995 when Lakewood and Bancroft Fire Protection Districts were consolidated. The two departments originally formed the Lakewood-Bancroft Fire Authority to give the two departments an opportunity to find efficiencies. Voters ultimately approved the merger and the West Metro Fire Protection District was formed. West Metro Fire Rescue has 332 full-time firefighters who staff 15 stations over more than 110 square miles. The District serves over 247,000 residents in the cities of Golden, Lakewood, Morrison, Wheat Ridge, Littleton, Unincorporated Jefferson County as well as the communities of Roxborough and Waterton Canyon. See service area map in Figure 1.

1.1.1 Hazard Summary

A hazard identification and vulnerability analysis was completed for West Metro Fire District using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Worksheet, which was distributed to each participating municipality or special district to complete at the kickoff meeting in August 2015. Each participating jurisdiction was in support of the main hazard summary identified in the base plan; however the hazard summary for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction. This helps to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County. Table 1 summarizes West Metro Fire District's hazards based on input provided during the planning and data collection process.

Information from the Data Collection Worksheet is summarized in Table 1 with all the hazards listed that could impact anywhere in West Metro Fire District's service area. The purpose of this exercise was to identify and rank the hazards and vulnerabilities unique to this jurisdiction. The hazard significance listed is based on District HMPC member input from the Data Collection Worksheet and the risk assessment developed during the planning process (refer to Chapter 4 of the base plan).

Figure 1. West Metro Fire Protection District Service Area




 Map compiled 11/2015;
 intended for planning purposes only.
 Data Source: Jefferson County, CDOT,
 NHD

0 2.5 5 Miles



Table 1. West Metro Fire Protection District – Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Avalanche	Negligible	Occasional	Negligible	Low
Dam Failure	Limited	Occasional	Limited	Low
Drought	Extensive	Occasional	Negligible	Low
Earthquake	Extensive	Unlikely	Catastrophic	Medium
Erosion and Deposition	Negligible	Occasional	Negligible	Low
Expansive soils	Negligible	Likely	Negligible	Low
Extreme Temperatures	Extensive	Occasional	Limited	Low
Flood	Extensive	Occasional	Limited	Medium
Hailstorm	Extensive	Likely	Limited	Low
Landslide, Debris flow, Rockfall	Negligible	Occasional	Negligible	Low
Lightning	Negligible	Highly Likely	Negligible	Low
Severe Winter Storms	Extensive	Likely	Limited	Medium
Subsidence	Negligible	Unlikely	Negligible	Low
Tornado	Limited	Occasional	Limited	Low
Wildfire	Limited	Highly Likely	Critical	High
Windstorm	Extensive	Highly Likely	Limited	Medium
Frequency of Occurrence: Highly Likely: Near 100% probability in next year. Likely: Between 10 and 100% probability in next year or at least one chance in ten years. Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years. Unlikely: Less than 1% probability in next 100 years.		Potential Magnitude: Catastrophic: Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50% of property is severely damaged Critical: Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 25% of property is severely damaged Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged Negligible: Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.		
Spatial Extent: Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		Significance: Low, Medium, High		

Previous Hazard Events

Through the Data Collection Guide, the District noted specific historic hazard events to include in the community profile. These events have been incorporated into the appropriate hazard chapters in the base plan. These events had a particular impact on the community beyond the impacts and events recorded in the Jefferson County Hazard Mitigation Plan. This is not a comprehensive summary of past incidents, as the hazard profiles collected in the main Mitigation Plan include other events that may have historically impacted the jurisdiction.

September 21-24, 1978 – The Murphy Gulch fire burned approximately 3,300 acres. The first Emergency Fire Fund fire in the Front Range, several structures were lost to the blaze and many subdivisions were evacuated. Interagency resources were ordered to supplement local fire departments. The Federal Type 2 Team took over and managed the closeout. The agencies involved were the Inter-Canyon Fire Protection District and Bancroft FPD, both of which preceded the creation of the West Metro FPD. The fire burned along the foothills west of the Ken-Caryl Ranch subdivision.

1.1.2 Vulnerability Assessment

The intent of this section is to assess West Metro Fire District’s vulnerability separately from that of the planning area as a whole, which has already been addressed in the Vulnerability Assessment in the main plan. For more information about how hazards affect the County as a whole, see the Risk Assessment in Chapter 4.

District Asset Inventory

Table 2 is a detailed inventory of assets identified by the District’s planning team. This inventory includes some critical facilities. For more information about how “critical facility” is defined in this plan, see Section 4.3 Vulnerability Assessment.

Table 2. West Metro Fire Protection District’s Assets

Name of Asset	Type	Replacement Value (\$)	Occupancy/Capacity #**	Hazard Specific Info
Administration	EI	\$9,597,141.00	490	
Fleet Maintenance	EI	\$3,986,274.00	6	
Old Tens	EI	\$1,653,788.00	n/a	
Station 1	EI	\$2,646,204.00	7	
Station 2	EI	\$2,432,703.00	8	
Station 3	EI	\$3,348,787.00	9	
Station 4	EI	\$4,084,496.00	10	
Station 5	EI	\$3,835,796.00	10	
Station 6	EI	\$1,779,700.00	5	
Station 7	EI	\$4,802,694.00	10	

Name of Asset	Type	Replacement Value (\$)	Occupancy/Capacity #**	Hazard Specific Info
Station 8	EI	\$2,122,705.00	10	
Station 9	EI	\$2,456,880.00	6	
Station 10 & Training	EI	\$16,341,936.00	12/500	
Station 11	EI	\$3,515,010.00	4	
Station 12	EI	\$2,067,183.00	6	
Station 13	EI	\$2,469,068.00	6	
Station 14	EI	\$3,358,590.00	10	
Station 15	EI	\$3,314,207.00	7	
Communications	EI	\$1,636,826.00	n/a	

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: natural assets

** B = Business per International Fire Code Occupancy classification.

Vulnerability by Hazard

This section examines those existing and future structures and other assets at risk to hazards ranked of moderate or high significance that vary from the risks facing the entire planning area and estimates potential losses.

Wildfire

West Metro Fire Protection District does have exposure risk to wildfire both in terms of critical facilities and parcels/structures in WUI communities.

According to the GIS based analysis of wildfire, West Metro FPD has a total of 33 critical facilities at risk to a crown fire (see Table 3) and 3,553 improved parcels in the WUI communities of Red Rocks, Willow Brook, Willow Springs South, Ken Caryl North Ranch, Ken Caryl Ranch, Morrison, Dear Creek Mesa, Willow Springs North totaling over \$2.2 billion in value at risk (see Table 4). \$420 M of this inventory is within communities ranked as 'High' hazard.

Table 3. West Metro Fire Protection District Critical Facilities At-Risk to Wildfire by Type

Fire Type	Category	Facility Type	Facility Count
Active Crown Fire	High Potential Loss Facilities	College	1
	High Potential Loss Facilities	Dam	7
	High Potential Loss Facilities	Day Care Center	1
	High Potential Loss Facilities	HAZMAT	2
	High Potential Loss Facilities	Long Term Care Facility	1
	High Potential Loss Facilities	PK-12 School	1
	Transportation and Lifelines	Bridge	6
	Transportation and Lifelines	Communication	6
	Total		27
Passive Crown Fire	High Potential Loss Facilities	College	1
	High Potential Loss Facilities	Dam	1
	High Potential Loss Facilities	Day Care Center	3
	Transportation and Lifelines	Communication	1
	Total		6
Surface Fire	Essential Facilities	Fire Station	2
	Essential Facilities	Hospital	2
	Essential Facilities	Law Enforcement	1
	High Potential Loss Facilities	College	2
	High Potential Loss Facilities	Dam	1
	High Potential Loss Facilities	Day Care Center	6
	High Potential Loss Facilities	Government Facility	1
	High Potential Loss Facilities	HAZMAT	3
	High Potential Loss Facilities	PK-12 School	1
	High Potential Loss Facilities	Private School	4
	Transportation and Lifelines	Bridge	3
	Transportation and Lifelines	Communication	5
	Transportation and Lifelines	Natural Gas Facility	1
Total		33	

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, West Metro Fire CWPP

Table 4. West Metro Fire District WUI Communities and Values At-Risk

WUI Hazard Class	Improved Parcels	Improved Value	Content Value	Total Value	WUI Community
Extreme	0	\$0	\$0	\$0	-
Very High	0	\$0	\$0	\$0	-
High	626	\$280,598,064	\$140,299,032	\$420,897,096	Red Rocks, Willow Brook, Willow Springs South
Moderate	2,243	\$932,424,622	\$466,212,311	\$1,398,636,933	Ken Caryl North Ranch, Ken Caryl Ranch, Morrison
Low	404	\$178,963,803	\$89,481,902	\$268,445,705	Dear Creek Mesa, Willow Springs North
n/a	280	\$120,979,596	\$60,489,798	\$181,469,394	-
Total	3,553	\$1,512,966,085	\$756,483,043	\$2,269,449,128	

Source: Amec Foster Wheeler analysis on data provided by Jefferson County, West Metro Fire CWPP

Other Hazards

In the case of other hazards that are not specific to geography such as drought, hailstorms, winter storms, earthquake, lightning, tornado and windstorm the entire building inventory and population in the District is potentially exposed. That is the reason for the asset inventory provided in Section 1.3. It should be noted that no hazard in this plan is expected to cause widespread impacts to this inventory.

1.1.3 Growth and Development Trends

West Metro Fire Protection District’s service area is mainly urban and as such most of the protection district is already developed and most growth is infill. New construction has modern protection systems and better code compliance.

1.1.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes the District’s regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities and then discusses these capabilities in further detail along with other mitigation efforts as they pertain to the National Flood Insurance Program’s Community Rating System (CRS). Although the CRS is flood-focused, this discussion also incorporates activities related to other hazards into the categories established by the CRS.

Mitigation Capabilities Summary

Table 75 and 6 identify regulatory tools or resources that the District could potentially use to help fund mitigation activities.

Table 5. North Fork Fire Protection District's Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General or Comprehensive plan	Yes	
Zoning ordinance	Yes	As administered by municipalities/County
Subdivision ordinance	Yes	As administered by municipalities/County
Growth management ordinance	Yes	As administered by municipalities/County
Floodplain ordinance	Yes	As administered by municipalities/County
Other special purpose ordinance (stormwater, steep slope, wildfire)	Yes	As administered by municipalities/County
Building code	Yes	As administered by municipalities/County
Fire department ISO rating	3	ISO Rating of 3
Erosion or sediment control program	Yes	As administered by municipalities/County
Stormwater management program	Yes	As administered by municipalities/County
Site plan review requirements	Yes	All plans reviewed by fire marshal
Capital improvements plan	Yes	
Economic development plan	Yes	As administered by municipalities/County
Local emergency operations plan	Yes	
Other special plans	Yes	Accreditation standard of cover document

Table 6. West Metro FPD Administrative/Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	No		
Engineer/professional trained in construction practices related to buildings and/or infrastructure	No		
Planner/engineer/scientist with an understanding of natural hazards	No		
Personnel skilled in GIS	Yes	Communications	
Full time building official	Yes	Fire Marshal	
Floodplain manager	No		
Emergency manager	Yes	Fire Chief's Office – Shared with Jeffco	
Grant writer	Yes	Fire Chief's Office	
Other personnel			
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	Yes	TriTech Computer Aided Dispatching System	
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Yes	CodeRED	

Table 7. West Metro Fire Protection District's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Y	
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	Y	
Incur debt through general obligation bonds	Y	
Incur debt through special tax bonds	Y	
Incur debt through private activities	N	
Withhold spending in hazard-prone areas	N	

Additional Capabilities

Public Education Programs: Full-time staff delivers fire safety education district-wide.

ISO Rating

The Department maintains an ISO 3 rating.

Community Wildfire Protection Plan - 2006

The 2006 West Metro CWPP provides an overview of the District, outlines the methodology used for assessing risk in the District, assesses the wildfire risk in the District and lists a number of mitigation options and specific actions aimed at reducing overall wildfire risk.

1.1.5 Mitigation Actions

1. Wildfire Mitigation

Issue/Background: This project will perform hazard fuel mitigation in areas within West Metro's district that have been identified as high-hazard in countywide and individual CWPPs. Different methods might include tree thinning, mastication, and controlled burning.

Other Alternatives: Work could also be performed by the Jefferson County Sheriff's Office fuels mitigation team.

Responsible Office: West Metro Fire Rescue

Priority: High

Cost Estimate: Varies depending on the fuel type and acreage. \$2,000 per acre is a good estimate.

Benefits (Avoided Losses): Fuel mitigation projects improve public safety, reduce risk to firefighters, and help forest ecology.

Potential Funding: Grant funding – state (CSFS) and federal (FEMA PDM or HMGP) **Schedule:** 2016-2020

STATUS: New in 2016



Appendix A

COUNTY MITIGATION ACTIONS

The following mitigation actions have been identified and adopted by Jefferson County. This list includes new actions added in 2016 as well as progress updates to ongoing actions identified in the original 2010 plan. A summary list of these actions, as well as the goals and hazards they apply to, can be found in Table 5.3 in Chapter 5.

New Projects in 2016

1. Massey Draw Floodplain Improvements

Issue/Background: Install box culverts at two roadway crossings with associated channel improvements. This will keep seven residences from experiencing flood damage and remove approximately 25 residential properties from the floodplain during a 100 year flood event.

Other Alternatives: No action

Responsible Office: Jefferson County Transportation and Engineering in conjunction with the Urban Drainage and Flood Control District

Priority (High, Medium, Low): Medium

Cost Estimate: \$ 1,800,000

Benefits (Avoided Losses): Reduced flood losses and safety for emergency vehicles during major flood events.

Potential Funding: Urban Drainage and Flood Control District 50 % and 50% from County General Fund for Capital Improvements.

Schedule: Design phase in 2015-2016 and proposed construction in 2016-2017

2. Major Drainageway Culvert Improvements with Urban Drainage and Flood Control District

Issue/Background: Multiple locations of roadway crossings with significantly undersized culverts to be replaced with culverts to accommodate the 100 year flood flows.

Other Alternatives: No action

Responsible Office: Jefferson County Transportation and Engineering in conjunction with the Urban Drainage and Flood Control District

Priority (High, Medium, Low): Medium

Cost Estimate: \$9,000,000

Benefits (Avoided Losses): Reduced flood losses safety for emergency vehicles and the public during major flood events.

Potential Funding: UDFCD

Schedule: Design phase in 2016-2019 and proposed construction in 2018-2021

3. Minor Culvert Improvements

Issue/Background: Multiple locations of roadways with existing culvert crossings either failing or in eminent danger of failure.

Other Alternatives: No action

Responsible Office: Jefferson County Transportation and Engineering, Jefferson County Road and Bridge

Priority (High, Medium, Low): Medium to High

Cost Estimate: \$1,000,000 per year

Benefits (Avoided Losses): Reduced flood losses and provide for public safety

Potential Funding: County General Fund

Schedule: Continuing, with culvert inspection and replacement ongoing.

4. Weaver Creek Major Drainageway Master Plan and FHAD

Issue/Background: The Weaver Creek Drainageway has many areas in which the existing channel and culverts lack the capacity to safely convey the major flood events. A Master Plan is needed to properly plan and budget for needed improvements. The current Flood Hazard Area Delineation was prepared over 35 years ago and needs to be updated to accurately reflect the regulatory 100 year floodplain.

Other Alternatives: No action

Responsible Office: Jefferson County Transportation and Engineering in conjunction with the Urban Drainage and Flood Control District and the City of Lakewood

Priority (High, Medium, Low): Medium

Cost Estimate: \$250,000

Benefits (Avoided Losses): Reduced flood losses

Potential Funding: Urban Drainage and Flood Control District \$150,000, County \$93,000, City of Lakewood \$7,000

Schedule: Continuing, with plan to begin in 2016.

5. Notification Polygons for Dam Failure and Flash Flooding

Issue/Background: Develop pre-established notification polygons for citizens who reside in dam failure hazard areas. Can also be established for floodplains. The technology currently exists in the CodeRED system employed by all county 911 entities. The project will require taking the dam inundation maps and floodplain maps for the targeted areas and creating a polygon in the CodeRED system.

Other Alternatives: State Engineer's office may have developed similar product.

Responsible Office: Jefferson County OEM

Priority (High, Medium, Low): High

Cost Estimate: Minimal, need in-kind labor

Benefits (Avoided Losses): Faster notification will give citizens more time to evacuate from flood-prone areas which could prevent injury or death from flooding.

Potential Funding: In-kind

Schedule: 2016-2018

6. Update CWPPs to reflect changing conditions and new development

Issue/Background: This project will update Community Wildfire Protection Plans (CWPPs) to reflect changing conditions and new development. Most plans were crafted in 2010 and with new development and changing conditions the accuracy of the data is questionable. Implementation would most likely require the hiring of a specific consulting firm to gather data and create new plans.

Other Alternatives: In-house personnel completing the updates.

Responsible Office: Jefferson County OEM

Priority (High, Medium, Low): High

Cost Estimate: To be determined based on community size, but approximately \$15-40k per plan

Benefits (Avoided Losses): Better data will ultimately lead to better mitigation activities, better planning, and ultimately a more effective response.

Potential Funding: Grant funding – state and federal

Schedule: 2016-2018

7. Mitigate wildfire hazards on public lands and open space properties

Issue/Background: There are fuel load concerns on County and other open space properties. Residential and other development are potentially at risk due to extensive WUI. This project will perform hazard fuel mitigation in areas identified as high-hazard in countywide and individual CWPPs. Different methods might include tree thinning, mastication, and controlled burning.

Other Alternatives: Work could also be performed by private contractors.

Responsible Office: Jefferson County OEM and Open Space. ID other partners - USFS, State, FPDs, JeffCo Conservation District, Denver Mountain Parks, municipalities etc.

Priority (High, Medium, Low): High

Cost Estimate: Varies depending on the fuel type and acreage. \$2,000 per acre is a good estimate.

Benefits (Avoided Losses): Reduced wildfire losses

Potential Funding: Grant funding – state and federal

Schedule: 2016-2020

8. Develop partnerships and begin needs assessment for seismic mitigation of critical infrastructure within JeffCo

Issue/Background: The Golden Fault and other seismic sources in the region present the potential for a low probability but potentially high consequence earthquake event. This project would begin with a needs assessment to identify critical facilities likely to incur strong ground shaking that could lead to nonstructural and structural damage. Facilities identified for further

review would undergo a FEMA rapid visual assessment (FEMA 154) to identify building hazards and potential mitigation options.

Other Alternatives: No action

Responsible Office: Jefferson County OEM

Priority (High, Medium, Low): Low

Cost Estimate: \$30-80K depending on scope and number of facilities assessed

Benefits (Avoided Losses): While the risk of earthquake in the area is low, the potential damage could be catastrophic. Performing seismic mitigation would help ensure uninterrupted governmental service for critical infrastructure. This is the first step in reducing earthquake losses including reduced potential for injuries; reduced potential for facility damage and loss of function.

Potential Funding: NEHRP, FEMA, DHSEM

Schedule: 2016-2020

9. Education and awareness of Geologic Hazards

Issue/Background: Due to relative infrequency of geologic hazards in the planning area, the public is not generally well informed about the risks associated with this type of hazard. Work in conjunction with Jill Carlson at Colorado Geological Survey; create GIS layers available to public that identify hazards such as landslide and debris flow and disseminate information.

Other Alternatives: None

Responsible Office: Jefferson County OEM, Local Government (interested parties)

Priority (High, Medium, Low): Low

Cost Estimate: To be determined

Benefits (Avoided Losses): While the risk of earthquake in the area is low, the potential damage could be catastrophic. Raising awareness of hazards will enable the public to understand how to survive an earthquake. Improved mapping of debris flow and landslide areas could lead to targeted mitigation projects.

Potential Funding: Grant funding – state and federal

Schedule: 2016-2019

10. Flood Education and Outreach

Issue/Background: Increase the flood awareness of residents of Jefferson County to protect people and property. This project would build upon annual floodplain notification efforts associated with the County's CRS program participation. Efforts include distributing the UDFCD flood awareness brochure to residents in the floodplain.

Other Alternatives: No action

Responsible Office: Jefferson County Planning and Zoning, OEM, UDFCD

Priority: High

Cost Estimate: TBD

Benefits (Avoided Losses): Increased awareness of the risk and dangers of flooding can reduce the impact of flooding to the citizens of Jefferson County.

Potential Funding: TBD

Schedule: Ongoing with annual efforts

Status: New in 2016

11. Perform Hazard Fuel Mitigation in Areas Identified as High Hazard in Countywide and Individual CWPPs

Issue/Background: This project will perform hazard fuel mitigation in areas that have been identified as high-hazard in countywide and individual CWPPs. Different methods might include tree thinning, mastication, and controlled burning. The CWPP will be referenced for specific areas and recommended treatments.

Other Alternatives: No Action

Responsible Office: Jefferson County Sheriff's Office in partnership with Jefferson County fire districts and Jefferson Conservation District

Priority: High

Cost Estimate: Varies depending on the fuel type and acreage. \$2,000 per acre is a typical estimate

Benefits (Avoided Losses): Fuel mitigation projects improve public safety, reduce risk to firefighters, reduce potential for structure losses and help forest ecology.

Potential Funding: Grant funding – state (CSFS) and federal (FEMA PDM or HMGP)

Schedule: 2016-2020

Status: New in 2016

Updates to 2010 Projects

12. Fairmount Drainage Improvement Program

Issue/Background: This project provides for the construction of a combination of channels and culverts to convey runoff from McIntyre Street east to Eldridge Street near 4th Avenue. Currently the existing drainage way has areas that are significantly undersized or not existing.

Other Alternatives:

- Don't construct drainage improvements
- Construct an underground storm sewer within the right-of-way for Indiana and Eldridge to Clear Creek at a very high expense.

Responsible Office: Jefferson County Transportation and Engineering, City of Wheat Ridge, Urban Drainage Flood Control District, Colorado Department of Transportation.

Priority (High, Medium, Low): Medium

Cost Estimate: \$200,000 (design), \$900,000 right-of-way, \$1,350,000 (construction) within the County possible storm sewer and pond upgrades needed in Wheat Ridge.

Benefits (Avoided Losses): Improvements will reduce flooding in the area and flooding damage to the County Street system and State Highway 58.

Potential Funding: Urban Drainage Flood Control District up to 50%. Possible funding from County Capital Improvements Plan or impact fees would need Board's approval.

Schedule: Design 2010, Construction is on the 5-year Capital Improvements Plan.

Status: Deferred, due to lacking of funding and necessary drainage easements

13. Drake Outfall

Issue/Background: This project provides for the construction of a combination of channels and culverts to convey runoff from 52nd Avenue and Indiana Street east and southeasterly to Youngfield Street near 50th Avenue.

Other Alternatives:

- Don't construct drainage improvements.
- Construct an underground storm sewer within the ROW for Indiana and Eldridge to Clear Creek at a very high expense.

Responsible Office: Jefferson County Transportation and Engineering, City of Wheat Ridge, City of Arvada, Urban Drainage Flood Control District, Colorado Department of Transportation.

Priority (High, Medium, Low): Medium

Cost Estimate: \$300,000 (design), \$1,400,000 r-o-w, \$1,000,000 (construction) within the County.

Benefits (Avoided Losses): Improvements will reduce flooding in the area and flooding damage to the County Street system.

Potential Funding: Urban Drainage Flood Control District up to 50%. Possible funding from County Capital Improvements Plan or impact fees would need Board's approval.

Schedule: Design 2010, Construction is on the 5-year Capital Improvements Plan.

Status: Deferred, due to lacking of funding and necessary drainage easements

14. Beer Sisters Reservoir Rehabilitation

Issue/Background: This project provides for the study of the existing Beer Sisters Reservoir and construction of improvements to insure the integrity and safety of this facility as a regional detention facility.

Currently this reservoir acts as a regional detention facility that greatly reduces the amount of runoff onto downstream properties in the County. The dam was constructed in 1966 as an irrigation water storage reservoir. The State Engineer's Office has identified several areas of concern that should be studied and upgraded to assure the safety of this facility. Failure of this 21 foot high by 750' long dam would be catastrophic to downstream citizens.

Other Alternatives: Emptying the reservoir by breaching the dam. This would require a letter of map revision approved by FEMA and would put more homes in the floodplain. It also may not be approved by FEMA since it would impact existing homes.

Lowering the water level on the reservoir will temporary satisfy the State Engineer's Office but will not eliminate the threat of a breach of the dam.

Responsible Office: Ownership is Foothills Park and Recreation. The project will be administered by Urban Drainage Flood Control District and Jefferson County Highways and Transportation.

Priority (High, Medium, Low): High

Cost Estimate: \$200,000 design, \$1,500,000 construction

Benefits (Avoided Losses): The project will eliminate the threat of a bam breach due to an inadequate spillway for current conditions. The project will also allow for the flood protection from the existing reservoir. This will help protect the downstream properties from flooding.

Potential Funding: Urban Drainage Flood Control District up to 50% the total cost.

Schedule: Completion by 2017/2018

Status: Design phase in 2015-2016 and proposed construction in 2017.

15. South Weir Gulch Rehabilitation

Issue/Background: This project provides for the construction of a combination of channel improvements and drop structures to control severe erosion and safely convey runoff from Union Boulevard east to Pierson Street south of Florida Avenue. Currently this section of the South Wier Gulch drainageway is very steep and is rapidly eroding the existing channel. This has resulted in a portion of the channel with almost vertical walls 15-20 feet deep. This erosion has progressed to the rear yard fences of adjacent residences.

Other Alternatives: Do nothing, do a smaller scale project that may not last due to an unstable channel up and down stream of the impact area.

Responsible Office: Jefferson County Transportation and Engineering, Urban Drainage Flood Control District. (The property is privately owned)

Priority (High, Medium, Low): Medium

Cost Estimate: \$200,000 Design; 2,500,000 Construction

Benefits (Avoided Losses): Reduction of erosion, improve long term water quality of the stream. Reduction of property loss in area and it will eliminate a safety hazard in the area.

Potential Funding: Urban Drainage Flood Control District up to 50% of the cost.

Schedule: Both design and construction are on the 5 year capital improvements plan.

Status: Deferred, due to lack of funding

16. National Flood Insurance Program (NFIP) and Community Rating System (CRS) Participation

Issue/Background: This project provides for the continual participation in both the NFIP and CRS floodplain management programs, which enables properties within the county to get flood insurance at reduced rates. In addition the floodplain management regulations reduce the flood risks for new and reconstructed buildings within the county.

Other Alternatives: Not to participate in the programs, this would have a major negative impact to over 1,000 properties within the flood plain because federal flood insurance would not be available. Properties outside of the floodplain would also not be able to get federal flood insurance.

Responsible Office: Jefferson County Planning and Zoning

Priority (High, Medium, Low): Medium

Cost Estimate: Within current county budget.

Benefits (Avoided Losses): Programs will reduce flood losses for new construction within the county and allow older properties access to flood insurance to help protect existing buildings.

Potential Funding: Programs are funded from the county's general fund.

Schedule: NFIP participation is ongoing.

Status: Jefferson County joined NFIP in 1986 and maintains qualification Jefferson County joined CRS in 2005 and has improved rating from 9 to 6 since 2010

17. Multi-Jurisdictional StormReady Program Participation

Issue/Background: This is a National Weather Service (NWS) Program helps communities to better prepare to save lives from the onslaught of severe weather through advanced planning, education and awareness. This is an accredited program through the National Oceanic & Atmospheric Administration & the National Weather Service.

Other Alternatives: Currently, we meet about 85% of the guidelines. To meet the accreditation, we would enhance our current program to meet 100% of the guidelines.

Responsible Office: Jefferson County Office of Emergency Management

Priority: Low

Cost Estimate: None (Unless upgrades to Emergency Preparedness infrastructure is needed to qualify as a Storm Ready Community). \$5,000, if it is necessary to upgrade equipment, training, staff hours, OT hours, and/or host trainings.

Benefits (Avoided Losses): Once Application has been submitted to the NWS, the application is reviewed and the Storm Ready chair will assign a team to visit the applicant and discuss options. The end result being a Certified Storm Ready Office and serving residents and County Offices better. An added benefit to this is, once a Community is certified as Storm Ready the Insurance Services Organization can provide Community Rating System points which may be applied to lower National Flood Insurance Program (NFIP) flood insurance rates.

Potential Funding: Our funding would be from our EMPG grant.

Schedule: 2010 Apply and depending on results, implement in 2011

Status: Deferred, meet most, if not all criteria but wasn't initiated.

18. Bi-lingual publications for Jeffco Residents

Issue/Background: This program will allow publications Colorado Life Trak, Jeffco Emergency Preparedness guides, pamphlets to be translated for our Spanish speaking residents of Jeffco.

Note. A language assessment should be completed to see if other translations are needed for our residents.

Other Alternatives: Consider having the Jeffco Emergency Management (most of publications are on this site) website in Spanish.

Responsible Office: Jefferson County Office of Emergency Management

Priority: Medium

Cost Estimate:

- \$10,000 for the translation
- \$2,000 for the assessment

Benefits (Avoided Losses): Giving the Jefferson county bi-lingual speaking communities a resource to use in preparing their homes/families for potential hazards.

Potential Funding: Possible Grants with 50/50 match

Schedule: 2010 - apply and purchase with a start in mid-2010 and finish in 2012.

Status: Bi-lingual publications are in place for many documents. Currently working on new preparedness guide.

19. Public Awareness for those in Dam Inundation Areas.

Issue/Background: There are 17 High Hazard and 19 Significant Risk dam in Jefferson County. Currently there is no notification system to those living “downstream” of the dam or information that they live in a potentially hazardous area. Our goal is to create and distribute a pamphlet notifying home and business owners that are in a dam inundation area. It will be similar to the mailer distributed to people that live in flood plains.

Part of this project is to create digital map layers of the inundation maps that can be incorporated into the county’s GIS database.

Other Alternatives: Create a website that will show dam inundation areas where citizens can look up their address and see if they are in an inundation zone. (May be a viable alternative) Digitizing maps will still be required.

Responsible Office: Jefferson County Office of Emergency Management

Priority: High

Cost Estimate: \$45,000

Benefits (Avoided Losses): Notification of those living in dam inundation areas will increase their awareness that they are in a higher hazard area. Or hope is that this awareness will improve preparedness for those in the area. This, along with better mapping will improve warning capabilities that will potentially save lives in case of a disaster.

Potential Funding: Possible CDEM/PDM Grants

Schedule: To be completed by end of 2012

Status: Not completed, however a public warning annex has been developed in the Emergency Operations Plan that will improve warning and evacuation in the event of a dam incident. Public awareness efforts will continue.

20. Geographic Information System Layer Updates

Issue/Background: Much of Jefferson County is considered to be in the Wildland Urban Interface (WUI). With diversity of land ownership in Jeffco it has been a challenge to develop GIS layers for wildfires and completed fire management (fuels reduction) projects.

Other Alternatives: No viable alternatives.

Responsible Office: Jefferson County Office of Emergency Management

Priority: Medium

Cost Estimate: \$35,000

Benefits (Avoided Losses): Having these layers available will be useful during wildfire events, developing future fuels reduction projects and reevaluating completed projects for maintenance/reentry.

Potential Funding: There is some potential to use stimulus money through the Coalition for the Upper South Platte as part of the 2009 ARRA grants.

Schedule: Will be completed in 2011

Status: Wildfire layers were developed for the County CWPP are updated periodically. Project ongoing.

Projects Completed Since 2010

Create a Community Wildfire Protection Plan (CWPP)

Issue/Background: Much of Jefferson County is considered to be in the Wildland Urban Interface (WUI). All but one of the Fire Districts located in the WUI have CWPPs. There is approximately 50 square miles of land in the county that is not part of a fire district. We call that area “no-man’s land” Our goal is to create a countywide CWPP that covers the no-man’s land properties that is also an “umbrella” plan for the Fire Districts CWPPS. Verify that existing CWPPs are updated/verified to be compliant with current CSFS CWPP guidelines. This project was completed in 2012.

North Branch of Coon Creek Culvert at Miller Street

Issue/Background: The existing metal culvert backs water up at Miller Street to a depth of more than 15 feet. This creates unsafe conditions which result in the adjacent residence being in the 100-year floodplain. Should Miller Street breach, the downstream flooding could be catastrophic to the residences and the assisted care living center. This project was completed in 2010.

Provide National Oceanic Atmospheric Administration (NOAA) Radios to Facilities in Jefferson County

Issue/Background: This is an ongoing project to provide a NOAA radio to schools, pre-schools, hospitals, and special needs facilities in high risk locations. This will help the community to better prepare for severe weather watches and warnings. This project was completed in 2010.

Fire Danger Operating Plan

Issue/Background: Large wind driven/weather dependent wildfires have become more common in the Colorado Front Range. County resources are dispatched to respond to these because of their proximity and quality work output. These fires can rapidly overwhelm local resources that are managing them due to firefighter safety, evacuations, public safety, information, and proximity to the WUI. Developing this plan will use the best available science through accurate weather measurements to help prepare agencies to safely manage wildfires year-round. This project was completed in 2013.

Evaluate all power/backup power systems for police, fire (etc.) and repeater tower sites

Issue/Background: Evaluate County/City locations to see which fire/police locations have emergency power and the status of those who don’t (Many locations already have back-up power). Prioritize locations and plan for emergency power either through city or county. The County evaluated and has backup power on Sheriff’s office facilities and County owned repeater towers. Jeffco critical power systems are regularly tested by County personnel. Lakewood and

Wheat Ridge evaluated critical facility backup power capabilities and needs as part of the development of Local Energy Assurance Plans. Project complete in 2011/2012.

Evaluate Possible Mountain Pine Beetle Infestation

Issue/Background: Mountain pine beetle (MPB), *Dendroctonus ponderosae*, is native to the forests of western North America. Periodic outbreaks of the insect, previously called the Black Hills beetle or Rocky Mountain pine beetle, can result in losses of millions of trees. Outbreaks develop irrespective of property lines, being equally evident in wilderness areas, mountain subdivisions and back yards. Even windbreak or landscape pines many miles from the mountains can succumb to beetles imported in infested firewood.

Mountain pine beetles are the most important insect pest of Colorado's pine forests. MPB often kill large numbers of trees annually during outbreaks. Trees that are not growing vigorously due to old age, crowding, poor growing conditions, drought, fire or mechanical damage, root disease and other causes are most likely to be attacked. For a long-term remedy, thin susceptible stands. Leave well-spaced, healthy trees. For short-term controls, spray, cover, burn or peel attacked trees to kill the beetles. Preventive sprays can protect green, un-attacked trees. Infestation was investigated and is not a threat currently. Project complete.

APPENDIX B HMPC and Stakeholder Contact List

Affiliation	Title	Name	Phone	Email
County				
Jefferson County, Administration	County Manager	Ralph Schell	(303) 271-8508	rschell@jeffco.us
Jefferson County, Administration	Deputy County Manager	Kate Newman	(303) 271-8567	knewman@jeffco.us
Jefferson County, Assessor	Assessor	Ron Sandstrom	(303) 271-8634	rsandstr@jeffco.us
Jefferson County, Building Safety		Becky Baker	(303) 271-8284	bbaker@jeffco.us
Jefferson County, Commissioner	Commissioner	Libby Szabo	(303) 271-8510	commish1@jeffco.us
Jefferson County, Commissioner	Commissioner	Casey Tighe	(303) 271-8510	commish2@jeffco.us
Jefferson County, Commissioner	Commissioner	Don Rosier	(303) 271-8510	commish3@jeffco.us
Jefferson County, Fairgrounds	Fairgrounds Director	Scott Gales	(303) 271-6600	sgales@jeffco.us
Jefferson County, IT		Jim Smith	(303) 271-8042	jfsmith@jeffco.us
Jefferson County, IT - GIS (current contact)		Stephen Mitchell	(303) 271-8785	smitchell@jeffco.us
Jefferson County, IT - GIS (initial contact)		Sage Wall	(303) 271-8797	swall@jeffco.us
Jefferson County, Open Space	Park Ranger	Simon Young	(303) 271-5930	syoung@jeffco.us
Jefferson County, Open Space		Tom Hoby	(303) 271-5930	thoby@jeffco.us
Jefferson County, Open Space	Natural Resources Supervisor	Randy Frank	(303) 271-5930	rfrank@jeffco.us
Jefferson County, Open Space	Visitor Services Supervisor	Mary Ann Bonnell	(303) 271-5995	mbonnell@jeffco.us
Jefferson County, Open Space	Natural Resources Team Lead	Keith Bol	(303) 271-5995	kbol@jeffco.us
Jefferson County, Planning & Zoning	Floodplain Manager	Patrick O'Connell	(303) 271-8707	poconnel@jeffco.us
Jefferson County, Planning & Zoning	Planning & Zoning Director	John Wolforth	(303) 271-8713	jwolfort@jeffco.us
Jefferson County, Public Health	Emergency Response Coordinator	Christine Billings	(303)271-8394	cbilling@jeffco.us
Jefferson County, Road & Bridge		Michael Dobbs		mDOBBS@jeffco.us
Jefferson County, Road & Bridge		Larry Benshoof	(303) 271-5204	lbenshoo@jeffco.us
Jefferson County, Road & Bridge		Mike Secary	(303) 271-5201	msecary@jeffco.us

Affiliation	Title	Name	Phone	Email
County				
Jefferson County, Sheriff's Office	Sheriff	Jeff Shrader	(303) 271-5310	jshrader@jeffco.us
Jefferson County, Sheriff's Office	OEM Director	Clint Fey	(303) 271-4901	cfey@jeffco.us
Jefferson County, Sheriff's Office	OEM Deputy Director	Rick Newman	(303) 271-4903	rjnewman@jeffco.us
Jefferson County, Sheriff's Office	OEM Lieutenant/Jeffco IMT	Scott Eddy	(720) 497-7206	seddy@jeffco.us
Jefferson County, Sheriff's Office	Fire Management Officer	Travis Griffin	(303) 271-4902	tkgriffin@jeffco.us
Jefferson County, Transportation, Engineering	T&E Director	Steve Durian	(303) 271-8498	sdurian@jeffco.us
Municipalities				
City of Arvada	Emergency Manager	Jim Lancy	(720) 898-6875	jlancy@arvada.org
City of Arvada	Engineer	Pat Sullivan	(720) 898-7642	Patrick@arvada.org
City of Arvada, Utilities	Utilities PM	Sandy McDonald	(720) 898-7646	
City of Edgewater, Community Services	Director	Dan Maples Darryl	(720) 763-3012	dmaples@edgewaterco.com
City of Golden, Police Department	Captain, Emergency Mgr	Hollingsworth	(303) 384-8032	dhollings@cityofgolden.net
City of Golden, Public Works	Deputy Director	Anne Beierle	(303) 384-8153	ABeierle@cityofgolden.net
City of Golden, Public Works	Engineer	Joe Puhr	(303) 384-8115	jpuhr@cityofgolden.net
City of Lakewood, Office of Emergency Management	Emergency Manager	Brian Nielsen	(303) 987-7192	brinie@lakewood.org
City of Lakewood, Police Department	Police Commander	Mike Greenwell	(303) 987-7174	mikgre@lakewoodco.org
City of Lakewood, Public Works	City Engineer	Anne Heine	(303) 987-7931	annhei@lakewoodco.org
City of Lakewood, Public Works	CRS Coordinator / Floodplain Manager	Marty Wilson- Lloyd	(303) 987-7943	MarWil@lakewood.org mcooney@ci.wheatridge.co.us
City of Wheat Ridge, Police Department	Emergency Manager	Mark Cooney	(303) 658-4550	us
City of Wheat Ridge, Public Works	Project Supervisor/Floodplain Manager	Mark Westberg Bob "Buck"	(303) 235-2863	mwestberg@ci.wheatridge.co.us
Town of Lakeside, Administration	Mayor	Gordani	(303) 739-6481	rgordani@ci.aurora.co.us

Affiliation	Title	Name	Phone	Email
County				
Town of Morrison	Floodplain Manager - contracted	Charles Weiss		cweiss@bowmanconsulting.com
Town of Morrison, Administration	Town Administrator	Kara Zabilansky	(303) 697-8749	kara@town.morrison.co.us
Town of Morrison, Police Department	Police Sergeant	Joe Leo	(303) 697-4810	jleo@police.town.morrison.co.us
Town of Mountain View, Administration	Mayor	Eugene Barnes	(303) 421-7282	ebarnes@tomv.org
Special Districts				
Denver Water	Emergency Manager	Becky Franco	(303) 607-3160	rebecca.franco@denverwater.org
Denver Water		Cindy Brady	(303) 628-6367	
Evergreen Fire District	Fire Chief	Mike Weege	(303) 674-3145	mweege@evergreenfirerescue.com
Evergreen Fire District	Fire Marshal	Frank Dearborn		fdearborn@evergreenfirerescue.com
Fairmount Fire	Fire Prevention Tech	Robert Ipatenco		ripatenco@fairmountfire.org
Fairmount Fire	Chief	Alan Fletcher		afletcher@fairmountfire.org
Golden Gate Fire Protection District	Board Secretary	Sam Paton		secretary@goldengatefire.org
Indian Hills Fire District	Fire Chief	Emery Carson	(303) 697-4568	chief@ihfr.org
Jefferson Conservation District	District Manager (former)	Gwen Steel		gwen.steel@gmail.com
Jefferson Conservation District	District Manager	Garrett Stevens		garrett.stephens@co.nacdn.net
Lookout Mountain Water District	Administrator	Christina Shea	(303) 526-4266	csbis@msn.com
Lookout Mountain Water District	Vice President	Bob Heine		rmheine1@msn.com
North Fork Fire District	Fire Chief	Curt Rogers	(303) 838-2270	nffpd@hotmail.com
Pleasant View Metropolitan District	District Manager	Shonda Norris	(303) 277-9547	snorris@pleasantviewmetro.org
Pleasant View Metropolitan District	Fire Chief	Chris Malmgren		cmalmgren.pvfire@comcast.net
West Metro Fire Protection District	Deputy Chief	Steve Aseltine		saseltine@westmetrofire.org

Affiliation County	Title	Name	Phone	Email
West Metro Fire Protection District	Deputy Chief	Scott Rogers		sgrogers@westmetrofire.org dlombardi@westmetrofire.org
West Metro Fire Protection District	Fire Chief	Don Lombardi	(303) 539-9511	rg
Local/Regional Stakeholders/Non Profits				
Bear Creek Watershed Association	Manager	Russ Clayshulte	(303) 751-7144	rclayshulte@earthlink.net
Chatfield Watershed Authority	Manager	Julie Vlier	(303) 522-8091	julie.vlier@tetrattech.com
Coal Creek Canyon Watershed Partnership	Watershed Coordinator	David Kamin	(303) 586-1491	david@cccwp.org
Coalition for the Upper South Platte	Executive Director	Carol Ekarius	(719) 748-0033	carol@uppersouthplatte.org
DRCOG		Jennifer Schaufele		jschaufele@drcog.org
Evergreen Metro District	New Services & Environmental Manager	Chris Schauder	(303) 674-4112	cschauder@evergreenmetrodistrict.com
Foothills Fire Protection District	Fire Chief	Brian Zoril	(303) 526-0707	zoril@comcast.net
JeffCo Public Schools	Director, Environmental Services	Kim Brogan	(303) 982-2350	kbrogan@jeffco.k12.co.us
Jefferson County Fire Chiefs	President	Alan Fletcher		afletcher@fairmountfire.org
Urban Drainage and Flood Control District	Flood Warning Program Manager	Kevin Stewart		kstewart@udfcd.org
State Stakeholders and Academia				
Colorado Department of Transportation	Emergency Manager	Chad Ray		chad.ray@state.co.us
Colorado DHSEM	Mitigation Planning Coordinator	Patricia Gavelda		patricia.gavelda@state.co.us
Colorado DHSEM	Hazard Mitigation Planner	Stephany Juneau		sstephany.juneau@state.co.us
Colorado DHSEM		Cory Stark		cory.stark@state.co.us
Colorado Division of Water Resources - Dam Safety	Engineer	Kallie Bauer		kallie.bauer@state.co.us
Colorado Geological Survey/CO School of Mines	State Geologist/Director	Karen Berry		kaberry@mines.edu

Affiliation	Title	Name	Phone	Email
County				
Colorado Geological Survey/CO School of Mines	Geologist	Jill Carlson	(303) 384-2643	carlson@mines.edu
Colorado Parks and Wildlife		Bob Broscheid		bob.broscheid@state.co.us
Colorado State Forest Service	District Forester	Alan Gallamore		lm.gallamore@colostate.edu
Colorado Water Conservation Board	NFIP Coordinator	Jamie Prochno		jamie.prochno@state.co.us
Federal Stakeholders				
FEMA Region VIII	Planner / GIS Specialist	Shelby Hines (Hudson)		shelby.hudson@fema.dhs.gov
National Weather Service	Meteorologist	Bob Glancy		robert.glancy@noaa.gov
US Forest Service	Fire Management Officer	Joe Sean Kennedy		jskennedy@fs.fed.us
US Geological Survey		Max Ethridge		methridge@usgs.gov
Business and Industry Stakeholders				
Lockheed Martin	Fire Marshal, Emergency Manager	Darrell Root		darrell.t.root@lmco.com
Molson Coors	Water Resources, Environmental Compliance	Ben Moline		Ben.moline@molsoncoors.com
Xcel Energy	Area Manager	Preston Gibson		preston.e.gibson@xcelenergy.com
Neighboring Jurisdictions				
Adams County	Emergency Manager	Heather McDermott		hmcdermott@adcogov.org
Arapahoe County	Emergency Manager	Nathan Fogg		nfogg@co.arapahoe.co.us
Arapahoe County	Floodplain Manager	Chuck Haskins		chaskins@arapahoegov.com
Boulder County	Emergency Manager	Mike Chard		mchard@bouldercounty.org
Boulder County	Floodplain Manager	Dave Thomas		dthomas@bouldercounty.org
Broomfield County	Emergency Manager	Kent Davies		kdavies@broomfield.org

Affiliation	Title	Name	Phone	Email
County				
Broomfield County	Floodplain Manager	Katie Allen		kallen@broomfield.org
City of Westminster	Emergency Manager	Greg Moser	(303) 658-4550	gmoser@CityofWestminster.us
City of Westminster	Floodplain Manager	John Burke		jburke@cityofwestminster.us
Clear Creek County	Emergency Manager	Kathleen Krebs		Kkrebs@co.clear-creek.co.us
Clear Creek County	Floodplain Manager	John Loughrey		jlloughrey@co.clear-creek.us
Denver City and County	Emergency Manager	Scott Field		scott.field@denvergov.org
Denver City and County	Floodplain Manager	Jeremy Hamer		jeremy.hamer@denvergov.org
Denver City and County, OEM	Planner	Philip Hunt		philip.hunt@denvergov.org
Douglas County	Emergency Manager	Tim Johnson		tmjohnso@dcsheriff.net
Douglas County	Floodplain Manager	Garth Englund		genglund@douglas.co.us
Gilpin Creek County	Emergency Manager	Steve Watson		swatson@co.gilpin.co.us
Park County	Emergency Manager	Gene Stanley		gstanley@parkco.us
Consultant Team				
Amec Foster Wheeler Project Team	Project Manager	Jeff Brislaw	(303) 820-4654	jeff.brislaw@amecfw.com
Amec Foster Wheeler Project Team	Planner/EM Specialist	Kyle Karsjen	(303) 443-7839	Kyle.karsjen@amecfw.com
Amec Foster Wheeler Project Team	GIS Specialist	Mack Chambers	(303) 443-7839	Mack.chambers@amecfw.com
Amec Foster Wheeler Project Team	CRS Specialist/QC Review	David Stroud	(919) 325-6497	david.stroud@amecfw.com



Appendix C PLAN ADOPTION

Note: The records of adoption will be incorporated as an electronic appendix. When the plan is adopted in 2016 the jurisdictions and adoption date will be noted here, but scanned versions of all adoption resolutions will be kept on file with Jefferson County Emergency Management. A sample adoption resolution is provided here.

Multi-Hazard Mitigation Plan Adoption Sample Resolution

Resolution # _____

**Adopting the Jefferson County, Colorado
Multi-Hazard Mitigation Plan 2016**

Whereas, (name of county or community) recognizes the threat that natural hazards pose to people and property within our community; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

Whereas, an adopted Multi-Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, (name of county or community) resides within the Planning Area, and fully participated in the mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

Whereas, the Colorado Division of Homeland Security and Emergency Management and Federal Emergency Management Agency, Region VIII officials have reviewed the Jefferson County Multi-Hazard Mitigation Plan and approved it contingent upon this official adoption of the participating governing body; and

Now, therefore, be it resolved, that the (name of board or council), hereby adopts the Jefferson County Multi-Hazard Mitigation Plan, as an official plan; and

Be it further resolved, Jefferson County Emergency Management will submit this Adoption Resolution to the Colorado Division of Homeland Security and Emergency Management and Federal Emergency Management Agency, Region VIII officials to enable the Plan's final approval.

Passed: (date)

Certifying Official



Appendix D REFERENCES

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City of Golden. www.ci.golden.co.us

City of Lakewood. www.ci.lakewood.co.us

City of Wheat Ridge. www.ci.wheatridge.co.us

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Colorado Department of Local Affairs. www.dola.colorado.gov

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Colorado State Forest Service. [http:// forestry.state.co.us](http://forestry.state.co.us)

Colorado Water Conservation Board. <http://cwcb.state.co.us>

Community Rating System. www.fema.gov/business/nfip/crs.shtm

Denver Regional Council on Governments. www.drcog.org

Denver Regional Council on Governments Natural Hazard Mitigation Plan.

www.drcog.org/index.cfm?page=NaturalHazardMitigation89

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Enhanced Fujita Scale. National Oceanic and Atmospheric Administration Storm Prediction Center, www.spc.noaa.gov/faq/tornado/ef-scale.html

Evergreen Fire Protection District. [udfcd.org/downloads/pdf/publications/fhad_new/Clear Creek FHAD Denver and Jeffco 2007.pdf](http://udfcd.org/downloads/pdf/publications/fhad_new/Clear_Creek_FHAD_Denver_and_Jeffco_2007.pdf)

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<http://water.state.co.us/damsafety/damguide.pdf>.

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http://www.wildfirelessons.net/documents/Hayman_Fire_Impacts_FMT_Vol65_1.pdf

Indian Hills Fire Protection District. www.indianhillsfirerescue.org

Insurance Service Office, Inc. <http://www.iso.com/>

Jefferson County. www.co.jefferson.co.us

Jefferson County Archives and Records.

http://www.co.jefferson.co.us/archives/archives_T77_R66.htm

Jefferson County Assessor’s Office. [http:// jeffco.us/assessor/index.htm](http://jeffco.us/assessor/index.htm)

Jefferson County Office of Emergency Management.

www.co.jefferson.co.us/sheriff/sheriff_T62_R191.htm

Jefferson County Economic Profile, EDC

Jefferson County Emergency Preparedness Guide.

www.co.jefferson.co.us/health/health_T111_R214.htm

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National Environmental Policy Act. www.epa.gov/compliance/nepa

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National Lightning Safety Institute. www.lightningsafety.com

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National Resource Conservation Service Emergency Watershed Program.
<http://www.nrcs.usda.gov/programs/ewp/>

National Weather Association (NWA) Online Glossary. <http://www.weather.gov/glossary/>

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North Fork Fire Protection District. www.northforkfire.org

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Precipitation Runoff Modeling System. http://cmd.gsfc.nasa.gov/records/USGS_PRMS.html

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http://co.jefferson.co.us/jeffco/planning_uploads/guides/small_site_erosion.pdf

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Town of Morrison. <http://town.morrison.co.us>

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<http://earthquake.usgs.gov/regional/states/colorado/hazards.php>

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<http://www.westwideriskassessment.com/data/wwagisdata.html>

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Jefferson County Multi-Hazard Mitigation Plan Update

Public Participation Plan

January 2016

Prepared by:
Amec Foster Wheeler Environment and Infrastructure



Purposes of the Public Participation Plan

The basic purpose for a public participation plan is to provide for a meaningful process through which Jefferson County and the participating jurisdictions' citizens, public officials, and stakeholder groups may effectively participate in the update of the Jefferson County Multi-Jurisdictional Multi-Hazard Mitigation Plan. This plan will be developed based upon the understanding that citizens and groups are the source of tremendous creativity, and that their creativity and input will produce better planning decisions. The emphasis is to recognize every citizen's right to participate in the process of making local government decisions. Significant energy investments such as time, financial support, and data gathering on the part of the participants will be needed to complete the planning effort. Given these investments, broad public participation throughout the planning process is regarded as an essential strategy for developing a plan that withstands the test of an actual event.

A wide variety of public participation methods, representing distinct purposes, will be employed to provide for broad public participation. These purposes of public participation are as follows:

- **Public Awareness** - to share information and to promote awareness of planning process, including ways the public can participate
- **Public Education** - to educate citizens and help them make more informed choices
- **Public Input** - to provide citizens and groups with opportunities to inject ideas into the planning process
- **Public Interaction** - to exchange views and ideas as a means of reaching consensus
- **Public Partnership** - to involve citizens in the decision making process

Objectives of the Public Participation Plan

1. Recognizing that there are many levels of public participation, to provide for an effective mix of participation opportunities that include the above bulleted purposes.
2. Recognizing that not everyone participates in the same way or at the same time, to include a mix of participation strategies that provides for a broad and diverse set of participation opportunities that considers the diversity of the planning area.
3. Recognizing Jefferson County and the participating jurisdictions' history of past public participation with planning projects, the designated Jefferson County lead will continue to provide the public with opportunities to review, clarify, and update previously generated information, as well as generate new policies, goals, objectives, and information.
4. To build public support for, and ultimately ownership of, the update to the Jefferson County Multi-Hazard Mitigation Plan.

Local Government Public Outreach/Involvement Responsibilities

The requirements related to public involvement in hazard mitigation plans according to the Disaster Mitigation Act of 2000 are listed below:

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process **shall** include:*

- (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;*
- (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and*
- (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

Requirement §201.6(c)(1): *[The plan **shall** document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Requirement §201.6(c)(4)(iii): *[The plan maintenance process **shall** include a] discussion on how the community will continue public participation in the plan maintenance process.*

To meet these requirements, and the goals of the Public Participation Plan, local governments are expected to assist with public outreach and feedback efforts, which can include:

- Assisting in distributing press releases and information to local media
- Sharing public input/comment with the HMPC
- Provide report on progress/activities related to public involvement, as requested by the County and/or AMEC
- Reviewing public input for incorporation in plan, as appropriate
- Assisting with holding public workshops as requested, including providing meeting space and advertising meeting.
- Announcing the planning effort at other public and civic meetings, or holding additional public meetings, if desired by the jurisdiction.
- Announce how the plan can be accessed during the public review period. This can include providing links from the jurisdiction's website to the project website, or providing hardcopy of the plan in a public location such as a library or municipal building.
- Follow the recommendations for continued public involvement as designated in the implementation chapter of the plan.

The following public participation steps and specific activities are outlined in conjunction with the hazard mitigation steps to give a better picture of how they are linked in the process. This is a working document that will be updated throughout the process, and serve to document the efforts made to involve the public during the plan update.

Timeframe	Mitigation Planning Steps	Public Participation Steps/Ideas	Specific Activities/Actions
Aug–Oct 2015	<ol style="list-style-type: none"> 1. Getting Organized 2. Plan for public involvement 3. Coordinate with other departments and agencies 	<ul style="list-style-type: none"> • Build public awareness through media channels, specifically Channel 8 public access • Post information about the HMP update on the County Website • Local jurisdiction public outreach • Leverage current and ongoing public outreach efforts (town hall meetings, etc.) • Online survey tools (Survey Monkey) • Outreach through other groups, Private, Non-Profit, Non-governmental organizations • Possible public groups include: Local media, LEPC, Chambers of Commerce • Possible private/business groups include: Xcel Energy, MillerCoors, Lockheed Martin, Dam owners 	<ul style="list-style-type: none"> • Hazard Mitigation Planning Committee formed • Develop backgrounder fact sheet (one page handout) for public distribution • Discussed plan and handed out Conifer/285 Corridor Area Community Plan meeting September 1, 2015 • Handout materials at JeffCo Health and Safety Fair (Sept. 19th) • Jefferson Conservation District annual meeting in October • West Metro has annual fire meeting at training center • Wheat Ridge annual flood meeting (March/Apr) • Evergreen wildfire forum (March/Apr) • Xcel energy attended kickoff • Lockheed Martin invited to participate on HMPC
Oct-Dec 2015	<ol style="list-style-type: none"> 4. Identify the hazards 5. Assess the risks 	<ul style="list-style-type: none"> • Provide maps and info materials at meetings • Share public input with HMPC • Cooperative review of public input • Announce workshops • Build contact list of interested citizens to inform of future activities 	<ul style="list-style-type: none"> • Announcement of upcoming public outreach efforts through various media channels • Development of a public survey that can be distributed online and in hardcopy • Post link to survey on County homepage and jurisdictional home pages • Utilize Social media (JeffCo OEM Twitter and Facebook) outreach to announce public survey

Timeframe	Mitigation Planning Steps	Public Participation Steps/Ideas	Specific Activities/Actions
Jan- Mar 2016	<ol style="list-style-type: none"> 6. Set planning goals 7. Review mitigation alternatives 8. Draft an action plan 	<ul style="list-style-type: none"> • Continue to build public awareness through various media channels • Host public workshop to allow comment on draft mitigation plan goals, objectives, and actions. • Provide Internet access for public info and draft plan review and comment • Participating jurisdictions submission of comments for review and incorporation • Encourage public review of final draft 	<ul style="list-style-type: none"> • Announcement of upcoming public survey through various means including: • Posting link on websites • Inclusion of hardcopy survey in utility mailings (Lookout Mountain Water Dist.) • Distributing link with social media and email groups • Compiling survey results and sharing with HMPC • Public workshop March 23, 2016 in Wheat Ridge with flood forum • Announcement of upcoming public workshop through various media channels • Post draft plan for public review with links from County and city websites; encourage review and comment on draft plan.
April 2016 and beyond	<ol style="list-style-type: none"> 9. Adopt the plan 10. Implement the plan, evaluate its worth, and revise as needed 	<ul style="list-style-type: none"> • Discuss plan as agenda item at Commissioner and board meetings during adoption 	Utilize plan for continued public involvement outlined in Chapter 7 during plan implementation

APPENDIX F
PLANNING PROCESS DOCUMENTATION



CITY OF ARVADA

OFFICE OF THE CITY MANAGER
FACSIMILE: 720-898-7515 ▲ TDD: 720-898-7869
PHONE: 720-898-7500

August 21, 2014

Jefferson County Sheriff's Office
Clint Fey, Emergency Management Director
200 Jefferson County Parkway
Golden, CO 80419

Re: "Statement of Intent to Participate" as a participating jurisdiction in the Jefferson County Multi-Jurisdictional Hazard Mitigation Plan (HMP)

Dear Mr. Fey:

In accordance with the Federal Emergency Management Agency's (FEMA) Local Hazard Mitigation Plan (HMP) requirements, under 44 CFR §201.6, which specifically identify criteria that allow for multi-jurisdictional mitigation plans, the City of Arvada is submitting this letter of intent to confirm that the City of Arvada has agreed to participate in the Jefferson County Multi-Jurisdictional Hazard Mitigation Planning effort.

Further, as a condition to participating in the mitigation planning, the City of Arvada agrees to meet the requirements for mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Jefferson County to complete the plan in conformance with FEMA requirements.

The City of Arvada understands that it must engage in the following planning process, as more fully described in FEMA's *Local Mitigation Planning Handbook* dated March 2013 including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.);
- Documentation of an effective process to maintain and implement the plan;
- Formal adoption of the Multi-Jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by an agreement between the Lead Jurisdiction and the Participating Jurisdiction, I, Mark Deven, City Manager, commit the City of Arvada to the Jefferson County Multi-Jurisdictional Hazard Mitigation Planning effort.


Mark G. Deven, City Manager



August 15, 2014

Jefferson County Sheriff's Office
Clint Fey, Emergency Management Director
200 Jefferson County Parkway
Golden, CO 80419

Re: "Statement of Intent to Participate" as a participating jurisdiction in the Jefferson County Multi-Jurisdictional Hazard Mitigation Plan (HMP)

Dear Mr. Fey,

In accordance with the Federal Emergency Management Agency's (FEMA) Local Hazard Mitigation Plan (HMP) requirements, under 44 CFR §201.6, which specifically identify criteria that allow for multi-jurisdictional mitigation plans, the City of Edgewater is submitting this letter of intent to confirm that the City of Edgewater has agreed to participate in the Jefferson County Multi-Jurisdictional Hazard Mitigation Planning effort.

Further, as a condition to participating in the mitigation planning, the City of Edgewater agrees to meet the requirements for mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Jefferson County to complete the plan in conformance with FEMA requirements.

The City of Edgewater understands that it must engage in the following planning process, as more fully described in FEMA's *Local Mitigation Planning Handbook* dated March 2013 including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.);
- Documentation of an effective process to maintain and implement the plan;
- Formal adoption of the Multi-Jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by an agreement between the Lead Jurisdiction and the Participating Jurisdiction, I HJ Stalf, commit the City of Edgewater to the Jefferson County Multi-Jurisdictional Hazard Mitigation Planning effort.

Executed this 19 day of August 2014



HJ Stalf, City Manager



August 21, 2014

Jefferson County Sheriff's Office
Clint Fey, Emergency Management Director
200 Jefferson County Parkway
Golden, CO 80419

Re: "Statement of Intent to Participate" as a participating jurisdiction in the Jefferson County Multi-Jurisdictional Hazard Mitigation Plan (HMP)

Dear Mr. Fey,

In accordance with the Federal Emergency Management Agency's (FEMA) Local Hazard Mitigation Plan (HMP) requirements, under 44 CFR §201.6, which specifically identify criteria that allow for multi-jurisdictional mitigation plans, the City of Golden is submitting this letter of intent to confirm that the City of Golden has agreed to participate in the Jefferson County Multi-Jurisdictional Hazard Mitigation Planning effort.

Further, as a condition to participating in the mitigation planning, the City of Golden agrees to meet the requirements for mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Jefferson County to complete the plan in conformance with FEMA requirements.

The City of Golden understands that it must engage in the following planning process, as more fully described in FEMA's *Local Mitigation Planning Handbook* dated March 2013 including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.);
- Documentation of an effective process to maintain and implement the plan;
- Formal adoption of the Multi-Jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by an agreement between the Lead Jurisdiction and the Participating Jurisdiction, I Michael C. Bestor, commit the City of Golden to the Jefferson County Multi-Jurisdictional Hazard Mitigation Planning effort.

Sincerely,

A handwritten signature in black ink, appearing to read 'M. Bestor', with a long, sweeping horizontal stroke extending to the right.

Michael C. Bestor
City Manager



North Fork Fire Protection District

P O Box 183
Buffalo Creek, CO 80425-0183
Phone: 303-838-2270
Fax: 303-838-0412

August 19, 2014

Jefferson County Sheriff's Office
Clint Fey, Emergency Management Director
200 Jefferson County Parkway
Golden, CO 80419

Re: "Statement of Intent to Participate" as a participating jurisdiction in the Jefferson County Multi-Jurisdictional Hazard Mitigation Plan (HMP)

Dear Mr. Fey,

In accordance with the Federal Emergency Management Agency's (FEMA) Local Hazard Mitigation Plan (HMP) requirements, under 44 CFR §201.6, which specifically identify criteria that allow for multi-jurisdictional mitigation plans, the North Fork Fire Protection District (NFFPD) is submitting this letter of intent to confirm that NFFPD has agreed to participate in the Jefferson County Multi-Jurisdictional Hazard Mitigation Planning effort.

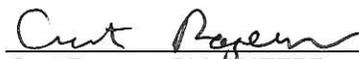
Further, as a condition to participating in the mitigation planning, NFFPD agrees to meet the requirements for mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Jefferson County to complete the plan in conformance with FEMA requirements.

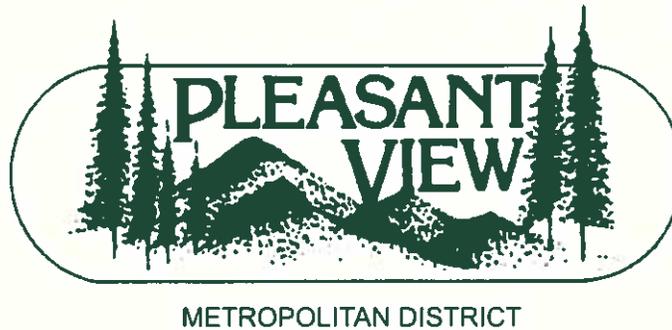
NFFPD understands that it must engage in the following planning process, as more fully described in FEMA's *Local Mitigation Planning Handbook* dated March 2013 including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.);
- Documentation of an effective process to maintain and implement the plan;
- Formal adoption of the Multi-Jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by an agreement between the Lead Jurisdiction and the Participating Jurisdiction, I Curt Rogers, commit North Fork Fire Protection District to the Jefferson County Multi-Jurisdictional Hazard Mitigation Planning effort.

Executed this 19th day of August


Curt Rogers, Chief NFFPD



LETTER OF INTENT TO PARTICIPATE

August 15, 2014

Jefferson County Sheriff's Office
Clint Fey, Emergency Management Director
200 Jefferson County Parkway
Golden, CO 80419

Re: "Statement of Intent to Participate" as a participating jurisdiction in the Jefferson County Multi-Jurisdictional Hazard Mitigation Plan (HMP)

Dear Mr. Fey,

In accordance with the Federal Emergency Management Agency's (FEMA) Local Hazard Mitigation Plan (HMP) requirements, under 44 CFR §201.6, which specifically identify criteria that allow for multi-jurisdictional mitigation plans, the Pleasant View Metropolitan District is submitting this letter of intent to confirm that Pleasant View Metropolitan District has agreed to participate in the Jefferson County Multi-Jurisdictional Hazard Mitigation Planning effort.

Further, as a condition to participating in the mitigation planning, Pleasant View Metropolitan District agrees to meet the requirements for mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Jefferson County to complete the plan in conformance with FEMA requirements.

Pleasant View Metropolitan District understands that it must engage in the following planning process, as more fully described in FEMA's *Local Mitigation Planning Handbook* dated March 2013 including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant

involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.);

- Documentation of an effective process to maintain and implement the plan;
- Formal adoption of the Multi-Jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by an agreement between the Lead Jurisdiction and the Participating Jurisdiction, I Adrian Waller, commit Pleasant View Metropolitan District to the Jefferson County Multi-Jurisdictional Hazard Mitigation Planning effort.

Executed this 19th day of August, 2014.



Adrian Waller, Board President



West Metro Fire Protection District

433 S. Allison Parkway
Lakewood, CO 80226

Bus: (303) 989-4307
Fax: (303) 989-6725
www.westmetrofire.org

August 18, 2014

Jefferson County Sheriff's Office
Clint Fey, Emergency Management Director
200 Jefferson County Parkway
Golden, CO 80419

Re: "Statement of Intent to Participate" as a participating jurisdiction in the Jefferson County Multi-Jurisdictional Hazard Mitigation Plan (HMP)

Dear Director Fey:

In accordance with the Federal Emergency Management Agency's (FEMA) Local Hazard Mitigation Plan (HMP) requirements, under 44 CFR §201.6, which specifically identify criteria that allow for multi-jurisdictional mitigation plans, the West Metro Fire Protection District is submitting this letter of intent to confirm that West Metro Fire Protection District has agreed to participate in the Jefferson County Multi-Jurisdictional Hazard Mitigation Planning effort.

Further, as a condition to participating in the mitigation planning, West Metro Fire Protection District agrees to meet the requirements for mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Jefferson County to complete the plan in conformance with FEMA requirements.

West Metro Fire Protection District understands that it must engage in the following planning process, as more fully described in FEMA's *Local Mitigation Planning Handbook* dated March 2013 including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;

- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.);
- Documentation of an effective process to maintain and implement the plan;
- Formal adoption of the Multi-Jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by an agreement between the Lead Jurisdiction and the Participating Jurisdiction, I, Fire Chief Don Lombardi, commit West Metro Fire Protection District to the Jefferson County Multi-Jurisdictional Hazard Mitigation Planning effort.

Executed this 18th day of August 2014.

A handwritten signature in black ink, appearing to read 'Don Lombardi', written over a faint, illegible printed name.

Don Lombardi
Fire Chief

Jeffery Shrader <jshrader@co.jefferson.co.us>; 'jlancy@arvada.org'; 'dmaples@edgewaterco.com'; Daryl Hollingsworth <dhollings@cityofgolden.net>; 'brinie@lakewood.org'; 'mcooney@ci.wheatridge.co.us'; 'rgordani@ci.aurora.co.us'; 'kara@town.morrison.co.us'; 'ebarnes@tomv.org'; 'mweege@evergreenfirerescue.com'; 'chief@ihfr.org'; 'nffpd@hotmail.com'; 'csbis@msn.com'; 'snorris@pleasantviewmetro.org'; 'dlombardi@westmetrofire.org'; 'rebecca.franco@denverwater.org'; 'mwestberg@ci.wheatridge.co.us'; Ralph Schell <rschell@co.jefferson.co.us>; Kate Newman <knewman@co.jefferson.co.us>; commish1 <commish1@co.jefferson.co.us>; commish2 <commish2@co.jefferson.co.us>; commish3 <commish3@co.jefferson.co.us>; Pat OConnell <poconnel@co.jefferson.co.us>; John Wolforth <jwolfort@co.jefferson.co.us>; Tom Hoby <thoby@co.jefferson.co.us>; Mary Ann Bonnell <mbonnell@co.jefferson.co.us>; Simon Young <syoun@co.jefferson.co.us>; Steve Durian <sdurian@co.jefferson.co.us>; Larry Benshoof <lbenshoo@co.jefferson.co.us>; Mike Secary <msecary@co.jefferson.co.us>; Michael Dobbs <mdobbs@co.jefferson.co.us>; Ron Sandstrom <rsandstr@co.jefferson.co.us>; Becky Baker <bbaker@co.jefferson.co.us>; Jim Smith <jfsmith@co.jefferson.co.us>; Sage Wall <swall@co.jefferson.co.us>; Scott Gales <sgales@co.jefferson.co.us>; 'secretary@goldengatefire.org'; 'gwen.steel@gmail.com'; 'kaberry@mines.edu'; 'lm.gallamore@colostate.edu'; 'chad.ray@state.co.us'; 'patricia.gavelda@state.co.us'; 'cory.stark@state.co.us'; 'bob.broscheid@state.co.us'; 'jschaufele@drcog.org'; 'amcgoing@jeffco.us'; 'afletcher@fairmountfire.org'; 'preston.e.gibson@xcelenergy.com'; 'darrell.t.root@lmco.com'; 'robert.glancy@noaa.gov'; 'shelby.hudson@fema.dhs.gov'; 'jskennedy@fs.fed.us'; 'rjarrett@usgs.gov'; 'methridge@usgs.gov'; 'kstewart@udfcd.org'; Clint Fey <cfey@co.jefferson.co.us>; Richard J Newman <rjnewman@co.jefferson.co.us>; Scott Eddy <seddy@co.jefferson.co.us>; 'fdearborn@evergreenfirerescue.com'; 'rmheine1@msn.com'; 'mikgre@lakewoodco.org'; 'ripatenco@fairmountfire.org'; 'srogers@westmetrofire.org'; 'saseltine@westmetrofire.org'; 'cmalmgren.pvfire@comcast.net'; Christine Billings <cbilling@co.jefferson.co.us>; 'chief@police.town.morrison.co.us'; Brislawn, Jeff P <jeff.brislawn@amec.com>; Karsjen, Kyle <kyle.karsjen@amec.com>; Valdez, Andrew <andrew.valdez@amec.com>; Chambers, Mack <Mack.Chambers@amec.com>; Stroud, David A <David.Stroud@amec.com>

From: Clint Fey

Sent: Friday, August 07, 2015 12:14 PM

Subject: Jeffco Hazard Mitigation Plan Kickoff - DATE CHANGE!

Importance: High

Hi All,

Jefferson County has finalized a contract with AMEC Foster Wheeler to update our 2010 regional hazard mitigation plan. The process took a little longer than anticipated and, as such, we've elected to move the date of our kickoff meeting.

The meeting will take place on Tuesday, August 25th from 9:00a until 11:30a. The meeting will take place at the West Metro Fire Training Center at 3535 S. Kipling St. in Lakewood (Southwest corner of Kipling and Hampden).

Please mark your calendars and plan on attending this kickoff meeting to meet the consultant, get information on the update process, and learn how your jurisdiction will be involved. Your attendance at this meeting (and any additional meetings) will count towards your agency's fund matching requirements. A copy of the agenda is attached for your information.

Thank you for your patience in this process. I look forward to seeing you on the 25th.

Sincerely,

Clint

CLINT J. FEY, DIRECTOR

JEFFERSON COUNTY EMERGENCY MANAGEMENT

JEFFERSON COUNTY SHERIFF'S OFFICE
800 JEFFERSON COUNTY PARKWAY
GOLDEN, CO 80401
OFFICE: (303) 271-4901
MOBILE: (720) 641-5696
FAX: (303) 271-4905
DISPATCH: (303) 271-0211
CFEY@JEFFCO.US



JEFFERSON COUNTY MULTI-HAZARD MITIGATION PLAN 2015- 2016 UPDATE

KICKOFF MEETING

**Tuesday, August 25, 2015 9:00-11:30am
West Metro Fire Training Center, 3535 S. Kipling St, Lakewood, CO**

- ❖ Opening Remarks and Introductions**
- ❖ Mitigation, Mitigation Planning, and the Disaster Mitigation Act Requirements**
- ❖ Multi-Jurisdictional Participation and the Hazard Mitigation Planning Committee**
- ❖ Overview of the existing Hazard Mitigation Plan**
- ❖ Implementation Success Stories**
- ❖ Objectives and Schedule for the Plan Update**
- ❖ Review of Identified Hazards**
- ❖ Coordinating with Other Agencies\Related Planning Efforts\Recent Studies**
- ❖ Planning for Public Involvement**
- ❖ Information Needs/Next Steps**
- ❖ Questions and Answers/Adjourn**

Jefferson County Multi-Hazard Mitigation Plan Update

Summary of Kickoff and Hazard Identification Update Meeting

Tuesday, August 25th 2015

9:00am to 11:30am

West Metro Fire Training Center 3535 S. Kipling St. Lakewood CO 80235

Introduction and Opening Remarks

Clint Fey with Jefferson County emergency management began the meeting with welcoming remarks and introduced Jeff Brislawn, project leader with Amec Foster Wheeler, the consulting firm hired to facilitate the planning process and develop the updated County plan. Clint asked everyone around the room to introduce themselves, 32 persons from various County, municipal, special district, state and federal organizations were in attendance and documented on a sign in sheet. Handout materials were provided. Many were new to the plan; 6 people indicated they were involved in the 2010 plan.

Presentation

Jeff presented the PowerPoint slide deck that outlined the planning process, goals of the previous plan and the estimated timeline to deliver a draft for review. Jeff also mentioned the increase in the number of disaster incidents and the corresponding increase in recovery costs in Colorado and nationwide in recent years. The planning process involves a 4 Phase approach with 10 steps (FEMA guidance). Goals of planning process:

- Reengage the stakeholders
- Raise awareness and engage the public
- New hazards and better data (wildfire)
- Update and enhance the mitigation strategy
- Highlight mitigation successes

The plan will also maintain eligibility for FEMA mitigation grant funding, and will help increase Community Rating System planning credits for communities that are part of the CRS program. Jeff outlined DMA planning and noted that every local government (including certain special districts) should participate in this planning effort if they want to continue FEMA mitigation grant eligibility. The plan's intent is to guide mitigation activities in coordinated manner, eg. land use, zoning, wildfire, and reduce disaster losses (resilience). ***Jeff recommended each government entity form their own subcommittee for including representation for floodplain management, planning, open space, public works, etc.***

Planning for public involvement – FEMA doesn't prescribe (hosting public meetings, provide input, workshops, public television, etc.) so the HMPC will steer public engagement process and manage coordination with other agencies (fed, state, local).

Risk assessment – The risk assessment process identifies:

Where are the hazards that happen? Has it happened before?

- Data and GIS analysis to drive risk assessment to quantify risk to life and property.
- Capability assessment – Identify/update programs, policies, and plans are currently in place to mitigation hazards.

Mitigation Strategy – This will be the topic of future meetings.

- Solicit input from those in room and revisit goals and actions/projects.
- Outline 4 A's (alter, adapt, avert, avoid)
- Review mitigation alternatives
- Revisit priorities
- Capture ongoing grant efforts and leverage resources

Plan Drafts - 3 Drafts will be created: first for review by HMPC committee, a 2nd for public review, and a 3rd for state and FEMA review.

Role of the Hazard Mitigation Planning Committee (HMPC) – Jeff emphasized that this is YOUR plan, we need local input, and participation is required; participation includes:

- establishing a planning committee for each jurisdiction,
 - provide requested data,
 - hosting public meetings and assisting in coordinating press releases,
 - providing comments on draft plans and
 - coordinating formal adoption.
- Question: How long does process take? Typically it is 8 months to 1 year from beginning till plan is submitted to State/FEMA for review; State/Fed review can add 3-4 months before plan is approvable pending adoption.

Jeff outlined the planning process timetable to include completing the risk assessment by fall and conduct meetings 2 and 3 before holidays. March 2016 is the target for a revised draft.

NFIP and CRS – Compliance with NFIP is a required element of the plan; CRS rewards communities that go above NFIP minimum standards with discounts on flood insurance. Documentation of planning is important for CRS credits.

Background on 2010 Jefferson County MHP

- Began process in March of 2009, March of 2010 approval.
- All sections will be revised, per a handout noting the plan chapter and key items to update.
- New Census data will be used to update community profile and update on development trends.

2010 JeffCo Plan Goals will be revisited; these included the following plus several objectives:

- Increase awareness of natural hazards,
- Reduce impacts of natural hazards on life, property and environment,
- Strengthen and develop partnerships to mitigate hazard impacts.

Jeff discussed an example of mitigation projects in the plan (CWPP, NFIP and CRS participation, backup power for critical facilities, etc.)

Jeff asked for examples of implementation success stories.

- Clint Fey noted public warning notification improvements including a new policy with 3 different evacuation levels, public outreach; tested in Genesee; new vendor (CodeRed) tied in with National Weather Service to broadcast information and messages related to natural disasters.
- Following 2013 floods they hired firm to analyze flows and changes have been made to mitigate based on lessons learned.
- One concern from an HMPC member was opposition to fire mitigation in JeffCo Open Space – Specifically in Apex Open Space Park fuels loads, there was public opposition to doing clearing; need to find out whom from and engage.

Plan Update Requirements

Jeff noted some of the plan update requirements that were captured in a handout. Amec Foster Wheeler will offer planning guidance throughout process.

- Project schedule – Target: March revised draft for DHSEM/FEMA review; Formal adoption by August 2016
- Question - Can we send PPT to committee? Jeff responded: Will email PDF of all materials to group.
- Question - At what stage do we talk about potential mitigation projects? Jeff responds: 3rd meeting, but never too early to start thinking about that – write ideas down.

Hazards Identification Process

Hazards ID summary from 2010 plan

A list of potential natural hazards was discussed, based on hazards identified in the 2010 plan and Colorado State Hazard Mitigation Plan, to determine if any changes needed to be made during the update process. The focus of the updated plan will be on natural hazards, since manmade hazards are not required by DMA 2000 regulations and are addressed by a separate planning mechanisms. The hazards discussed that are currently in the plans include:

- Avalanche
- Dam Failure
- Drought
- Earthquake
- Erosion and deposition
- Expansive soils
- Extreme temperatures
- Flood
- Hailstorm
- Landslides, debris flows and rock falls
- Lightning
- Severe Winter Storms
- Subsidence
- Tornado
- Wildfire

- Windstorm

A handout was provided that listed the hazards and summarized their geographic extent, probability, and potential magnitude/severity ratings (from 2010 plan) to start the discussion.

Question – Will transportation of hazardous materials be covered? Clint: Transportation of HazMat: no, but facilities that store HazMat are included as critical facilities. Clint: THIRA data is available but information is sensitive, we are focusing on ‘natural’ hazards and not on ‘manmade’ hazards like terrorism.

Comment from HMPC: Wildfire future potential is rated “likely” but recommend “highly likely”. May be more appropriate. Worth revisiting.

Comment from HMPC: Avalanche risk was negligible: I-70 corridor, but no direct risk to life/property.

Question: Zoonotic disease, pandemic flu, etc. should be included in this plan? Clint concurs, the Colorado Department of Health and Public Environment will be involved in the development of this plan.

Question: Why is lightning magnitude/severity listed as ‘critical.’ Strikes 1-2 people per year statewide, might look at downgrading? Jeff noted the potential for death and injury and impacts to critical facilities. Deserves review.

Question: Why is drought magnitude/severity so low? Colorado has recently been in drought and the rating should be increased from limited. Higher food prices, higher water prices, higher potential for wildfire. Deserves review.

Information Sources: Jeff asked the HMPC for additional sources for information related to recent studies/reports/data. Suggested sources included:

- Clint: CoreLogic wildfire risk report and lessons learned from 2013 floods
- JeffCo CRS– recent verification visit
- Shelby (FEMA): Spatial data that tracked damaged buildings/infrastructure (Public Assistance program) Can provide Lat. Long; West Wide Wildfire risk assessment has a lot of data, there is portal for data on CSFS website.
- Countywide CWPP has neighborhoods classified by risk..
- In Open space we keep track of fire incidents, pull data from state Forest Service
- Sage (County GIS) provided fire perimeters from recent fires
- Watershed groups would have data on forest health and watersheds, e.g. Coalition for Upper South Platte
- Colorado Dam Safety engineer, reevaluating safety of existing dams following 2013 floods
- Urban Drainage and Flood Control District “September to Remember” document
- Recent damage assessments (2013 and 2015 flooding)

Coordination with other Planning Efforts

This plan should coordinate with ongoing and future planning efforts (land use plans, master plans, comp plans. Plans suggested by the HMPC included:

- Watershed master plan (Coal Creek)
- CDOT hydrology and bridge studies
 - Hydrology plan in Clear Creek, may increase floodplain
 - Bridge evaluations (Kipling bridge at Clear Creek is at capacity during normal spring runoff)
- Urban Drainage and Flood Control District is involved with advanced hydrology planning for flood response, warning and evacuation in Lena Gulch and Maple Grove Reservoir
- Urban drainage CRS website under development.

Jeff asks HMPC: Has 2010 plan been integrated into any plans? CRS resource urban drainage 610 credit, flood extent mapping, multiple (3) levels of threat (Wheat Ridge) Might augment CRS rating if mapping is completed. When would first house get wet? Related to FEMA mapping.

Comment from Shelby (FEMA) RiskMap – Site specific flood mapping out of FEMA VIII mapping in HAZUS (specific facilities) happening next year? Shelby will follow up with Jeff on that. Will stand up a GIS viewer online tool – checking on timing.

Planning for Public Involvement:

The public participation plan from the 2010 plan will be updated to outline public involvement strategies and opportunities. Getting the public to meetings can be a challenge. A discussion was held on how to coordinate this planning process with other public outreach efforts.

- Question: What do we want from public? Make them aware plan exists; take personal responsibility for hazards; help identify problem areas/information; query types of mitigation activities they would support; known issue areas.

Opportunities to engage the public that were noted by the HMPC included:

- Telephone Town Hall meetings
- Wheat Ridge annual floodplain meeting in March
- Summerset festival in Clement Park.
- Annual fire meeting at training center.
- Online surveys - A statistically valid survey may be more valuable than having 'town hall' meetings that has limited attendance.
- Randomized telephone surveys.
- Inquire with Natural Hazards Center at CU Boulder to see if any surveys/studies are in the works.
- Open Space - Segment on Channel 8, opportunity to advertise survey.
- Jefferson Conservation District has annual meeting coming up in October
- Health and Safety Fair – 19th of September
- Evergreen wildfire forum in Mar/Apr – (typically 350 attendees)
- Fire dept. fundraisers
- Provide handouts at Community Plan meetings
- Social media blasts from the Sheriff's Office
- Programs for Public Information set up for CRS/floodplain management purposes.

Coordination with other Agencies

A diverse group of participants and stakeholders have been invited to participate including neighboring counties, state and federal agencies, business and industry, and academia. Jeff asked who else should be involved. Clint noted that while we have good representation today he will reach out to those who didn't show. Some of the questions from the HMPC included:

- Colorado Parks and Wildlife was invited but didn't come
- Weather Service? invited
- CDOT? Yes - represented
- Army Corps of Engineers? On the list but no representation
- NRCS? Check on that...
- JeffCo Health Dept? (on list, unable to attend today but engaged)
- JeffCo Planning and Zoning? (is here)

New Participating jurisdictions include Golden Gate FPD, Fairmount Fire Protection District and Denver Water all represented.

Data Collection Guide and Next Steps

A data collection guide was distributed to jurisdictions that are new to the plan. The guide is designed to facilitate gathering information on hazards, past events, vulnerable assets, and capabilities. The HMPC was asked to return to Jeff Brislawn by September 25, 2015.

Jeff discussed that for the jurisdictions that participated in the 2010 plan the preferred method to provide input was direct editing within Word docs of the jurisdictional annexes. Amec Foster Wheeler will be reaching out to HMPC members with a Word version of their annex and more detailed instructions regarding review and feedback.

Question: Where to find existing plan? It can be found online here:

<http://jeffco.us/sheriff/documents/emergencies-documents/hazard-mitigation-documents/hazard-mitigation-plan/>

The next meeting will be held on Monday November 9th from 9:00am to noon. The meeting will be held at the same location: West Metro Fire Training Center, 3535 S. Kipling St. Lakewood, Colorado.

Wrap up and Adjourn

The meeting adjourned at 11:00am.

Summary prepared by Andrew Valdez and Jeff Brislawn, Amec Foster Wheeler, September 2, 2015.

SIGN-IN SHEET
JEFFERSON COUNTY
MULTI-HAZARD MITIGATION PLAN PROJECT
HMPC Meeting #1 - KICKOFF MEETING

Tuesday August 25, 2015 @ 9:00-11:30am
 West Metro Fire Training Center, 3535 S. Kipling Street, Lakewood CO

Name	Jurisdiction/Organization/Citizen	Title	Contact: E-mail/Phone
CHAD RAY	COOT	Dir. OEM	Chad.ray@State.co.us
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Rick Newman	Joffco OEM	Vendy Orata OEM	rjnewman@joffco.us
Sam Faxon	Golden Gate FPD	Board Secretary	secretary@goldengatefire.org
FRANK DEARBORN	Evergreen Fire Rescue	Fire MARSHAL	FDEARBORN@EVERGREENFIRERESUE.COM
Curt Rogers	North Fork FPD	Chief	nffpd@hotmail.com
Bob Heine	LOOKOUT MT. WATER	V.P.	RMHEINE2@MSN.COM
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DARYL HOLLINGSWORTH	GOLDEN P.D.	CAPTAIN	dhollings@cityofgolden.net
KEVIN STEWART	UDFCD	FWP Manager	kstewart@udfcd.org

Name	Jurisdiction/Organization/Citizen	Title	Contact: E-mail/Phone
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ROBERT IPATENCU	FAIRMOUNT FIRE RESCUE	FIRE PREVENTION TECHNICIAN	RIPATENCU@FAIRMOUNTFIRE.ORG
PATRICK O'CONNELL	JEFFERSON COUNTY	FLOODPLAIN ADMIN	POCONNELL@JEFFCO.US
Gwen Steel	Jefferson Conservation District	District Manager	gwen.steel@gmail.com
SAGE WALL	JEFFCO ITS-GIS	SR. GIS ANALYST	SWALL@JEFFCO.US
Mary Ann Bonnell	Jeffco Open Space	Visitor Service Supervisor	mbonnell@jeffco.us

Name	Jurisdiction/Organization/Citizen	Title	Contact: E-mail/Phone
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Scott Rogers	WMFR	Deputy Chief	srogers@westmetrafla.org
Chris Malmgren	PVFD	Chief	cmalmgren.pvfire@comcast.net
Clint Fey	JEFFCO OEM	Director	cfey@jeffco.us
Jeff Brislan	Amec Foster Wheeler	Project Manager	Jeff.brislan@amec.fw.com 303-820-4654
ANDREW VALDEZ	AFW	PLANNER	ANDREW.VALDEZ@AMEC.COM

Name	Jurisdiction/Organization/Citizen	Title	Contact: E-mail/Phone
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Chris Malmgren	" " Fire	Fire Chief	cmalmgren@pvmetro@comcast.net
	Sanctus Mhalen	GIS Specialist	mick.chambers@sanctusfw.com

**JEFFERSON COUNTY MULTI-HAZARD MITIGATION PLAN
2015-2016 UPDATE**

RISK ASSESSMENT and GOALS UPDATE MEETING

Tuesday November 10th 2015

9:00 am – Noon

West Metro Fire Training Center, 3535 S. Kipling St, Lakewood, CO

- ❖ **Introductions**

- ❖ **Review of the Planning Process**

- ❖ **Review of Identified Hazards**

- ❖ **Vulnerability Assessment Review by Hazard**

- ❖ **Capability Assessment Review**

- ❖ **Reviewing and Updating Plan Goals**

- ❖ **Update on Public Involvement Activities**

- ❖ **Next Steps**

- ❖ **Questions and Answers/Adjourn**

Summary of the Jefferson County Multi-Hazard Mitigation Plan Update Risk Assessment and Goals Meeting

November 10th, 2015

9:00 AM - Noon

West Metro Fire Training Center, 3535 S. Kipling Street, Lakewood CO

Introductions and Opening Remarks

Clint Fey, Jefferson County Emergency Management, and Jeff Brislawn of Amec Foster Wheeler, the consulting firm hired to facilitate the plan update process, began the meeting with welcoming remarks. Jeff asked everyone around the room to introduce themselves. Eighteen persons representing a mix of Jefferson County agencies and representatives from Arvada, Morrison, Lakewood, Golden, Indian Hills FPD, Evergreen FPD, Fairmount FPD, Wheat Ridge, and Lookout Mountain Water District were present and documented on a sign in sheet. An agenda, goals update worksheet, mitigation action status worksheet, risk summaries overview sheet, and hard copies of the maps developed for the plan update were provided as handouts.

Review of Mitigation, Disaster Mitigation Act (DMA) Requirements, and the Planning Process

A PowerPoint presentation was presented by Jeff Brislawn, the project manager from Amec Foster Wheeler. Jeff reviewed the planning process used for updating the Jefferson County Multi-Hazard Mitigation Plan (MHMP) approved in 2010. Jeff outlined the ten step planning process being followed and discussed the project status.

Risk Assessment Presentation and Discussion

Jeff outlined the general risk assessment requirements before beginning a detailed discussion of high impact hazards. Jeff presented details on each hazard that will be included in the draft updated risk assessment chapter. Details included past events, likelihood of occurrence, geographic (spatial) extent, potential magnitude, overall hazard significance, and the County's existing mitigation capabilities. Refer to the Jefferson County MHMP Risk Assessment PowerPoint presentation and draft Hazard Identification and Risk Assessment (HIRA - forthcoming) chapter for specific details on each hazard.

Several valuable details were learned during the risk assessment conversation among participants. Highlights of the discussion are noted by hazard in the table below.

Hazard or Topic	Meeting Discussion
Flood	<ul style="list-style-type: none"> • 3 major floods and 9 major flash floods since 2010 • New DFIRMs; new parcel data for analysis • 157 critical facilities located in 1% floodplain <p>Q: Are we using the new effective FIS data? A: We are</p> <p>Q: Do our loss calculations included impacts of dam failure or spillway flows? A: We don't incorporate a dam failure or dam spillway flows in our analysis unless spills are being accounted for in the DFIRM mapping. Per Wheat Ridge – what is on the DFIRM should incorporate the effects of dam performance in a 100 year event, with Maple Grove Reservoir given as an example.</p>
Wildfire	<ul style="list-style-type: none"> • 2 major wildfires since 2010 • 2012 fire season - \$22M in total damage and 3 fatalities • Incorporation of new GIS layers; better data for analysis <p>Q: Are exposure numbers just within the county? A: They are, and they don't include buffer area outside the county</p>
Severe Winter Storm	<ul style="list-style-type: none"> • Annual occurrence; second most costly hazard in Colorado • 130 NCDC-reported storms since 1990; average 5.2/year
Hail Storm	<ul style="list-style-type: none"> • Most costly hazard in Colorado • 351 NCDC-reported incidents since 1950; average 5.4/year
Earthquake	<ul style="list-style-type: none"> • JeffCo has 2nd highest potential for earthquake losses in the state per CGS HAZUS modeling. • While the probability is low, earthquake modeling shows potential for devastating impacts
Other Geological Hazards	<ul style="list-style-type: none"> • JeffCo is vulnerable to a variety of geological hazards, including dipping bedrock, landslide, slope failure, subsidence and rockfall • Many of these hazards are accounted for in planning and zoning and development regulations
Dam Failure	<ul style="list-style-type: none"> • Within JeffCo – 27 High Hazard and 14 Significant Hazard dams • Outside JeffCo (but could impact JeffCo) – 17 High Hazard and 10 Significant Hazard
Overall exposure	<ul style="list-style-type: none"> • 565,000 people in the county vulnerable to natural hazards of some kind • 1,499 critical facilities • Estimated total structure value: \$53.4B • Estimated total structure contents value: \$33.4B
Critical Facilities	<ul style="list-style-type: none"> • 3 categories – at-risk population, high potential loss, and essential services • A more comprehensive inventory has been compiled in GIS as part of the plan update effort.

Risk Summary Review

Jeff reviewed a handout with specific risk summaries for each community. While the full HIRA will review each hazard in the context of each community, these summaries highlight the high-risk hazards for each community and note specific problems or concerns that might require mitigation. Input was requested from each community on their risk summaries. Specific HMPC questions and answers are outlined below, along with general HMPC input:

Q: Is the dam condition report from the State Engineer's Office taken into account in this data? Risk is affected by the condition of the dam itself.

A: We did not have access to this information; sometimes it is provided to local emergency managers by the Division of Water Resources - State Engineer but the information is considered sensitive.

Q: Dam failure needs to be discussed across the board for every community

A: Dam failure will be assessed for every community in the county in the full HIRA

Q: Severe winter storm needs to be discussed across the board for every community

A: Severe winter storm will be assessed for every community in the county in the full HIRA

Q: Did the state share dam inundation data? They are currently working on making better data.

A: No – that data is difficult to access and is sensitive. Local EM should have access to mapping in Emergency Action Plans.

Q: Do we cover infectious disease in this plan? Tularemia is pretty endemic right now.

A: Not with a full assessment. We acknowledge disease risk, but explain why the hazard isn't profiled. The plan focuses on natural hazards, and disease is covered under other county plans and initiatives.

Capability Assessment Review

Jeff reviewed highlights of capability changes from the 2010 plan, including changes in National Flood Insurance Policies, improvements in NFIP Community Rating System classifications (4 of the 7 CRS participating jurisdictions had an improvement) and Community Wildfire Protection Plans. Specific HMPC questions and answers are outlined below, along with general HMPC input:

Q: How often are CWPPs updated?

A: An official update schedule is not a requirement of a CWPP; recommended update every 5 years

Additional HMPC input:

- Many in the Coal Creek watershed purchased flood insurance policies since 2013; many were not in a FEMA defined flood hazard area thus the flood insurance was affordable.
- Wheat Ridge has used recent events to educate citizens on risks of flooding

Plan Goals and Objectives Update

The HMPC revisited the existing goals of the hazard mitigation plans to determine if changes were needed to reflect current priorities. Participants received a handout that listed the overall goals of the 2010 MHMP, the county CWPP, the 2013 State of Colorado Multi-Hazard Mitigation Plan, and the mitigation-related goals of the Jefferson County Comprehensive Master Plan. The HMPC attending the meeting concurred that the goals are still valid; HMPC members wishing to amend or edit the goals and/or objectives may suggest these changes using the worksheet on page 7 of the *Formulating and Updating the Mitigation Strategy* handout. Specific discussion on plan goals and objectives is summarized below:

Q: Where does long-term growth fit into the plan?

A: Long-term growth is a factor in the risk assessment, and should be taken into account when formulating mitigation measures as the plan requires actions addressing both existing and future development.

Q: How do you incorporate long-term impacts to water and water mitigation for long term drought?

A: This could fit under Goal #2. Jeff noted that the plan is lacking specifics on drought impacts from 2012 are asked if the committee could provide additional input when they review the draft HIRA.

Q: Can we add updating CWPPs as a measure or objective?

A: Yes, it can be a mitigation action. Actions in existing CWPPs can be linked to the County HMP with 'umbrella actions' that recommend their implementation.

Additional HMPC inputs:

- In favor of keeping the three goals as worded and generally liked the objectives
- Need wildfire mitigation (such as fuels reduction) in County open space included
- Under Goal #2, consider adding mechanisms to mitigate long term drought such as increasing water storage capacity or construction of new reservoirs (Lookout Mountain Water District) Look at: Colorado Drought Plan and Colorado Water Plan (in process)
- Others left feedback on the handout.

Mitigation Action Strategy Update Initial Discussion

The HMPC received a handout with a summary table of mitigation actions from the 2010 MHMP, grouped by jurisdiction. Each jurisdiction needs to provide a status report on actions listed in the plan in 2010; thanks to those that already have. Input was requested

by December 8th; please use the *Mitigation Action Status Worksheet*. Amec Foster Wheeler will be revised to include mitigation actions for Jefferson Conservation District.

Planning for Public Involvement

Public involvement will include a public workshop and advertisement of the draft updated plan for review and comment. The committee would like to hold the first public meeting in the same week as the next HMPC meeting. Jeff and Clint will discuss scheduling; tentative date for the public meeting is December 17th.

Q: When will Amec Foster Wheeler share how to apply for mitigation funding?

A: Jeff will cover that in more detail at the next meeting and mentioned that a new round of Hazard Mitigation Grant Program (HMGP) should be forthcoming as a result of the 2015 flood disaster. He recommended checking with the CO Division of Homeland Security and Emergency Management for specifics on timing.

Plan Timeline/Next steps

Jeff summarized the next steps in the process. Amec Foster Wheeler will finalize HIRA and share with HMPC. Amec Foster Wheeler will also complete HIRA information in the jurisdiction-specific annexes and share them.

- HMPC homework:
 - Review the HIRA and provide feedback
 - Update progress on 2010 mitigation actions by **December 8th** (*Mitigation Action Worksheet*)
 - Provide feedback on the risk summaries/problem statements by **December 8th** (*Risk Summary*)
 - Provide any remaining input on goals and objectives by **December 8th** (*Formulating and Updating the Mitigation Strategy*)
 - Start formulating ideas for mitigation projects
 - Andrew Valdez will coordinate with jurisdictions with outstanding information needs.

Next meeting will be held December 15th at 9 AM at the West Metro Fire Training Center. A calendar update will be sent out to save the date. The meeting materials will also be shared electronically including the presentation and worksheets.

SIGN-IN SHEET
JEFFERSON COUNTY
MULTI-HAZARD MITIGATION PLAN PROJECT
HMPC Meeting #2 - Risk Assessment and Goals Update

Tuesday November 10th, 2015 @ 9:00-Noon
 West Metro Fire Training Center, 3535 S. Kipling Street, Lakewood CO

Name	Jurisdiction/Organization/Citizen	Title	Contact: E-mail/Phone
Jeff Briscann	Amer Foster Wheeler	Project Manager	Jeff.bris@amerfwr.com 303-820-4854
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Sam Patton	GGFPD	Board	secretary@goldengatefire.org
Allan Fletcher	Fairmount Fire Rescue	Chief	afletcher@fairmountfire.org
Daryl Hollenbush	GOLDEN P.D.	CAPT.	303-384-8032 dhollings@cityofgolden.net
Mike Greenwell	Lakewood	Commander	mkgre@lakewood.org / 31987-7174
Brian Nielson	Lakewood	Firefighter	brniel@lakewood.org 987-7192
Patrick O'Connell	JEFFERSON COUNTY	ambulance	POCONNEL@JEFFCO.US
Simon Young	JEFFCO OPEN SPACE	PARK RANGER	SYOUNG@JEFFCO.US 303 887 5726
EMERY CARSON	TRAILBLAZERS FIRE	CHIEF	303-853-8565 CHIEF@TRAILBLAZERS.ORG
SCOTT EDDY	JEFFCO EMT	DEPUTY DIRECTOR	SEDDY@JEFFCO.US / 720-497-7206
Curt Rogers	North Fork FPD	Chief	nrffpd@hotmail.com / 303-438-2270
FRANK DEARBORN	EVERGREEN FIRE RESCUE	FIRE MARSHAL	FDEARBORN@EVERGREENFIRERESCUE.COM
MARK WESTBROG	CITY OF WHEAT RIDGE	PROTECT JURISDICTION	mwestbrog@ci.wheatridge.co.us

**JEFFERSON COUNTY MULTI-HAZARD MITIGATION PLAN
2015-2016 UPDATE**

MITIGATION STRATEGY MEETING

Thursday, January 7, 2016

1:00 pm – 4:00 pm

West Metro Fire Training Center, 3535 S. Kipling St, Lakewood, CO

- ❖ **Opening remarks and introductions**
- ❖ **Review of the planning process and key issues from the risk assessment and capability assessment**
- ❖ **Overview of revised goals and objectives**
- ❖ **Review of possible mitigation activities and alternatives**
- ❖ **Discuss criteria for mitigation action selection and prioritization**
- ❖ **Review of progress on existing actions in the plan**
- ❖ **Brainstorming Session: Development of new mitigation actions (group process)**
- ❖ **Prioritize mitigation actions (group process)**
- ❖ **Discuss plan implementation and maintenance**
- ❖ **Discuss next steps and public involvement**
- ❖ **Questions and Answers/Adjourn**

Jefferson County Multi-Hazard Mitigation Plan Update

Summary of Mitigation Strategy Meeting

January 7th, 2016

1:00 – 4:00 PM

West Metro Fire Training Center 3535 S. Kipling St. Lakewood CO 80235

Introduction and Opening Remarks

Clint Fey with Jefferson County emergency management began the meeting with welcoming remarks and introduced Jeff Brislawn, project leader with Amec Foster Wheeler, the consulting firm hired to facilitate the planning process and develop the updated County plan. Clint asked everyone around the room to introduce themselves, 30 persons from various County, municipal, special district, state and federal organizations were in attendance and documented on a sign in sheet. Handout materials were provided.

Jeff presented the PowerPoint slide deck that outlined the meeting agenda and topics.

Review of the Planning Process

Jeff reviewed the planning process that has taken place so far. The process is currently in Phase III – Develop a Mitigation Plan. Further information on the planning process can be found in Slide 3 of the meeting PowerPoint. Jeff also reviewed the findings of the process up to the point of the meeting, including the hazard identification and risk assessment and the capability assessment.

Revised Goals and Objectives

Jeff reviewed the revised goals and objectives with the group (see handout – DRAFT Updated Goals and Objectives 12-11-15). A question was asked about the term “county open space” listed as part of an objective under Goal 2 – the decision was made to change ‘County Open Space’ to “public lands and open space” to make this broader and include municipal parks, open space and federal lands. There was also discussion that Denver Mountain Parks needs to be coordinated with on this topic. Stakeholders such as Denver will have the opportunity to review and comment on the plan before publication. Aside from this modification the group concurred with the updated goals and objectives.

Review of Possible Mitigation Activities and Alternatives

Jeff presented information on typical mitigation activities and alternatives and referred to handouts with further details and guidance. Jeff reviewed ideas for possible mitigation activities and alternatives based on the risk assessment. The group discussed previous mitigation measures that had been successful or resulted in losses avoided; cited examples included community participation and class improvements in the Community Rating System program resulting in flood insurance premium reductions and the Morrison siren test of their new outdoor warning system. A question was asked about whether a mitigation measure can continue from

one version of the plan through subsequent updates; Jeff explained that it can, and explained a couple different ways to go about it. Regarding loss avoidance studies the FEMA study only looked at Weld and Boulder County. A suggestion was made that the Army Corps of Engineers' has a methodology for detailing lost avoidance that is used to justify public project expenditure. It's possible they may have conducted studies on losses avoided from 2013 and 2015 flooding on Bear and Chatfield Reservoirs.

The group also discussed the importance of coordinating the mitigation plan with other planning processes, and vice versa. The group cited inclusion of the plan into updates to some of the community level land use planning efforts; The Wheat Ridge Energy Assurance plan also referred to the County HMP.

Jeff outlined potential project criteria and action requirements, including the requirements of the Disaster Mitigation Act of 2000. Each hazard and each community has to have at least one true mitigation action (not preparedness) pertaining to them. A question was asked regarding whether warning sirens count as a mitigation action or preparedness. The answer was it sometimes can depend on the subjective opinion of the FEMA reviewer. The plan can include a siren project, but should also include another mitigation action.

New Mitigation Action Brainstorming

The group proceeded to brainstorm possible mitigation projects and categorize them by hazard. The HMPC members were provided with several lists of alternative multi-hazard mitigation actions. To facilitate the brainstorming process, the HMPC referred to a matrix of typical mitigation alternatives organized by CRS category for the hazards identified in the plan, in addition to a handout that explains the categories and provided examples. Another reference document titled "Mitigation Ideas" developed by FEMA was distributed to the HMPC via an online link and a reference hardcopy brought to the HMPC mitigation strategy meeting in 2016. This reference lists the common alternatives for mitigation by hazard. A facilitated discussion then took place to examine and analyze the alternatives. With an understanding of the alternatives, a brainstorming session was conducted to generate a list of preferred mitigation actions, beginning with discussion regarding the priority hazards. HMPC members wrote project ideas on large sticky notes. Each proposed action was written on a large sticky note and posted on flip chart paper underneath the hazard it addressed. The result was a number of new project ideas with the intent of meeting the identified hazards.

Following the new project development the group then identified points of contact to flesh out the specifics of the different projects. The HMPC should use the 'New Mitigation Action Worksheet' to fill out the details of new projects. This worksheet was sent electronically with the meeting attachments and are due February 4th.

Plan Implementation and Maintenance and Public Involvement

Jeff covered the steps for plan implementation. These can be found on slide 26 in the PowerPoint and in Chapter 7 in the plan. Information on public involvement can be found on

slide 27. A public survey has been developed related to the plan that will be broadcast out via email, social media and websites in the coming days. A public workshop on the plan will be held when the draft plan is out for public review. The workshop will be held in conjunction with the Wheat Ridge flood forum. The flood forum is held each year to coincide with national flood awareness week. This is anticipated to be around the 18-23rd of March. More details on the meeting will be forthcoming.

Next Steps

Existing mitigation action status due	Jan 15
New mitigation actions due from HMPC	Feb 4
Jurisdictional Annex outstanding input	Feb 4
Public survey closes	Feb 17
HMPC draft	Feb 18
HMPC comments by	Mar 4
Public review draft	Mar 18
Public meeting	Week of Mar 21st
Public comments due	April 8
Updated Plan to state/FEMA	April 15
Conditional Approval	June
Local adoption	July
Target for approved, adopted plan	Aug

Wrap up and Adjourn

The meeting adjourned at 3:30 PM.

Mitigation Action Selection and Prioritization Criteria

Does the proposed action protect lives?

Does the proposed action address hazards or areas with the highest risk?

Does the proposed action protect critical facilities, infrastructure, or community assets?

Does the proposed action meet multiple objectives (multi-objective management)?

STAPLE/E

Developed by FEMA, this method of applying evaluation criteria enables the planning team to consider in a systematic way the social, technical, administrative, political, legal, economic, and environmental opportunities and constraints of implementing a particular mitigation action. For each action, the HMPC should ask, and consider the answers to, the following questions:

Social

Does the measure treat people fairly (different groups, different generations)?

Technical

Will it work? (Does it solve the problem? Is it feasible?)

Aministrative

Is there capacity to implement and manage project?

Political

Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support it?

Legal

Does your organization have the authority to implement? Is it legal? Are there liability implications?

Economic

Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development? Does it reduce direct property losses or indirect economic losses?

Environmental

Does it comply with environmental regulations or have adverse environmental impacts?

2010 Jefferson County Hazard Mitigation Plan

Goals and Objectives

Goal 1: Increase awareness about natural hazards

- Create a public outreach effort on the hazards identified in this plan.
- Provide timely notification and direction to the public of imminent and potential hazards.
- Provide notification for properties within hazard areas.
- Provide education on hazard resistant construction techniques.
- Engage constituency to take personal responsibility for their own exposure and mitigation.
- Increase public awareness of the need for funding for disaster mitigation & preparedness.

Goal 2: Reduce the impacts of natural hazards on life, property and the environment

- Continue to manage development and placement of structures in hazard-prone areas.
- Protect existing property to the extent possible.
- Utilize the risk assessment as the basis for jurisdictional response and evacuation plans.
- Protect critical facilities and infrastructure to minimize loss of critical services following a hazard event.
- Create incentives for the public to mitigate hazards on their own property.
- Strongly communicate wildfire mitigation with all land use proposals and existing land uses.
- Continue CWPP Efforts and Implementation, wildfire fuel breaks, wildfire safe zones and defensible space, fuels reduction and biomass use.
- Increase wildfire mitigation efforts.
- Reduce the economic impact to public and private entities from hazards.
- Enhance ability of businesses to mitigate and recover from disasters.
- Continue to reduce flood losses through compliance with National Flood Insurance Program requirements.
- Continue to participate with Community Rating System, where applicable (i.e., Jefferson County, Arvada, Golden, Wheat Ridge and Lakewood).

Goal 3: Strengthen and develop partnerships in regards to mitigating hazard impacts

- Promote planning efforts that foster cooperation and coordination among jurisdictions, agencies, and community aide organizations involved in hazard mitigation and response.
- Maximize the use of shared resources to leverage funding for hazard mitigation projects between all levels of government and the private sector.
- Develop links between emergency planning and land use planning.
- Strengthen community partnerships and confidence in the ability of local government to mitigate and respond to hazard events.

Other Goals from Related Plans

It is important to integrate the mitigation strategy with other existing goals to ensure consistency, efficiency, and effectiveness, which is also useful in identifying funding opportunities.

State of Colorado Multi-Hazard Mitigation Plan, 2013

1. Reduce the loss of life and personal injuries from natural hazard events.
 - Strengthen risk communication tools and procedures
 - Strengthen continuity of operations at the state, regional, tribal, and local levels of government to ensure the delivery of essential services
 - Strengthen cross-sector connections
 - Identify specific areas at risk to natural hazards and zones of vulnerability
 - Continue to develop and expand public awareness and information programs
 - Develop projects focused on preventing loss of life and injuries from natural hazards
2. Reduce damage to local government assets.
 - Assist local government officials with non-construction activities
 - Assist local government officials with construction activities
 - Improve local government monitoring and decision-making tools
3. Reduce damage to state government assets.
 - Continue to identify and prioritize state critical, essential, and necessary assets
 - Develop projects to protect state critical, essential, and necessary assets in natural hazard risk areas
 - Improve state government monitoring and decision-making tools
4. Reduce state and local costs of disaster response and recovery.
 - Strengthen connections between hazard mitigation activities and preparedness, response, and recovery activities
 - Improve coordination of state government resources with local and tribal government and private nonprofit resources
5. Minimize damages to personal property.
 - Distribute information on and promote involvement in existing programs
 - Continue to partner with local and tribal governments to develop projects and initiatives to protect personal property
6. Minimize economic losses.
 - Reduce service interruptions and revenue losses to the state
 - Reduce down time and revenue losses for local and tribal governments and private nonprofit organizations

Jefferson County Community Wildfire Protection Plan (2011) Goals:

- Conduct a wildfire risk assessment
- Develop a mitigation plan
- Manage hazardous fuels
- Facilitate emergency planning
- Facilitate public outreach

Jefferson County Comprehensive Master Plan (2013):

- Encourage infill and redevelopment projects.
- Promote well-planned sustainable residential neighborhoods that create a sense of place.
- Ensure Hazardous Materials are utilized and disposed of responsibly.
- Ensure design is compatible with community character and natural surroundings.
- Promote public safety and reduce loss of property due to Geologic Hazards and Constraints.
- Ensure development activities in or around Floodplains mitigate impacts to life and property.
- Protect wetlands
- Ensure that proposed land uses are managed to decrease Wildfire hazards.
- Evaluate new development for impacts from radiation.
- Protect life and property from harm or loss due to toxic fumes, explosion, and ground settlement due to current, closed, and abandoned landfills.
- Evaluate new development for the existence of abandoned mines.
- Ensure that existing and New Developments are served at an acceptable level by law enforcement, fire protection, and emergency and disaster services.
- Protect people and property from hazardous conditions and events.

Group Goals and Objectives Update/Development

The purpose of this process is to revisit the existing goals and objectives and come to a team decision, or consensus, on revisions to them. **List below suggested revisions or additions to the goals and objectives of Jefferson County’s Hazard Mitigation Plan.** You can refer to the existing plan goals listed previously and you may reword them or add new ones. If you believe the existing goals and objectives are already comprehensive as is then indicate “no change.” For any new goals suggest one or more objectives to accomplish that goal. Leave behind or return to Andrew Valdez (andrew.valdez@amecfw.com).

Goal 1:

Objectives:

Goal 2:

Objectives:

Goal 3:

Objectives:

Goal 4:

Objectives

Jefferson County Local Hazard Mitigation Plan New Mitigation Action Worksheet

Name of Department/Jurisdiction: _____

Use this to record new potential mitigation projects or modifications to existing projects (1 form per project) identified during the planning process. Provide as much detail as possible and use additional pages as necessary. Complete and return to Andrew Valdez by **February 4, 2016**.

Mitigation Project Title	
Hazard(s) Mitigated	
Project Description, Issue & Background	
Ideas for Implementation (include existing planning mechanisms)	
Other Alternatives	
Responsible Office/ Agency	
Partners	
Priority (High, Medium, Low)	
Cost Estimate	
Benefits (Avoided Losses)	
Potential Funding	
Timeline	

Prepared by: _____
 Title: _____
 Phone: _____
 Email: _____

Please return worksheets by mail, email, or fax to: Jeff Brislawn
 Jeff.Brislawn@amecfw.com
 Amec Foster Wheeler
 1002 Walnut St, #200, Boulder CO, 80302
 Tel 303-820-4654
 Fax 303-442-0616

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Goal 1:

Objectives:

Goal 2:

Objectives:

Goal 3:

Objectives:

Goal 4:

Objectives

Example Mitigation Action Items by Community Rating System categories

Alternative Mitigation Actions	Dam Failure	Floods	Hazardous Materials	Landslides/ Debris Flows/ Rockfalls; soil hazards	Weather Extremes (hail, lightning, wind, temps, drought)	Earthquakes	Wildland Fires	Severe Winter Storm
PREVENTION								
Building codes and enforcement		■	■	■	■	■	■	■
Comprehensive Watershed Tax		■						
Density controls	■	■	■	■			■	
Design review standards		■	■	■		■	■	
Easements		■	■	■			■	
Environmental review standards		■	■	■		■	■	
Floodplain development regulations	■	■	■					
Hazard mapping	■	■	■	■			■	
Floodplain zoning	■	■	■					
Forest fire fuel reduction			■				■	
Housing/landlord codes			■		■			
Slide-prone area/grading/hillside development regulations				■			■	
Manufactured home guidelines/regulations		■			■	■		
Minimize hazardous materials waste generation			■					
Multi-Jurisdiction Cooperation within watershed	■	■						
Open space preservation	■	■		■			■	
Performance standards	■	■		■	■	■	■	■
Periodically contain/remove wastes for disposal			■					
Pesticide/herbicide management regulations			■					
Special use permits	■	■	■	■			■	
Stormwater management regulations		■	■					
Subdivision and development regulations	■	■	■	■		■	■	

Alternative Mitigation Actions	Dam Failure	Floods	Hazardous Materials	Landslides/ Debris Flows/ Rockfalls; soil hazards	Weather Extremes (hail, lightning, wind, temps, drought)	Earthquakes	Wildland Fires	Severe Winter Storm
Surge protectors and lightning protection					■			
Tree Management					■		■	■
Transfer of development rights		■		■			■	
Utility location			■	■	■			■
PROPERTY PROTECTION								
Acquisition of hazard prone structures	■	■		■			■	
Facility inspections/reporting	■	■	■			■		
Construction of barriers around structures	■	■	■					
Elevation of structures	■	■						
Relocation out of hazard areas	■	■	■	■			■	
Structural retrofits (e.g., reinforcement, floodproofing, bracing, etc.)		■	■	■	■	■	■	■
PUBLIC EDUCATION AND AWARENESS								
Debris Control		■		■				
Flood Insurance	■	■						
Hazard information centers	■	■	■	■	■	■	■	■
Public education and outreach programs	■	■	■	■	■	■	■	■
Real estate disclosure	■	■	■	■	■	■	■	■
Crop Insurance					■	■		
Lightning detectors in public areas					■			
NATURAL RESOURCE PROTECTION								
Best Management Practices (BMPs)		■	■	■	■		■	
Forest and vegetation management	■	■		■	■		■	■
Hydrological Monitoring	■	■	■	■	■			
Sediment and erosion control regulations	■	■	■	■				

Alternative Mitigation Actions	Dam Failure	Floods	Hazardous Materials	Landslides/ Debris Flows/ Rockfalls; soil hazards	Weather Extremes (hail, lightning, wind, temps, drought)	Earthquakes	Wildland Fires	Severe Winter Storm
Stream corridor restoration		■		■				
Stream dumping regulations		■	■					
Urban forestry and landscape management		■		■	■		■	■
Wetlands development regulations		■	■	■			■	
EMERGENCY SERVICES								
Critical facilities protection	■	■	■	■	■	■	■	■
Emergency response services	■	■	■	■	■	■	■	■
Facility employee safety training programs	■	■	■	■	■	■	■	■
Hazard threat recognition	■	■	■	■	■	■	■	■
Hazard warning systems (community sirens, NOAA weather radio)	■	■	■	■	■	■	■	■
Health and safety maintenance	■	■	■	■	■	■	■	■
Post-disaster mitigation	■	■	■	■	■	■	■	■
Evacuation planning	■	■	■	■			■	
STRUCTURAL PROJECTS								
Channel maintenance		■		■				
Dams/reservoirs (including maintenance)	■	■						
Isolate hazardous materials waste storage sties			■					
Levees and floodwalls (including maintenance)		■						
Safe room/shelter					■	■		■
Secondary containment system			■					
Site reclamation/restoration/revegetation		■	■	■				
Snow fences								■
Water supply augmentation					■			

CATEGORIES OF MITIGATION MEASURES

PREVENTION: Preventive measures are designed to keep the problem from occurring or getting worse. Their objective is to ensure that future development is not exposed to damage and does not increase damage to other properties.

- o *Planning*
- o *Zoning*
- o *Open Space Preservation*
- o *Land Development Regulations*
 - *Subdivision regulations*
 - *floodplain development regulations*
- o *Storm Water Management*
- o *Fuels Management, Fire-Breaks*
- o *Building Codes*
 - *Fire-Wise Construction*
- o *(See Property Protection also)*

EMERGENCY SERVICES measures protect people during and after a disaster. A good emergency services program addresses all hazards. Measures include:

- o *Warning* (floods, tornadoes, ice storms, hail storms, dam failures)
 - NOAA Weather Radio
 - Sirens
 - Reverse 911
- o *Evacuation & Sheltering*
- o *Communications*
- o *Emergency Planning*
 - Activating the emergency operations room (emergency management)
 - Closing streets or bridges (police or public works)
 - Shutting off power to threatened areas (utility company)
 - Holding children at school/releasing children from school (school district)
 - Passing out sand and sandbags (public works)
 - Ordering an evacuation (mayor)
 - Opening evacuation shelters (Red Cross)
 - Monitoring water levels (engineering)
 - Security and other protection measures (police)
- o *Monitoring of Conditions (dams)*
- o *Critical Facilities Protection (Buildings or locations vital to the response and recovery effort, such as police/fire stations, hospitals, sewage treatment plants/lift stations, power substations)*
 - Buildings or locations that, if damaged, would create secondary disasters, such as hazardous materials facilities and nursing homes
 - Lifeline Utilities Protection
 - Health & Safety Maintenance

PROPERTY PROTECTION: Property protection measures are used to modify buildings subject to damage rather than to keep the hazard away. A community may find these to be inexpensive measures because often they are implemented by or cost-shared with property owners. Many of the measures do not affect the appearance or use of a building, which makes them particularly appropriate for historical sites and landmarks.

- o ***Retrofitting/disaster proofing***
 - ***Floods***
 - Wet/Dry floodproofing (barriers, shields, backflow valves)
 - Relocation
 - Acquisition
 - ***Tornadoes***
 - Safe Rooms
 - Securing roofs and foundations with fasteners and tie-downs
 - Strengthening garage doors and other large openings
 - ***Drought***
 - Improve water supply (transport/storage/conservation)
 - Remove moisture competitive plants (Tamarisk/Salt Cedar)
 - Water Restrictions/Water Saver Sprinklers/Appliances
 - Grazing on CRP lands (no overgrazing-see Noxious Weeds)
 - Create incentives to consolidate/connect water services
 - Recycled wastewater on golf courses
 - ***Earthquakes***
 - Removing masonry overhangs, bracing other parts.
 - Tying down appliances, water heaters, bookcases and fragile furniture so they won't fall over during a quake.
 - Installing flexible utility connections that won't break during shaking (pipelines too!)
 - ***Wildfire, Grassfires***
 - Replacing building components with fireproof materials
 - Roofing, screening
 - Create "Defensible Space"
 - Installing spark arrestors
 - Fuels Modification
 - ***Noxious Weeds/Insects***
 - Mowing
 - Spraying
 - Replacement planting
 - Stop overgrazing
 - Introduce natural predators
- o ***Insurance***

NATURAL RESOURCE PROTECTION: Natural resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. In so doing, these activities enable the naturally beneficial functions of floodplains and watersheds to be better realized. These natural and beneficial floodplain functions include the following:

- storage of floodwaters
- absorption of flood energy
- reduction in flood scour
- infiltration that absorbs overland flood flow
- groundwater recharge
- removal/filtering of excess nutrients, pollutants, and sediments from floodwaters
- habitat for flora and fauna
- recreational and aesthetic opportunities

Methods of protecting natural resources include:

- o *Erosion & Sediment Control*
- o *Wetlands Protection*
- o *Riparian Area/Habitat Protection*
- o *Threatened & Endangered Species Protection*
- o *Fuels Management*
- o *Set-back regulations/buffers*
- o *Best Management Practices*

Best management practices (“BMPs”) are measures that reduce nonpoint source pollutants that enter the waterways. Nonpoint source pollutants come from non-specific locations. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, and other farm chemicals, animal wastes, oils from street surfaces and industrial areas and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground’s surface by stormwater and flushed into receiving storm sewers, ditches and streams. BMPs can be implemented during construction and as part of a project’s design to permanently address nonpoint source pollutants. There are three general categories of BMPs:

1. Avoidance: setting construction projects back from the stream.
2. Reduction: Preventing runoff that conveys sediment and other water-borne pollutants, such as planting proper vegetation and conservation tillage.
3. Cleanse: Stopping pollutants after they are en route to a stream, such as using grass drainageways that filter the water and retention and detention basins that let pollutants settle to the bottom before they are drained

- o *Dumping Regulations*
- o *Water Use Restrictions*
- o *Weather Modification*
- o *Landscape Management*

STRUCTURAL PROJECTS have traditionally been used by communities to control flows and water surface elevations. Structural projects keep flood waters away from an area. They are usually designed by engineers and managed or maintained by public works staff. These measures are popular with many because they “stop” flooding problems. However, structural projects have several important shortcomings that need to be kept in mind when considering them for flood hazard mitigation:

- They are expensive, sometimes requiring capital bond issues and/or cost sharing with Federal agencies, such as the U.S. Army Corps of Engineers or the Natural Resources Conservation Service.
- They disturb the land and disrupt natural water flows, often destroying habitats.
- They are built to a certain flood protection level that can be exceeded by a larger flood, causing extensive damage.
- They can create a false sense of security when people protected by a structure believe that no flood can ever reach them.
- They require regular maintenance to ensure that they continue to provide their design protection level.

Structural measures include:

- o *Detention/Retention structures*
- o *Erosion and Sediment Control*
- o *Basins/Low-head Weirs*
- o *Channel Modifications*
- o *Culvert resizing/replacement/Maintenance*
- o *Levees and Floodwalls*
- o *Fencing (for snow, sand, wind)*
- o *Drainage System Maintenance*
- o *Reservoirs(for flood control, water storage, recreation, agriculture)*
- o *Diversions*
- o *Storm Sewers*

PUBLIC INFORMATION: A successful hazard mitigation program involves both the public and private sectors. Public information activities advise property owners, renters, businesses, and local officials about hazards and ways to protect people and property from these hazards. These activities can motivate people to take protection

- o *Hazard Maps and Data*
- o *Outreach Projects*
 - (mailings, media, web, speakers bureau)
- o *Library Resources*
- o *Real Estate Disclosure*
- o *Environmental Education*
- o *Technical Assistance*

Jefferson County Multi-Jurisdictional Multi-Hazard Mitigation Plan 2015-2016 Plan Update

Background Information

What is Hazard Mitigation?

The Federal Emergency Management Agency (FEMA) defines hazard mitigation as, "any sustained action taken to reduce or eliminate long-term risk to life and property from natural hazards." Another way to understand hazard mitigation is as the prevention component of the emergency management process.

- Preparedness activities are the emergency plans, training, drills, and exercises that individuals, communities and first responders participate in on almost daily basis. These are things done to get ready for an emergency or disaster before it happens.
- Response is the short-term, emergency actions taken to address the immediate impacts of a hazard.
- Recovery is the longer-term process of restoring the community back to normal or pre-disaster conditions.
- Mitigation activities are actions that will reduce or eliminate losses, for anticipated future events. Mitigation can reduce or eliminate the need for an emergency response and greatly reduce the recovery period.



Emergency Management Cycle

Many types of mitigation actions are things done on a daily basis without much forethought such as purchasing insurance to protect a vehicle investment, putting on your seatbelt, or putting in gutters around a roof to better direct rain runoff. The same concepts apply to community level hazard mitigation planning. Mitigation planning is a process for county and local governments to identify community-level policies and actions that will reduce the impacts of natural hazards.

Why is Natural Hazard Mitigation Important?

Most people who live or work in Jefferson County or its jurisdictions have been affected by natural hazards in one way or another. Some of the natural hazards that can affect Jefferson County include flash flooding, wildfire, severe weather, landslide and rockfall. Jefferson County has had much experience with disasters and emergencies in recent past. A highlighted few include: the Black Mountain, Schoonover, Snaking, and Hayman wildfires of 2002, two Winter Storm Emergency Declarations in March of 2003 and over the Christmas and New Year's holidays of 2006-2007, hail in 2009, the Lower North Fork Wildfire and drought in 2012, and significant flooding in 2013. In addition to these large events, almost every year there are smaller, isolated weather events that cause localized property damage and losses significant to the people affected. The planning process will evaluate the potential for future damaging events and work toward solutions to help mitigate their impacts in the future.

Hazard Mitigation Plans

The rising costs associated with disaster response and recovery has caused federal, state, and local governments to focus on addressing natural hazards before they occur. The acts of "Mother Nature" cannot be prevented, but the impacts thereby can be reduced and sometimes prevented altogether. It takes, on the part of a community, a cohesive planning effort from all sectors in identifying the hazards, risks and vulnerabilities of natural disasters on specific geographic areas within a jurisdiction. That is how a Multi-Jurisdictional Multi-Hazard Mitigation Plan is developed. A community comes together as a team (Hazard Mitigation Planning Committee, HMPC) in a facilitated forum to gather data that is then organized into a plan which identifies goals, objectives and actions pertaining to mitigating impacts from identified natural hazards. As the plan is developed, the HMPC reviews the data for accuracy and the public at large has an opportunity to comment and have their comments incorporated before a final draft is completed. FEMA realizes the importance of mitigation planning and offers incentives to communities that

develop one. By following FEMA guidelines for a plan approval process, participating communities can be eligible for grant funding intended for mitigation projects. It is an opportunity for communities to take advantage of funds they would not have been able to tap into previously.

Plan Update Process

Jefferson County has received a FEMA grant to support the update of the Jefferson County Hazard Mitigation Plan. The plan was developed in 2010 and is required to be updated every 5 years. Jefferson County Emergency Management is taking the lead on the update with professional planning assistance from Amec Foster Wheeler. Amec will facilitate the planning process, collect necessary data, and perform other technical services, including updating the risk assessment and plan document.

A planning team will be organized, and will meet on a regular basis, working through varying levels of review, revision, and update of the following elements of the plan:

- Identify hazards that may impact or have impacted the community;
- Profiles of the most recent hazard events;
- Assessment of the vulnerability to those hazards;
- Assessment of the communities' capabilities to mitigate the hazards;
- Mitigation goals and objectives;
- Specific mitigation actions and projects;
- Implementation strategy for the plan;
- Plan maintenance and update process;
- Plan approval and adoption.

The planning team will include representatives from various County Departments and the participating jurisdictions will include Arvada, Bow Mar Edgewater, Golden, Lakewood, Lakeside, Morrison, Mountain View and Wheat Ridge. Special districts such as fire protection and water districts are involved as well. Stakeholders include representatives from state and federal agencies, the Urban Drainage and Flood Control District, and private industry.

How Can You Get Involved?

Members of the community have a very important role in this process. The planning team regards broad public participation in the planning process as an essential strategy for developing a plan that will be effective, supported by the public, and ultimately implemented. The process will provide a range of opportunities for Jefferson County and its participating jurisdictions' citizens, public officials, and stakeholder groups to participate and give input in the plan update. Interested stakeholders should pay attention to the Jefferson County Emergency Management website for updates on the process: <http://jeffco.us/sheriff/emergencies/emergency-management/>

The process will begin with a kickoff meeting for the Hazard Mitigation Planning Committee on Tuesday, August 25th.

For more information on the plan or the planning process, please contact:

Jefferson County Sheriff Emergency Mgt. Clint Fey Emergency Management Director 800 Jefferson County Parkway Golden, CO 80401-2697 Ph (303) 271-4901; Fax (303) 217-4905 cfey@co.jefferson.co.us	Amec Foster Wheeler project manager Jeff Brislawn Amec Foster Wheeler 1002 Walnut Street, Suite 200 Boulder CO 80302 Ph (303)820-4654 jeff.brislawn@amecfw.com
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Please return worksheets by mail, email, or fax to:
Andrew Valdez by February 17th 2016
Andrew.Valdez@amecfw.com
1002 Walnut St, Boulder CO, 80302
Tel 303-443-4652
Fax 303-442-0616
This survey may also be completed online at:
https://www.surveymonkey.com/r/JeffCoHMP_Update2015

Jefferson County Multi-Hazard Mitigation Plan

Public Survey

1. The hazards addressed in the Draft Multi-Hazard Mitigation Plan are listed below. Please indicate the level of significance in Jefferson County that you perceive for each hazard. Please rate these hazards 1 through 3 as follows: 1=low, 2=moderate, 3=high.

- | | |
|------------------------|----------------------------------|
| Avalanche | Hailstorm |
| Dam Failure | Landslide, Debris Flow, Rockfall |
| Drought | Lightning |
| Earthquake | Severe Winter Storms |
| Erosion and Deposition | Subsidence |
| Expansive Soils | Tornado |
| Extreme Temperatures | Wildfire |
| Flood | Windstorm |

2. Do you have information on specific hazard issues/problem areas that you would like the planning committee to consider? Note the jurisdiction to which it applies:

3. The following types of mitigation actions may be considered in Jefferson County. Please place a check next to the types of mitigation actions that you think should have the highest priority in the Jefferson County Multi-Hazard Mitigation Plan.

- | | |
|---|--|
| Indoor/Outdoor Warning | Flood Mitigation |
| Wildfire Fuels Treatment projects | Education and Discounts on Flood Insurance |
| Assistance with Defensible Space | Floodprone Property Buyout |
| Participation in the National Flood Insurance Program | Education and discounts on flood insurance |
| Critical Facilities Protection | Avalanche mitigation |
| Planning/Zoning | Landslide/mudslide mitigation |
| Public Education/Awareness | Rockfall mitigation |
| Stormwater Drainage Improvements | Evacuation route development |
| Forest Health/Watershed Protection | |

Jefferson County Multi-Hazard Mitigation Plan

Public Survey

4. Please comment on any other pre-disaster strategies that the planning committee should consider for reducing future losses caused by natural disasters:

5. Provide your name and email address if you would like to be added to a distribution list for upcoming activities related to the planning process:

FOR IMMEDIATE RELEASE

March 15, 2016

Contact: Clint Fey

Jefferson County Emergency Management
303-271-4900

PUBLIC INPUT OPPORTUNITY ON JEFFERSON COUNTY MULTI-HAZARD MITIGATION PLAN UPDATE

JEFFERSON COUNTY, CO – The City of Wheat Ridge and Jefferson County Emergency Management is hosting an open house to present information on reducing risk to natural disasters in the County, including floods, wildfires, winter storms and other hazards. The Jefferson County Multi-Hazard Mitigation Plan is undergoing an update and the open house is being held to raise awareness and solicit input on the draft plan. This is an important plan in helping the County, municipalities, and fire districts understand the potential impacts of a multitude of hazards and outlines strategies to reduce damage and loss. All interested parties are invited and encouraged to attend. The meeting is being held as part of the City of Wheat Ridge Floodplain Open House on **Wednesday, March 23, 2016 between 5:00 and 7:00 pm at the Wheat Ridge City Council Chambers, 7500 W 29th Ave, Wheat Ridge, CO 80033**. A presentation on Wheat Ridge flood hazards and flood mapping will begin at 5:15, followed by a presentation and discussion on the Hazard Mitigation Plan at 6:15. The draft plan will be available for public review and comment on the Jefferson County website <http://jeffco.us> between March 18 and April 8th. For more information on this project, contact Clint Fey at 303-271-4900 or cfey@co.jefferson.co.us.



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3rd Annual Floodplain Open House

Wednesday, March 23

The City is holding a Floodplain Open House in conjunction with Flood Safety Awareness Week--March 20-26, 2016. All residents who currently live or own property in the floodplain are invited to attend.

A short presentation will be made at 5:15 p.m. and again at 6:15 p.m. with a Q & A session after each presentation. City staff will also be available to check the floodplain status of your property.

In addition to the regular program, the City is hosting the Public Meeting for the [Jefferson County Multi-Hazard Plan Update](#). This is an important plan in helping the City, as well as the County and other municipalities and fire districts, understand the potential impacts of a multitude of hazards and outlines strategies to reduce damage and loss. Another benefit of this plan is it earns CRS credits under floodplain management planning, which could help improve the City's CRS rating and in turn reduce flood insurance premiums!

For additional information, please plan on attending this informational meeting. You can also contact Mark Westberg, Floodplain Administrator, at 303-235-2863 or [email](#).

Date: March 23, 2016
Time: 5:00 PM - 7:00 PM
Time Details: 5:00 PM - 7:00 PM
Location: City Council Chambers
Address: 7500 W. 29th Ave.
Wheat Ridge, CO 80033
Links: [More information](#)



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Government County Offices Community Business Services



Jeffco Hazard Mitigation Public Survey
Provide your feedback to the committee on reducing hazard impacts.

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- Commissioner's Telephone Town Ha...
- Arvada Man Sentenced to Life in ...
- Volunteers Needed to Serve on Bo...

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Events

- 01/23/2016 - Full Moon Hike
- 01/26/2016 - BCC Hearing January...
- 01/26/2016 - BCC Staff Briefings...
- 01/28/2016 - Telephone Town Hall
- 01/30/2016 - Scout Mystery Day -...

More Events

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- Casey Tighe, District Two Commis...
- Libby Szabo, District One Commis...
- Donald Rosier, District Three Co...
- Slash Collection
- Concealed Handgun Permit Process

More Videos

Jefferson County Government

100 Jefferson County Parkway
Golden, Colorado 80419
(303) 279-6511

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- Adopted Budgets
- \$ Data Search

SIGN IN SHEET

	NAME / ORGANIZATION	ADDRESS	PHONE / EMAIL
1.	Wes Johnson	3595 Quail	303-514-4215
2.	FRED GINTENO	3575 Quail St.	303 263 1750
3.	Craig Couture	4770 Carr Street	303-903-1407
4.	Gino Zanleno	4131 Kipling St	303 398 3366
5.	Evelyn MERRIOTT	6115 W 30 th Ave	303 238-7181
6.	Sarah Johnson	4388 Garland St Wheat Ridge	303 421 9151
7.	Kae Betz	3165 Kendall St	703-234-0783
8.	Jim Opp	3232 Vivian Dr	303 232 5431
9.	Deborah Kerr	4770 Carr street	720-955-4096
10.	Tanya Barkum	6300 W. 49th Drive	303-944-9689
11.	Greg Ley Legeberg	4220 Iris St	303 431-7142
12.	JEFF BRISLAWN / AMEL FOSTER WHEELER	11075 W 54th Ln ARVADA	303-704-5506
13.	David Stefovich	6300 W 49th DR	3-944-3196
	PATRICK O'CONNOR		POCONNOR@JEFFCO.US
14.	JEFFERSON COUNTY		



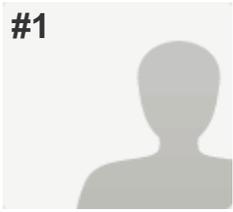
3rd ANNUAL FLOODPLAIN OPEN HOUSE
& JEFFCO MULTI-HAZARD PLAN
MARCH 23, 2015
31

City of Wheat Ridge Municipal Building 7500 W. 29th Ave. Wheat Ridge, CO 80033-8001 P: 303.235.2861 F: 303.235.2857

SIGN IN SHEET

NAME / ORGANIZATION	ADDRESS	PHONE / EMAIL
1. Amy OMare	4970 Card	-
2.		
3.		
4.		
5.		
6.		
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11.		
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14.		

#1



COMPLETE

Collector: Web Link 1 (Web Link)
Started: Thursday, March 17, 2016 3:36:49 PM
Last Modified: Thursday, March 17, 2016 3:37:42 PM
Time Spent: 00:00:53
IP Address: 50.243.153.249

PAGE 2: Affiliation

Q1: Select affiliation (select one):

Private industry

PAGE 3: Comments

Q2: Please provide comments regarding the Draft Jefferson County Multi-Hazard Mitigation Plan here:

Test comment

PAGE 4: Future Correspondence

Q3: If you are interested in receiving future correspondence and updates regarding the Jefferson County Hazard Mitigation Plan, please provide an email address.

Respondent skipped this question

#2



INCOMPLETE

Collector: Web Link 1 (Web Link)
Started: Sunday, March 20, 2016 8:37:12 PM
Last Modified: Sunday, March 20, 2016 8:37:39 PM
Time Spent: 00:00:27
IP Address: 184.96.45.191

PAGE 2: Affiliation

Q1: Select affiliation (select one):

Member of the public

PAGE 3: Comments

Q2: Please provide comments regarding the Draft Jefferson County Multi-Hazard Mitigation Plan here:

Respondent skipped this question

PAGE 4: Future Correspondence

Q3: If you are interested in receiving future correspondence and updates regarding the Jefferson County Hazard Mitigation Plan, please provide an email address.

Respondent skipped this question

#3

**COMPLETE****Collector:** Web Link 1 (Web Link)**Started:** Saturday, March 19, 2016 10:11:11 AM**Last Modified:** Monday, March 21, 2016 11:29:04 PM**Time Spent:** Over a day**IP Address:** 184.96.112.165

PAGE 2: Affiliation**Q1: Select affiliation (select one):**

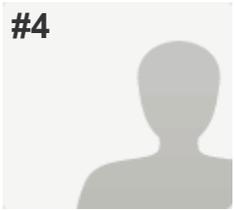
Member of the public

PAGE 3: Comments**Q2: Please provide comments regarding the Draft Jefferson County Multi-Hazard Mitigation Plan here:**

I'm glad to see that fire has been rated as High priority for mitigation (above medium for flood mitigation in lower Jeffco), what concerns me is that only Evergreen Fire Rescue and Indian Hills Fire are involved in preparing this Hazard Mitigation Plan/listed as stakeholders - not Elk Creek Fire, Inter-Canyon Fire, or North Fork Fire. I wish to make sure that the hazards, specifically wildfires, that we uniquely face in our mountain communities are given proper weight and attention.

PAGE 4: Future Correspondence**Q3: If you are interested in receiving future correspondence and updates regarding the Jefferson County Hazard Mitigation Plan, please provide an email address.**

SharonT@mymountaintown.com



COMPLETE

Collector: Web Link 1 (Web Link)
Started: Tuesday, April 05, 2016 10:04:03 AM
Last Modified: Tuesday, April 05, 2016 10:04:50 AM
Time Spent: 00:00:47
IP Address: 12.197.236.105

PAGE 2: Affiliation

Q1: Select affiliation (select one):

Member of the public

PAGE 3: Comments

Q2: Please provide comments regarding the Draft Jefferson County Multi-Hazard Mitigation Plan here:

1

PAGE 4: Future Correspondence

Q3: If you are interested in receiving future correspondence and updates regarding the Jefferson County Hazard Mitigation Plan, please provide an email address.

Respondent skipped this question

#5



INCOMPLETE

Collector: Web Link 1 (Web Link)
Started: Friday, April 08, 2016 9:22:20 AM
Last Modified: Friday, April 08, 2016 9:22:35 AM
Time Spent: 00:00:15
IP Address: 72.42.81.210

PAGE 2: Affiliation

Q1: Select affiliation (select one):

Member of the public

PAGE 3: Comments

Q2: Please provide comments regarding the Draft Jefferson County Multi-Hazard Mitigation Plan here:

Respondent skipped this question

PAGE 4: Future Correspondence

Q3: If you are interested in receiving future correspondence and updates regarding the Jefferson County Hazard Mitigation Plan, please provide an email address.

Respondent skipped this question

#6



INCOMPLETE

Collector: Web Link 1 (Web Link)
Started: Tuesday, April 12, 2016 5:58:45 PM
Last Modified: Tuesday, April 12, 2016 5:59:22 PM
Time Spent: 00:00:36
IP Address: 24.8.22.20

PAGE 2: Affiliation

Q1: Select affiliation (select one):

Member of the public

PAGE 3: Comments

Q2: Please provide comments regarding the Draft Jefferson County Multi-Hazard Mitigation Plan here:

Respondent skipped this question

PAGE 4: Future Correspondence

Q3: If you are interested in receiving future correspondence and updates regarding the Jefferson County Hazard Mitigation Plan, please provide an email address.

Respondent skipped this question

#7



INCOMPLETE

Collector: Web Link 1 (Web Link)
Started: Wednesday, April 13, 2016 2:01:09 PM
Last Modified: Wednesday, April 13, 2016 2:01:44 PM
Time Spent: 00:00:35
IP Address: 208.117.66.231

PAGE 2: Affiliation

Q1: Select affiliation (select one):

Nonprofit

PAGE 3: Comments

Q2: Please provide comments regarding the Draft Jefferson County Multi-Hazard Mitigation Plan here:

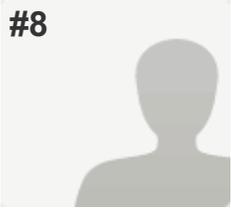
Respondent skipped this question

PAGE 4: Future Correspondence

Q3: If you are interested in receiving future correspondence and updates regarding the Jefferson County Hazard Mitigation Plan, please provide an email address.

Respondent skipped this question

#8



INCOMPLETE

Collector: Web Link 1 (Web Link)
Started: Wednesday, April 13, 2016 3:09:42 PM
Last Modified: Wednesday, April 13, 2016 4:50:36 PM
Time Spent: 01:40:54
IP Address: 73.169.77.169

PAGE 2: Affiliation

Q1: Select affiliation (select one):

Member of the public

PAGE 3: Comments

Q2: Please provide comments regarding the Draft Jefferson County Multi-Hazard Mitigation Plan here:

Respondent skipped this question

PAGE 4: Future Correspondence

Q3: If you are interested in receiving future correspondence and updates regarding the Jefferson County Hazard Mitigation Plan, please provide an email address.

Respondent skipped this question

APPENDIX G
PUBLIC SURVEY SUMMARY

Public Survey Results

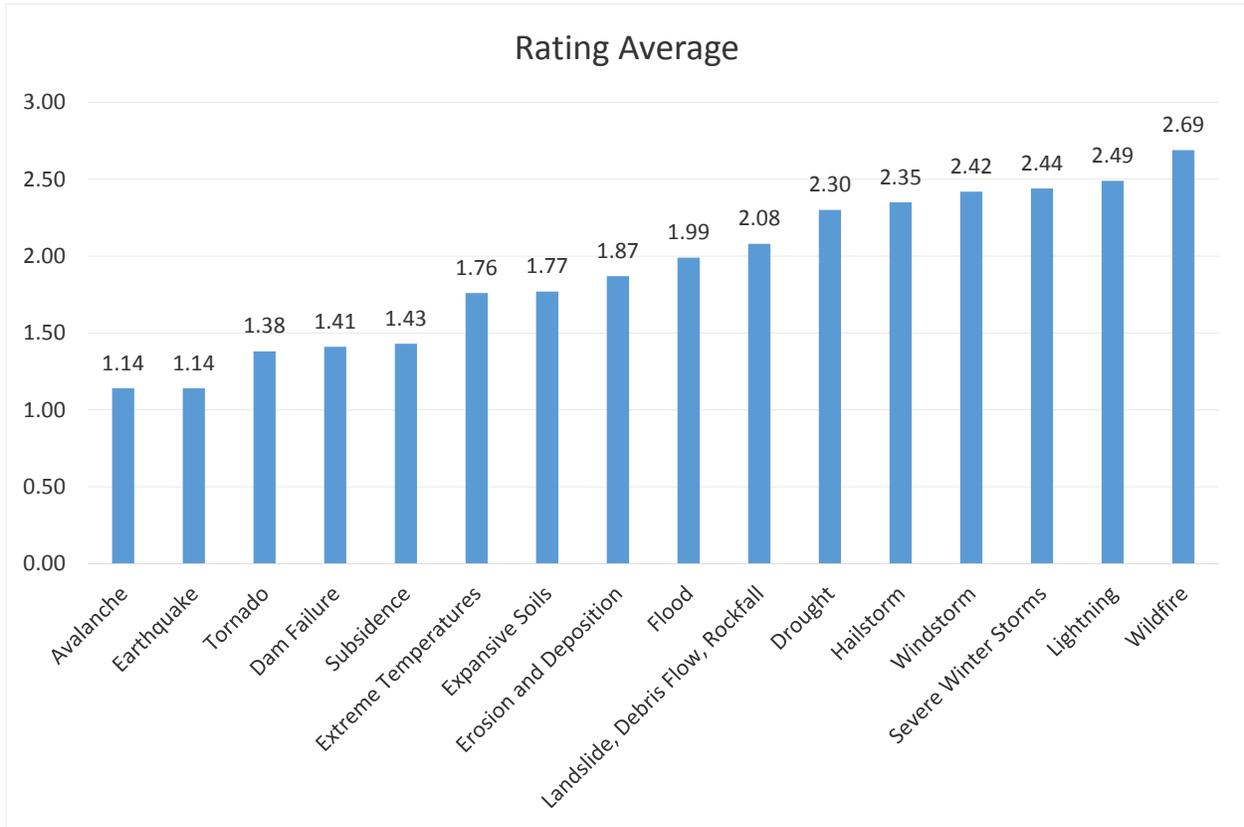
As part of the planning and public engagement process of the Jefferson County Hazard Mitigation Plan, a 5 question web-based and hardcopy survey was created and distributed via numerous channels. The purpose of the survey was to collect information from the public and stakeholders to better understand the perception of hazards in Jefferson County.

The online survey opened on 1/11/2016 and closed on 2/17/16. The link to the survey was distributed via email to members of the Hazard Mitigation Planning Team, who were encouraged to broadcast the link far and wide through their constituent networks. A total of 157 responses were collected. The following charts and graphs summarize the data collected from this effort.

Question 1: The hazards addressed in the Draft Multi-Hazard Mitigation Plan update are listed below. Please indicate the level of significance in Jefferson County that you perceive for each hazard.

Answer Options	Low	Moderate	High	Rating Average	Response Count
Avalanche	132	17	2	1.14	151
Earthquake	132	18	2	1.14	152
Tornado	107	33	12	1.38	152
Dam Failure	99	44	9	1.41	152
Subsidence	91	46	8	1.43	145
Extreme Temperatures	65	58	29	1.76	152
Expansive Soils	64	58	29	1.77	151
Erosion and Deposition	50	72	30	1.87	152
Flood	45	63	43	1.99	151
Landslide, Debris Flow, Rockfall	37	66	49	2.08	152
Drought	26	55	72	2.30	153
Hailstorm	21	59	75	2.35	155
Windstorm	18	52	82	2.42	152
Severe Winter Storms	12	62	79	2.44	153
Lightning	16	46	92	2.49	154
Wildfire	11	26	118	2.69	155
<i>answered question</i>					157
<i>skipped question</i>					0

Question 1 Graph:



Question 2: Do you have information on specific hazard issues/problem areas that you would like the planning committee to consider? Note the jurisdiction to which it applies:

Number	Response Date	Response Text
1	2/17/2016 23:19	Water shortage potential due to growth and increased well drilling. Increased number of septic system and impact on water supplies, especially wells. Jurisdiction: Jefferson County & Lookout Mountain Water
2	2/17/2016 20:24	Bikes in Apex Park at night cause hazardous conditions for other trail users.
3	2/16/2016 23:47	Development in wetlands and floodplains leading to property damage from flooding.
4	2/16/2016 17:12	Wildfire danger in Genesee
5	2/16/2016 4:42	Negligence in controlled burns
6	2/15/2016 20:02	Improve water pressure on Lookout Mountain in view of fire hazard.
7	2/15/2016 19:31	No
8	2/15/2016 17:53	Single egress in Coal Creek Subdivisions

Number	Response Date	Response Text
9	2/14/2016 19:14	None
10	2/13/2016 23:19	Mountain district 1: lack of internet cable and service
11	2/13/2016 17:04	Golden Gate Canyon, Northwest Jefferson County
12	2/13/2016 16:34	Golden Gate Canyon Fire District
13	2/13/2016 16:18	Beetle kill
14	2/13/2016 14:35	We are a home rule state and to my understanding that means Jefferson County has jurisdiction. We need to do more about the standing dead and brush growth, especially along roads. A road can serve as a fire break and is also how citizens evacuate a disaster area. We also should find ways to establish more fire water ponds throughout the county for fire department to use in the event of a fire. Finally, the county needs to reestablish building regulations restricting land and water resources being developed and depleted. The county did have such restrictions in place until we elected a realtor as a commissioner, so the documents already exist and could easily be reinstated. We now know building in the middle of a forest is not a great idea, building on a ridge with a gorgeous view is not a great idea, and buying water rights from other areas to have rights for development, really is not a good idea.
15	2/13/2016 4:10	Wildfire. Conifer (Kings Valley neighborhood)
16	2/13/2016 0:05	Fire Mitigation in Conifer, CO - Jefferson Country
17	2/12/2016 23:23	Wildfire mitigation for every new homeowner - not just homebuilder. - Elk Creek
18	2/12/2016 22:40	Close growing, immature stands of lodgepole pines in the Arapaho National Forest along Black Mountain/Brook Forest Drive
19	2/12/2016 22:17	No
20	2/12/2016 22:02	Fire danger in Conifer/Evergreen. Moth and beetle kill destroying forests.
21	2/12/2016 21:45	Wildfire is greatest hazard - Conifer, Colorado. Lots of overgrown forests on both private and public properties. Lots of mitigation work is needed.
22	2/12/2016 20:02	Inadequate mitigation of public lands. Conifer 80433
23	2/12/2016 17:29	Evacuation roads in case of wild fires
24	2/12/2016 6:40	Wildfire and mitigation on public lands
25	2/11/2016 14:52	Land Erosion Centennial Cone
26	2/9/2016 21:50	Controlling wildlife proliferation, i.e. deer and elk on roads and highways and vermin outbreaks (pocket gophers and voles) Lookout Mountain Water District.
27	2/9/2016 17:54	Need water storage for wild land fires in Golden Gate Canyon. Also, with more open space and traffic Golden Gate Fire Protection District needs more support.
28	2/7/2016 18:25	Douglas Mountain: fire mitigation -- Jefferson County should send mulching and chipping equipment and personnel to eliminate the waste that the homeowners produce from their personal fire mitigation efforts.
29	2/7/2016 1:32	No
30	2/6/2016 2:04	I was struck by lightning on July 15, 2015 with no prior warning that a thunderstorm was present. This happened in the foothills of Jefferson County, CO west of Golden.

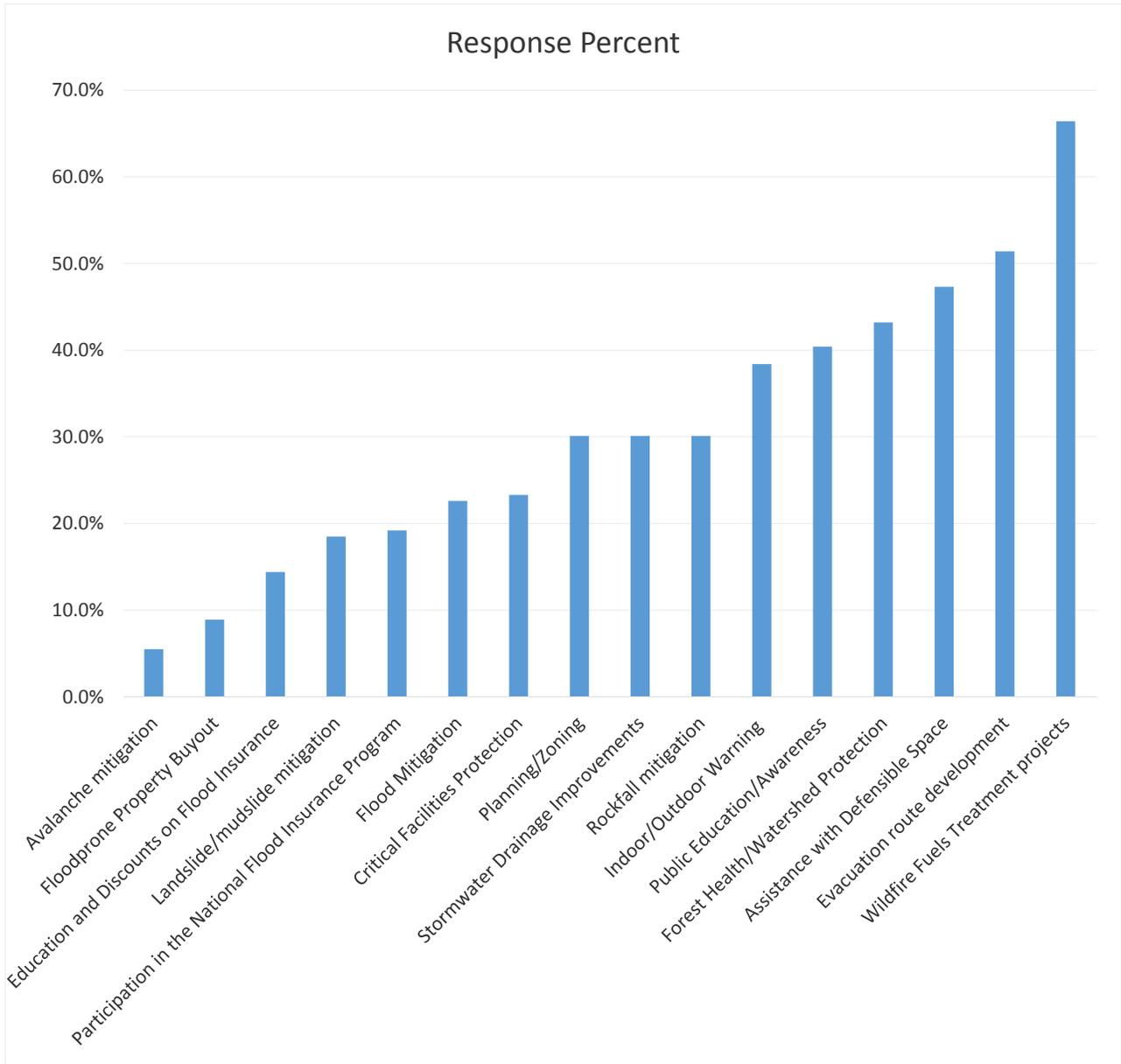
Number	Response Date	Response Text
31	2/5/2016 4:56	No
32	2/4/2016 22:25	None
33	2/4/2016 21:34	1.) Debris and high tree and shrub growth in Tucker Gulch that would cause damming and overflowing, causing problems with ingress and egress of residences and road damage should there be another 50 to 100 year flood, which is likely with El Nino seasons.
34	2/4/2016 20:56	None
35	2/4/2016 20:06	Overpopulation, Excessive building permits, sustainable Water use
36	2/4/2016 14:58	Open space in the mountain areas promotes a high population increase. Problems include parking, road congestion and carelessness that greatly adds to hazard conditions for residents.
37	2/4/2016 14:45	No
38	2/4/2016 14:42	Long term, grid down, situation. Food, water, heat during that time.
39	2/4/2016 14:42	Fire sources in Golden Gate Canyon - home owners having open fires, drivers through the canyon throwing lit cigarettes out the window
40	2/4/2016 2:48	Fire Jefferson County mountains
41	2/4/2016 1:55	Wildfire in Golden Gate Canyon
42	2/4/2016 1:26	Wildfire
43	2/4/2016 0:30	Fire mitigation evacuation plan
44	2/4/2016 0:07	Wild fires
45	2/3/2016 23:53	No
46	2/3/2016 23:49	Crawford Gulch Road, Golden, Jefferson County repairs from flood several years ago never fixed.
47	2/3/2016 23:49	Rockslides -- Golden Gate Canyon
48	2/3/2016 23:45	We need better information when fires are nearby or evacuation may be needed. We have had 4 small fires within sight of our home and have seen helicopters fighting them without ever receiving information. Even with fire trucks in front of our home.
49	2/2/2016 16:44	Severe snow
50	1/30/2016 4:14	Coal Creek Canyon - erosion since flood
51	1/24/2016 5:34	I don't really have any formal expertise, but I'm passionate about the wildfire efforts
52	1/22/2016 23:12	Edgewater currently has very few storm drains. Ice and water build up at the intersections as a result. I think this is strange and a possible hazard issue.
53	1/22/2016 17:34	Wildfire-egress from `no outlet' roads Coal Creek Canyon
54	1/22/2016 17:14	Winds and Winter Warning Snowstorms

Number	Response Date	Response Text
55	1/22/2016 4:57	Stream restoration; culvert cleaning in Coal Creek Canyon and its tributaries
56	1/22/2016 4:43	Although we (in Coal Creek Canyon) have "recovered" from our flood disaster, I feel like I have received very little information on how we can mitigate a future disaster. The flood completely changed the landscape down here along the creek in the lower canyon. Every time it rains, the small streams and rockslides are unpredictable. But, during the clean up I tried to get answers about how to better mitigate my home and my neighborhood. I could never get a straight answer from anyone in the county office. I couldn't even figure out if there WAS someone that I could hire to come out and take a look. It's like I was expected to spend \$100,000 to clean up and pretend like it never happened. So flood mitigation in Coal Creek Canyon is obviously a big issue to me.
57	1/21/2016 19:52	No
58	1/21/2016 14:08	Way too much fire danger from oak brush and from beetle killed trees. Planning & Zoning, Parks, etc.
59	1/21/2016 1:46	Emergency evacuation options out of narrow or dead end mountain neighborhoods is serious concern. The roads are not mitigated and I am not sure responders could rescue anyone trapped. Significant dead fall next to or leaning over roadways. Mountain Park area is worst
60	1/20/2016 21:57	Effective community warning & information dissemination
61	1/20/2016 21:33	No
62	1/20/2016 21:04	Evergreen Dam, in need of repair before it breaks.
63	1/17/2016 20:26	Climate change is leading to increased length of wildfire seasons and intensity of wildfires. Yet Jeffco seems to be unwilling to limit human habitation in danger areas or to impose fees on those who live in these areas and don't do all they could to mitigate on their own properties.
64	1/16/2016 0:38	No
65	1/15/2016 3:19	How about addressing the disposal of hazardous materials?
66	1/14/2016 20:01	No
67	1/14/2016 17:39	The soils in Edgewater & the effect on the foundations of our homes
68	1/14/2016 17:23	Flood zone mapping and risk to structures in Edgewater
69	1/14/2016 17:13	None at this time.
70	1/14/2016 16:51	no
71	1/14/2016 16:42	No
72	1/14/2016 16:40	Inadequate or missing storm sewers in Wheat Ridge (north of 44th)
73	1/13/2016 19:50	Drought

Question 3: The following types of mitigation actions may be considered in Jefferson County. Please indicate the types of mitigation actions that you think should have the highest priority in the Jefferson County Multi-Hazard Mitigation Plan.

Answer Options	Answer Options2	Response Percent	Response Count
Avalanche mitigation	Avalanche mitigation	5.5%	8
Flood prone Property Buyout	Flood prone Property Buyout	8.9%	13
Education and Discounts on Flood Insurance	Education and Discounts on Flood Insurance	14.4%	21
Landslide/mudslide mitigation	Landslide/mudslide mitigation	18.5%	27
Participation in the National Flood Insurance Program	Participation in the National Flood Insurance Program	19.2%	28
Flood Mitigation	Flood Mitigation	22.6%	33
Critical Facilities Protection	Critical Facilities Protection	23.3%	34
Planning/Zoning	Planning/Zoning	30.1%	44
Stormwater Drainage Improvements	Stormwater Drainage Improvements	30.1%	44
Rockfall mitigation	Rockfall mitigation	30.1%	44
Indoor/Outdoor Warning	Indoor/Outdoor Warning	38.4%	56
Public Education/Awareness	Public Education/Awareness	40.4%	59
Forest Health/Watershed Protection	Forest Health/Watershed Protection	43.2%	63
Assistance with Defensible Space	Assistance with Defensible Space	47.3%	69
Evacuation route development	Evacuation route development	51.4%	75
Wildfire Fuels Treatment projects	Wildfire Fuels Treatment projects	66.4%	97
<i>answered question</i>			146
<i>skipped question</i>			11

Question 3 Graph:



Question 4: Please comment on any other pre-disaster strategies that the planning committee should consider for reducing future losses caused by natural disasters.

Number	Response Date	Response Text
1	2/16/2016 23:49	Prevent or limit development in flood prone areas and other areas that may be affected by natural events such as rockfall and mudslides.
2	2/16/2016 4:44	Aerial force to fight wildfires
3	2/15/2016 19:32	None
4	2/15/2016 17:56	Implement fire bans early and prohibit backyard campfires, especially in subdivisions with mostly 1-2 acre lots. The wind picks up with no warning in the foothills and could easily start a fire in the middle of a subdivision.
5	2/13/2016 23:22	Strengthen number of first responders in rural areas
6	2/13/2016 17:06	Wildfire mitigation, forest management
7	2/13/2016 16:36	Financial tax incentive to mitigate fire risk; FEMA funding to assist in lower the fire risk and providing distributed large capacity(30000 gal) cisterns in the district
8	2/13/2016 14:41	Public education is key, then private ownership responsibility. The government is responsible for people building in areas prone to various disasters, but it is also the home owner's responsibility to take all precautions to protect themselves. Living in a rural area I know many people do not have the financial resources to do proper fire mitigation, as a county we need to find federal funds to assist those who truly live on limited finds. But first, educating homeowners is of the highest importance.
9	2/13/2016 0:07	(Slightly) Increase Taxes to pay for Forestry Work - County Employees to clean the Forest.
10	2/12/2016 23:25	Maintain/widen narrow county roads for evacuation/mitigation any time a home is purchased in treed areas
11	2/12/2016 22:41	Distribute locally appropriate and in use fire mitigation strategies for homeowners and neighborhoods in the mountains.
12	2/12/2016 22:05	#1 Clear the forest of diseased trees.
13	2/12/2016 21:48	Beef up the local fire departments with better equipment and have state/federal help with both personnel and fire fighting equipment ready for use at a moment's notice.
14	2/12/2016 20:04	significantly increased state and county support for initial fire attack
15	2/12/2016 6:42	School response plans. During natural disasters, every school should have a plan for what appropriate actions to take
16	2/9/2016 18:01	1. Prohibit/remove permanent development in flood zones. 2. Require class A fire-resistant roofs for new structures and roof replacements. 3. Limit slopes of driveways and other development-related cuts and fills.
17	2/7/2016 18:30	Douglas Mountain road has had 3 cars in the past two years go off the road at its turns, especially where it doesn't get enough sun to melt snow, rather, the snow packs down into ice at critical turns.
18	2/7/2016 1:33	Not much you can do to prepare for hailstorms, etc.
19	2/6/2016 16:48	We will never have the resources to plan and protect everyone from all disasters. Education about risks and personal responsibility and consequences is critical.
20	2/6/2016 2:08	Invasive weed and rodent controls

Number	Response Date	Response Text
21	2/5/2016 4:58	Merits of mandatory evacuation versus no evacuation in a wildfire
22	2/4/2016 22:27	None
23	2/4/2016 20:57	None
24	2/4/2016 20:09	\$\$ & equipment for volunteer fire departments
25	2/4/2016 15:00	Limit activities in open space.
26	2/4/2016 14:43	\$ assistance for people wishing to host fire department cisterns. Agricultural grade sprinklers can dose houses.
27	2/4/2016 2:50	fire
28	2/4/2016 2:05	A downed tree and slash removal program paid for through fees from residents who participate in the program. It would increase employment opportunities while reducing the fire danger.
29	2/4/2016 1:56	Snowfall
30	2/4/2016 1:27	Control beetles
31	2/4/2016 0:11	Robustness of power reliable
32	2/3/2016 23:55	Fuel mitigation
33	2/3/2016 23:53	Removal of dead beetle kill. Thinning of over dense growth. Defensible space around homes and structures. Help for local volunteer fire departments with water supply and equipment.
34	2/3/2016 23:46	Improved mountain area county wide vhf system.
35	1/24/2016 5:35	Drought and water-use limitations
36	1/23/2016 20:18	Traffic congestion as it is already an issue, new housing developments in disaster-prone areas
37	1/23/2016 16:57	Alert sirens / tornado sirens would be prudent.
38	1/22/2016 23:15	Edgewater is currently a part of the Wheat Ridge Fire Protection District. We need to construct a new fire station in our city to shorten response times to fires and other disasters.
39	1/22/2016 17:34	Natural Gas Supply protection
40	1/22/2016 17:16	Winter Snow Warning and Street Plowing
41	1/22/2016 5:01	Stream flow measuring devices in South Beaver Creek and Coal Creek that would send out an emergency warning for rising stream levels
42	1/22/2016 4:45	Evacuation routes MUST be a high priority. At this time, since the flood, many of the neighborhoods up here in coal creek canyon have lost access to critical egress routes. This needs to be fixed.
43	1/21/2016 1:48	Requiring improvements or removal of hazardous buildings, old tires and other flammables
44	1/20/2016 21:59	An integrated approach to hazard management, e.g. floods, wildfires, forest health
45	1/20/2016 21:35	Information/marketing of existing evacuation routes (not necessarily developing new routes)

BOARD OF COUNTY COMMISSIONERS BRIEFING

December 6, 2016

EXECUTIVE SUMMARY

HUMAN SERVICES DEPARTMENT

Children, Youth and Families

FOR DISCUSSION/APPROVAL PRIOR TO FUTURE HEARING

1. ISSUE:

Continuation of Limited Status positions are necessary for ongoing business operations for afterhours and weekend response to child abuse and neglect reports for the Children, Youth and Families Division (CYF).

RECOMMENDATION:

That the Board of County Commissioners approves the continued use of the CYF Division to access Limited Status positions as needed for use in the afterhours Auxiliary program to transition experienced certified caseworkers for hourly employment.

BOARD OF COUNTY COMMISSIONERS BRIEFING PAPER
Human Services Department

Children, Youth and Families Division

REQUEST FOR RENEWAL OF LIMITED STATUS POSITIONS

December 6, 2016

For Information

for Discussion/Approval

for Action

ISSUE: Continuation of Limited Status positions are necessary for ongoing business operations for afterhours and weekend response to child abuse and neglect reports for the Children, Youth and Families Division (CYF).

BACKGROUND: The CYF Division is required to respond to child abuse and neglect referrals 24 hours a day 7 days a week. CYF developed an afterhours and week-end response program called the Auxiliary program in 2010 to meet this requirement. Certified caseworkers are needed to meet this mandate. When caseworkers leave the Division for personal or career reasons and no longer wish to be employed full-time they have been able to stay and work hourly through the Auxiliary program. Afterhours and week-ends require highly experienced and qualified caseworkers to respond on critical immediate situations with remote supervisory support.

DISCUSSION: The Affordable Health Care Act established new employment requirements that no longer allow the transition of a full-time employee into a temporary position without offering benefits unless the separation of employment has been longer than 13 weeks. Given this requirement, in 2014, the CYF Division requested the use of Limited Status positions to transfer experienced certified caseworkers that have resigned from full time employment in order to work hourly in the Auxiliary program. The CYF Division is renewing this request for the continued use of four Limited Status positions to use for this purpose.

FISCAL IMPACT: No new funding is being requested to continue the positions. The LTE positions are funded by the Child Welfare Block allocation and included in the temporary position line of the budget.

RECOMMENDATION: That the Board of County Commissioners approves the continued use of the CYF Division to access Limited Status positions as needed for use in the afterhours Auxiliary program to transition experienced certified caseworkers for hourly employment.

ORIGINATOR: Lynn Johnson, Executive Director, Human Services Department (x4002)

CONTACTS: Mary Berg, Deputy Director, Human Services Department (x4163)

BOARD OF COUNTY COMMISSIONERS BRIEFING PAPER**Board of Adjustment-Zoning Resolution, Policy and Bylaws
December 6, 2016** For Information For Discussion/Approval
Prior to Future Hearing For Action**ISSUES:**

Section 4 of the Jefferson County Zoning Resolution pertaining to the Board of Adjustment (BOA) originated in 1946. There have been numerous updates and revisions over the past 70 years which have created a regulatory document inconsistent with other Planning & Zoning processes as well as inconsistent with other boards and commissions. Currently there is no BOA Policy adopted by the Board of the County Commissioners. Additionally, the BOA has never created nor adopted a set of Bylaws.

BACKGROUND:

As Section 4 has evolved over the years, items such as time and day of the week for BOA hearings have become regulation. Other operating procedures typically found in County Policies and board/commission Bylaws have been codified into Section 4. Not only are some of these regulations antiquated, they allow no flexibility.

DISCUSSION:

In order to create flexibility as well as to align the processing of BOA applications with other Planning and Zoning applications, staff is proposing to revise Section 4 of the Zoning Resolution, and to draft a County Policy as well as Bylaws for BOA adoption.

Creating an operating framework similar to that of the Planning Commission will establish clear and consistent expectations for applicants, citizens and staff.

FISCAL IMPACT:

None identified at this time.

RECOMMENDATIONS:

That the Board of County Commissioners direct staff to draft revisions to Section 4 of the Zoning Resolution while concurrently drafting a County BOA Policy and a set of Bylaws to be considered and adopted by the BOA. These drafts will be presented at a future BCC briefing for discussion prior to moving forward.

CONTACTS:

Jeanie Rossillon, Director of Development and Transportation
John Wolforth, Director of Planning & Zoning

SECTION 4: THE BOARD OF ADJUSTMENT

(orig. 5-6-46)

A. Rules of Procedure

1. Meetings

- a. Regular meetings of the Board of Adjustment shall be held on the first Wednesday and the third Wednesday of each month at 9:00 a.m. (orig. 5-6-46; am. 3-17-58; am. 4-30-69)
- b. Special meetings may be called by the Chairman and at such other times as the Board may determine. (orig. 5-6-46; am. 12-17-02)
- c. All meetings shall be open to the public. (orig. 5-6-46; am. 12-17-02)
- d. A quorum of the Board of Adjustment shall consist of 4 members. (orig. 5-6-46; am. 12-17-02)
- e. The members of the Board shall attend meetings of the Board in person. (orig. 5-6-46)
- f. The Chairman, or if absent, the Vice Chairman or the Acting Chairman, may administer oaths and compel the attendance of witnesses. (orig. 5-6-46)
- g. The Board shall keep minutes of its proceedings, showing the vote of each member on each question, or if absent or failing to vote indicating such fact; and it shall also keep records of its examinations and other official actions, all of which shall be filed immediately in the offices of the Board and shall be a public record. (orig. 5-6-46)
- h. The concurring vote of 4 members of the Board shall be necessary to reverse any order, requirement, or decision or determination of the Director of Planning and Zoning (also called the Zoning Administrator prior to March 3, 2015), or to decide in favor of the applicant, any matter upon which it is required to pass under the Zoning Resolution, or to effect any variation herein. An Appeal may be taken from any final action of the Director of Planning and Zoning to the Board of Adjustment by any person aggrieved, or by an officer, department, or board of the County. Such Appeal shall be taken within 30 days after the date of the final decision of the Director of Planning and Zoning, by filing with the Director of Planning and Zoning and the Board of Adjustment, a Notice of Appeal specifying the grounds thereof. (orig. 5-6-46; am. 3-28-00; am. 12-17-02; am. 12-14-04; am. 3-3-15)

2. Cases Before the Board

- a. Every application, appeal or petition to the Board shall be made to the Board on forms especially provided, and shall include the data required in such forms so as to supply all of the information necessary for a clear understanding and intelligent action by the Board. (orig. 5-6-46)
- b. Any communication purporting to be an application, appeal or petition shall be regarded as mere notice of intention to seek relief until it is made in the form required. (orig. 5-6-46)
- c. Upon receipt of any such communication, the writer shall be supplied with the proper forms for presenting an application, appeal or petition. If the required data is not submitted within the time provided for Appeal, the case may be dismissed for lack of prosecution. (orig. 5-6-46)
- d. When an Appeal is filed, the Director of Planning and Zoning shall forthwith transmit to the Board of Adjustment, all papers pertaining to the case. (orig. 5-6-46; am. 3-28-00; am. 12-17-02; am. 3-3-15)

3. Calendar of Cases – Notice of Hearing

- a. Not less than 15 days notice of the time and place of a Board of Adjustment hearing shall be given by posting a sign in a prominent place on the property which is the subject of such application or appeal. (orig. 5-6-46; am. 12-17-02)

- b. Notification Criteria: The Director of Planning and Zoning shall determine, at their discretion, the potentially affected property owners related to the specific Board of Adjustment request. This may include the adjacent property owners and any other properties that may be impacted by the proposed request. Once the potentially affected property owners have been determined, the County shall notify all potentially affected owners in writing of the proposed Board of Adjustment request and schedule hearing date and time. (orig. 3-26-13; am. 3-3-15)
 - c. Any applicant or appellant, and any resident or taxpayer of Jefferson County, who desires to oppose the application or appeal and be heard at Board hearing, may appear in person, by agent, or by attorney. (orig. 5-6-46; am. 12-17-02; am. 12-14-04)
4. Final Disposition of Cases
- a. Every decision of the Board on any case shall be by Resolution indicating the reasons of the Board's decision. (orig. 5-6-46; am. 12-17-02)
 - b. The final disposition of any Appeal from the Director of Planning and Zoning before the Board of Adjustment shall be in the form of a resolution, either affirming, reversing or modifying the order, requirement, decision or determination appealed from. If a resolution fails to receive 4 votes in favor of the appellant upon appeal or of the applicant for a variation from the zoning regulations, the action will be deemed equivalent to a denial, and a resolution denying such application or appeal shall be formally entered upon the record unless there be a member absent at the roll call and unless the vote of each absent member added to those voting for an applicant or appellant would equal 4, in which case the matter will be laid over for hearing before the full Board. (orig. 5-6-46; am. 3-28-00; 12-17-02; am. 3-3-15)
 - c. No application or appeal dismissed or denied can be considered again except on a motion to reconsider the vote or on a request for rehearing. No request to grant a rehearing will be entered unless new evidence is submitted which would not have been with due diligence, presented at the previous hearing. (orig. 5-6-46; am. 12-17-02)
 - d. The Board may, on a motion by any member, review any decision that it has made and may reverse or modify such decision, but no such review shall prejudice the right of any person who has, in good faith, acted thereon before ruling is reversed or modified. (orig. 5-6-46)
5. Zoning Application
- a. No application for a variation from the course prescribed by this Zoning Resolution shall be heard by the Board of Adjustment except in a specific case and from an order, requirement, decision or determination made by the Director of Planning and Zoning upon the ground that the proposed plan or use is contrary to provision of this Zoning Resolution. (orig. 5-6-46; am. 3-28-00; am. 12-17-02; am. 3-3-15)
 - b. No such application shall be entertained unless the application is filed within 30 calendar days after the date of the action of the Director of Planning and Zoning. (orig. 5-6-46; am. 3-28-00; am. 12-17-02; am. 12-14-04; am. 3-3-15)
 - c. Upon written request by the applicant, a case can be continued or held inactive prior to public hearing for a period not exceeding 60 calendar days. After this time, the application shall be considered withdrawn. (orig. 7-1-03)
 - d. As soon as any application is completed by the filing of the necessary data, the County shall fix a reasonable time for the hearing and give due notice thereof to the parties. (orig. 5-6-46; 12-17-02)
 - e. At the time of the hearing, the applicant states the case, then the opposition shall be heard and the applicant shall have the opportunity to reply. (orig. 5-6-46)
 - f. No application that has been dismissed or denied can be entertained in a case in which the applicant, by filing new plans, has obtained a new decision from the Director of Planning and

Zoning, unless the new plans materially change the aspects of the case. (orig. 5-6-46; am. 3-28-00; am. 12-17-02; am. 3-3-15)

6. Application Fees

Accompanying each application for an Appeal, Special Exception, or Variance shall be a nonrefundable processing fee in an amount established by the Board of County Commissioners. (orig. 8-7-74; am. 5-21-79; am. 5-3-94)

B. Establishment

A Board of Adjustment is hereby established, the members of which shall be appointed by the Board of County Commissioners. The word "Board" when used in this section shall be construed to mean the Board of Adjustment. The Board shall consist of 5 members, not more than 2 of whom at any time may be members of the Jefferson County Planning Commission. Each member shall serve 3 years or until their respective successors have been appointed. The terms of office shall be staggered so that the term of at least one member will expire each year. Vacancies shall be filled and associate members may be appointed as provided by law. Members of the Board of Adjustment as constituted at the time of enactment of this Zoning Resolution or any amendment to this section, shall be continued in office for the duration of their appointed terms. (orig. 5-6-46; am. 7-12-94; am. 12-17-02)

C. Officers

The Board shall, at its first regular meeting of such year, select a Chairman and a Vice Chairman. The Chairman shall preside at meetings and shall perform all duties usual and ordinary for the presiding officer of any Board or group. The Vice Chairman shall perform the duties of the Chairman in the absence of the Chairman. (orig. 5-6-46; am. 12-17-02)

D. Powers

The Board shall have the following powers: (orig. 5-6-46)

1. Appeals

To hear and decide upon Appeals where it is alleged by the appellant that there is an error in any order, requirement, decision or refusal made by an administrative official or agency based on or made in enforcement of this Zoning Resolution. (orig. 5-6-46; am. 12-6-71; am. 12-17-02)

2. Special Exceptions

To hear and decide requests for Special Exceptions or for interpretations of the Zoning Maps or for decisions upon other special questions upon which the Board is authorized by this section to pass. (orig. 5-6-46; am. 12-6-71)

a. To interpret the Zoning Maps to carry out the intent and purpose of the Zoning Maps where the street or highway layout on the ground varies from the street or highway layout shown on the Zoning Map. (orig. 5-6-46; am. 12-6-71)

b. Mining and attendant operations, previously approved by the Board of Adjustment, shall henceforth be administered and enforced pursuant to the Definitions Section of this Zoning Resolution. There shall be no Special Exceptions approved by the Board of Adjustment to allow mining in the M-C Zone District subsequent to June 1, 1993, the effective date of this Zoning Resolution. (orig. 6-1-93; am. 12-17-02)

c. To permit in any zone district the temporary occupation, for residential purposes, of a temporary living quarter as defined in the Definitions Section of this Zoning Resolution. Temporary living quarters may be permitted only in circumstances where a permanent dwelling is being constructed on the same or abutting property. Such permit may be granted only when the following requirements have been met: (orig. 12-6-71; am. 8-7-74; am. 12-17-02; am. 10-25-05)

- (1) Where a permanent dwelling and the temporary living quarters are requested to be constructed, the following must be shown: (orig. 8-7-74; am. 12-17-02)
 - (a) Proof of financing has been presented for the permanent dwelling. (orig. 12-6-71)
 - (b) A Building Permit has been obtained for the permanent dwelling. (orig. 12-6-71)
 - (c) A permit for an individual septic system or other sewage disposal facility, approved by Public Health, exists for such temporary living quarters. (orig. 12-6-71; am. 12-17-02; am. 10-13-09)
 - (d) A well permit has been obtained or public water supply exists for such temporary living quarters. (orig. 12-6-71; am. 12-17-02)
 - (e) Any other restrictions as may be deemed necessary by the Board of Adjustment. (orig. 12-6-71)
 - (2) The permit may be granted only to the true fee owners of the property on which the permanent home is to be constructed. Only 1 temporary living quarter may be permitted on the property and may be occupied by either the true fee owner or the contractor or builder upon approval by the Board. (orig. 12-6-71; am. 8-7-74; am. 12-17-02; am. 10-25-05)
 - (3) Permits may be granted for a period of up to 1 year and may be renewed after a complete rehearing is held thereon by the Board of Adjustment. (orig. 12-6-71; am. 8-7-74; am. 6-14-88; am. 12-17-02; am. 10-25-05)
- d. To permit in any zone district temporary buildings and/or temporary uses as follows: (orig. 5-6-46; am. 12-6-71; am. 1-17-84)
- (1) A building for temporary purposes if such use is authorized by the zoning on the property, or; (orig. 1-17-84)
 - (2) A temporary use of land and/or associated temporary buildings for any purpose or use which is clearly incidental to the development of the property. (orig. 5-6-46; am. 12-6-71; am. 1-17-84)
 - (3) Such Special Exception shall in no case be granted for use of a temporary building for residential occupancy unless a substantial need for security personnel on the property for which the permit is sought has been established. (orig. 5-6-46; am. 12-6-71; am. 1-17-84; am. 10-25-05)
 - (4) When requesting a construction trailer or where a substantial need for security personnel on the property has been shown, the following requirements must be met: (orig. 8-7-74; am. 12-17-02; am. 10-25-05)
 - (a) A permit for an Individual Sewage Disposal System or other sewage disposal facility, approved by Public Health, exists for such temporary structure. (orig. 12-6-71; am. 12-17-02; am. 10-25-05; am. 10-13-09)
 - (b) A well permit has been obtained or public water supply exists for such temporary structure. (orig. 12-6-71; am. 12-17-02; am. 10-25-05)
 - (c) Any other restrictions as may be deemed necessary by the Board of Adjustment. (orig. 12-6-71; am. 10-25-05)
 - (5) Such Special Exception, if issued, will be valid for a period of 1 year and thereafter may be renewed annually after a complete rehearing by the Board of Adjustment. A maximum of 5 total years, beginning from the date that the first Special Exception was granted, shall be allowed. (orig. 5-6-46; am. 12-6-71; am. 1-17-84)

NOTE: If an applicant has been granted a Special Exception for a temporary use of land and/or building for 5 years or more, at time of adoption of this change, the Board of

Adjustment may not grant a renewal for a Special Exception for more than 1 additional year. (orig. 1-17-84)

- (6) The Board shall, at the time of approval thereof, establish restrictions on location, access, heights, setbacks, water and sewer facilities, public improvements, and any other reasonable stipulations deemed necessary for the protection of the health, safety and welfare of the citizens of Jefferson County. (orig. 5-6-46; am. 12-6-71; am 1-17-84)
- e. To permit home occupations which do not meet the provisions of the Home Occupations Section of this Zoning Resolution, subject to the following limitations: (orig. 11-15-65; am. 12-6-71; am. 6-23-81; am. 7-11-07)
- (1) The Board shall not permit any home occupation specifically excluded in the Home Occupations Section of this Zoning Resolution. (orig. 6-23-81; am. 7-11-07)
 - (2) Such home occupation shall be approved initially for a period of up to one year and may be renewable for periods of greater duration after complete rehearing thereon by the Board of Adjustment. (orig. 6-23-81)
 - (3) The Board shall, at the time of approval thereof, establish restrictions on location, access, water and sewer facilities and any other reasonable stipulations deemed necessary for the protection of the health, safety and welfare of the citizens of Jefferson County. (orig. 6-23-81)
 - (4) In approval or denial of home occupations herein, the Board of Adjustment shall give consideration to all incidental uses in connection therewith concerning the extent of retail sale of commodities, if any. (orig. 11-15-65; am. 12-6-71)
 - (5) Such home occupation shall be conducted by the inhabitants of the residential property and shall terminate automatically upon any conveyance of possession or termination of lease or rental agreement. (orig. 11-15-65; am. 12-6-71; am. 6-23-81)
 - (6) Such home occupation shall be approved only if it is compatible with the general spirit and intent of this Zoning Resolution and to promote the general welfare. (orig. 11-15-65; am. 12-6-71; am. 12-17-02)
 - (7) The impact of the home occupation shall not adversely affect the character of the surrounding area. (orig. 7-1-03)
 - (8) One wall sign shall be allowed not to exceed 4 square feet. The sign shall have no exterior, interior or neon lighting. (orig. 7-1-03)
 - (9) Maximum number of employees: one. (orig. 7-1-03)
- f. To permit the short-term rental of a single-family dwelling subject to the following criteria: (orig. 1-1-12)
- (1) The Board of Adjustment may permit a short-term rental within the R-1, RR, MR-1, SR-1, SR-2, SR-5, A-1, A-2 or A-35 zone districts or a comparable Planned Development zone district. (orig. 1-1-12)
 - (a) The Board of Adjustment, in reviewing and making its decision upon such applications shall consider the impacts of the proposed use upon property in the surrounding area, including but not limited to: (orig. 1-1-12)
 - (a-1) Traffic impacts, volume of trips, safety and access; (orig. 1-1-12)
 - (a-2) Fire hazards; (orig. 1-1-12)
 - (a-3) Visual and aesthetic impact, including bulk and scale of buildings as they relate to the uses on surrounding properties; (orig. 1-1-12)

- (a-4) Noise; (orig. 1-1-12)
 - (a-5) Drainage, erosion and flood hazards; (orig. 1-1-12)
 - (a-6) Community character; (orig. 1-1-12)
 - (a-7) Adequate water and sewage disposal availability; (orig. 1-1-12)
 - (a-8) The availability of methods of mitigating the negative impacts of the proposed use upon the surrounding area; (orig. 1-1-12)
 - (a-9) The compatibility of the short-term rental with the existing and allowable land uses in the surrounding area; and (orig. 1-1-12)
 - (a-10) The effect upon health, safety and welfare of the residents in the surrounding area. (orig. 1-1-12)
- (b) Where reasonable methods or techniques are available to mitigate any negative impacts which could be generated by the proposed use upon the surrounding area, the Board of Adjustment may condition the decision to approve the Special Exception application upon implementation of such methods or techniques. (orig. 1-1-12)
- (2) Limitations upon Short-term Rental Special Exception Applications (orig. 1-1-12)
- (a) The lot, parcel, or boundary area subject to the Special Exception must conform to: (orig. 1-1-12)
 - (a-1) A minimum lot size of one acre, and (orig. 1-1-12)
 - (a-2) Building standards of the underlying zone district. (orig. 1-1-12)
 - (b) The proposed short-term rental shall provide a minimum of one (1) off-street parking spaces, plus one (1) additional off-street parking space per bedroom room. For example, a five-bedroom residence must have seven off-street parking spaces to meet this criterion. (orig. 1-1-12)
 - (c) The property owner shall comply with any defensible space requirements as set forth in the Wildfire Hazard Overlay District. (orig. 1-1-12)
 - (d) Valid water and sanitation must be provided either by an appropriate water and sanitation district or by a valid well permit and individual sewage disposal system (ISDS) permit specific to the property. (orig. 1-1-12)
 - (e) The lot, parcel, or boundary area subject to the Special Exception shall take legal access from a County maintained right-of-way or a private road that meets the minimum standard for private roads and driveways or non-maintained County right-of-way as set forth in the Jefferson County Transportation Design and Construction manual. (orig. 1-1-12; am. 11-24-15)
 - (f) The short-term rental shall offer overnight accommodations in the primary single family dwelling in existence on the property, not in an accessory dwelling unit. The entire property including accessory uses in the corresponding zone district may be utilized by the guests of the short-term rental. (orig. 1-1-12)
 - (g) The property owner may not, at the time of application for the Special Exception, be the subject of an ongoing zoning violation other than the short-term rental of a single-family dwelling. (orig. 1-1-12)
 - (h) No substantial detriment to the intent of the Zoning Resolution will be caused.

- (3) Such Special Exception, if granted, will be valid for a period of six months and thereafter may be renewed annually after a complete rehearing by the Board of Adjustment to determine that the use is in compliance with the intent and purpose for which the Special Exception was granted. (orig. 1-1-12)
- (4) Upon an affirmative decision, the applicant shall submit a request for a Short-term Rental Permit including documentation that all requirements of the Special Exception granted pursuant to this section have been fulfilled. (orig. 1-1-12)

3. Variances

To authorize Variances from the strict application of this Zoning Resolution, so as to relieve difficulties or hardships where by reason of exceptional narrowness, shallowness or shape of a specific piece of property at the time of the enactment of this Zoning Resolution or amendment thereof, or by reason of exceptional topographic condition or other extraordinary and exceptional situation or condition of such piece of property, the strict application of any zoning regulation adopted would result in peculiar and exceptional practical difficulties to, or exceptional and undue hardship upon the owner of such property; provided however, that such relief may be granted only without substantial detriment to the public good and without substantially impairing the intent and purpose of this Zoning Resolution and the Zoning Maps. (orig. 5-6-46; am. 12-6-71; am. 12-17-02)

a. Access Construction Criteria

The Board of Adjustment, upon application thereto, may authorize a Variance to the access standards, defined in the General Provisions Section of this Zoning Resolution, for the purpose of relieving difficulties or hardships due to topographic conditions; limited opportunities for the realignment of the access; or other difficulties which constrain or prohibit compliance with the General Provisions Section of this Zoning Resolution. In such cases the Board of Adjustment must consider the following. (orig. 12-5-95; am. 12-17-02; am. 7-11-07)

- (1) A drawing of the subject access drawn to scale, submitted by the applicant and signed and sealed by a licensed surveyor or engineer, which depicts the existing or proposed access and which clearly indicates those criteria in the Transportation Design and Construction Manual or the Zoning Resolution, which are and are not satisfied. (orig. 12-5-95; am. 12-17-02; am. 11-24-15)
- (2) A letter from the appropriate fire protection district which evaluates the suitability of the existing and/or proposed access for fire protection services. (orig. 12-5-95)
- (3) A report submitted by the applicant for property located within the Wildfire Hazard Overlay Zone which describes those site and building-related factors which contribute to the risks associated with wildfire and those building-design and technology-based factors, either existing or proposed, which mitigate the hazards associated with wildfire. Examples of contributing factors are: marginal water supplies and delivery systems, either on-site or off-site; the capabilities and response time of the local fire protection district; the presence of "heat traps" such as decks and roof overhangs; fuel sources, and topography. Examples of building design and technology based mitigation strategies are: exceptional water supplies and delivery systems, either on-site or off-site; fire resistive construction techniques and materials; irrigated lawns or groundcovers around the structure; fire department-approved suppression systems; monitored suppression systems and/or monitored detection/alarm systems. (orig. 12-5-95)

b. Access Width Criteria

In determining whether to grant a Variance for access, the Board of Adjustment shall consider the evaluation by the fire protection district and shall only grant a Variance contrary to such evaluation upon detailed findings that support a conclusion that no substantial detriment to the public good nor harm to the general purpose and intent of the Zoning Resolution will be caused thereby. (orig. 12-5-95; am. 12-17-02)

c. Parking

- (1) Where it is found by the Board of Adjustment, upon application thereto, that the parking demand engendered by the different uses, included in any joint arrangements to provide parking stalls required herein, occurs at definite different times of day, as in the case of a theater generating demand for parking after normal daytime business hours and a store generating demand for parking during such daytime hours and in such similar cases, the Board may reduce the total number of parking stalls to be jointly provided. (orig. 12-9-57; am. 8-6-80)
- (2) In a case where any public or private off-street parking facility, to be opened for public use free of charge or at reasonable rates, is planned or in process of development and where the Board of Adjustment has reasonable assurance that such development will be carried to completion and will, when completed, relieve the parking demand in an area within 500 feet thereof, the Board may establish a reasonable time period within which such area shall be provided with the required space of all or any portion of such development. The provisions of paragraph 3 above may be applied by the Board of Adjustment. (orig. 12-9-57; am. 8-6-80)
- (3) In a case where it is clearly shown by the applicant, to the satisfaction of the Board of Adjustment, that the provision of the amount of the space required herein for parking stalls, because of the particular nature of a proposed use, would be unnecessary, particularly difficult or create unnecessary hardship, the Board of Adjustment may reduce such requirements. (orig. 12-9-57; am. 8-6-80)

d. To hear and decide requests for Variances from the requirements of the Flood Plain (F-P) Overlay Zone District, and to hear and decide Appeals when it is alleged that there is an error in any requirement, decision, or determination made by the Director of Planning and Zoning in the enforcement or administration of the Flood Plain Overlay Zone District. (orig. 5-31-88; am. 12-17-02; am. 3-3-15)

- (1) In ruling upon such Appeals and Variance requests, the Board shall consider all technical evaluations, relevant factors, standards specified in other sections of this Zoning Resolution, and the following: (orig. 5-31-88; am. 12-17-02)
 - (a) The danger that materials may be swept onto other lands to the injury of others. (orig. 5-31-88)
 - (b) The danger to life and property due to flooding or erosion damage. (orig. 5-31-88)
 - (c) The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owners. (orig. 5-31-88)
 - (d) The importance of the services provided by the proposed facility to the County. (orig. 5-31-88)
 - (e) The necessity to the facility of a waterfront location, where applicable. (orig. 5-31-88)
 - (f) The availability of alternative locations for the proposed use which are not subject to flooding or erosion damage. (orig. 5-31-88)
 - (g) The compatibility of the proposed use with the existing and anticipated development. (orig. 5-31-88)
 - (h) The relationship of the proposed use to the comprehensive plan and floodplain management program for that area. (orig. 5-31-88)
 - (i) The safety of access to the property in times of flood for ordinary and emergency vehicles. (orig. 5-31-88)

- (j) The expected heights, velocity, duration, rate of rise and sediment transport of the flood waters and the effects of wave action, if applicable, expected at the site. (orig. 5-31-88)
 - (k) The costs of providing governmental services during and after flood conditions, including maintenance and repair of public utilities and facilities such as sewer, gas, electrical, and water systems, streets and bridges. (orig. 5-31-88)
- (2) The Board may grant a Variance provided that the following conditions are met. (orig. 5-31-88)
- (a) Generally, Variances may be issued for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base level, providing items (a) through (f) of paragraph D.3.d.(1) have been fully considered. As the lot size increases beyond the one-half acre, the technical justification required for issuing the Variance increases. (orig. 5-31-88; am. 12-17-02)
 - (b) Variances may be issued for the repair or rehabilitation of structures listed on the National Register of Historic Places or the State Inventory of Historic Places upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure. (orig. 5-31-88; am. 8-27-13)
 - (c) Variances shall not be issued within any designated floodway (high hazard area) if any increase in flood levels during the base flood discharge would result. (orig. 5-31-88)
 - (d) Variances shall only be issued upon a determination that the Variance is the minimum necessary, considering the flood hazard, to afford relief. (orig. 5-31-88)
 - (e) Variances shall only be issued upon the following. (orig. 5-31-88)
 - (e-1) A showing of good and sufficient cause. (orig. 5-31-88)
 - (e-2) A determination that failure to grant the Variance would result in exceptional hardship to the applicant. (orig. 5-31-88)
 - (e-3) A determination that the granting of a Variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public as identified in paragraph D.3.d.(1) or conflict with other sections of this Zoning Resolution. (orig. 5-31-88; am. 12-17-02)
 - (f) Any applicant to whom a Variance is granted shall be given written notice that the structure will be permitted to be built with a lowest floor below the base flood elevation and that the cost of flood insurance will be commensurate with the increased risk from the reduced lowest floor elevation. (orig. 5-31-88)
- (3) Upon consideration of the factors of paragraph D.3.d.(1). and the purposes of this Zoning Resolution, the Board may attach such conditions to the granting of Variances as it deems necessary to further the purposes of this Zoning Resolution. (orig. 5-31-88; am. 12-17-02)
- (4) The Director of Planning and Zoning shall maintain the records of all Appeal actions, including technical information, and report any Variances to the Federal Emergency Management Agency. (orig. 5-31-88; am. 12-17-02; am. 3-3-15)

- e. To hear and decide requests for Variances from the requirements of the Mountain Ground Water Overlay District, and to hear and decide Appeals when it is alleged that there is an error in any requirement, decision, or determination made by the Director of Planning and Zoning in the enforcement or administration of the Mountain Ground Water Overlay District. (orig. 7-11-07; am. 3-3-15)
 - (1) In ruling upon such Appeals and Variance requests, the Board shall consider all technical evaluations, relevant factors, standards specified in other sections of this Zoning Resolution, and the following:
 - (a) The proposed land use and well yield for the lot/parcel is sufficient to support the proposed development. (orig. 7-11-07)
 - (b) The compatibility of the proposed use with the existing and anticipated development. (orig. 7-11-07)
 - (2) It shall be the responsibility of the applicant to supply the Board of Adjustment with the requested data and documentation. (orig. 7-11-07)
 - (3) The Board may grant a Variance provided that the following conditions are met. (orig. 7-11-07)
 - (a) Variances may be granted for new construction and substantial improvements to be erected on a lot/parcel providing items (a) and (b) of paragraph D.3.e.(1) have been fully considered. (orig. 7-11-07)
 - (b) Variances may be granted for the reconstruction, rehabilitation or restoration of structures listed on the National Register of Historic Places or the State Inventory of Historic Places without regard to the procedures set forth in the remainder of this section. (orig. 7-11-07)
 - (c) Variances shall only be granted upon the following.
 - (c-1) A showing of good and sufficient cause, supported by technical data or additional material requested by the Board. (orig. 7-11-07)
 - (c-2) A determination that failure to grant the Variance would result in exceptional hardship to the applicant. (orig. 7-11-07)
 - (4) Upon consideration of the factors of paragraph D.3.e.(1). and the purposes of this Zoning Resolution, the Board may attach such conditions to the granting of Variances as it deems necessary to further the purposes of this Zoning Resolution. (orig. 7-11-07)
- f. To permit in any Geologic Hazard (G-H) Overlay Zone District specially excepted uses enabled by the Geologic Hazard Overlay District Section of this Zoning Resolution, more particularly those uses permitted in the underlying zone district, provided that the following conditions and restrictions are met by the applicant, and the Board of Adjustment determines, based on the evidence submitted and restrictions imposed, that the use will not significantly increase the danger from the geologic hazard to the public health and property. (orig. 1-20-76; am. 12-17-02, am. 7-11-07)
 - (1) It shall be the sole responsibility of the applicant to supply the Board of Adjustment with the following data and documentation: (orig. 1-20-76)
 - (a) All pertinent data submitted to the Board of County Commissioners relative to the zoning of the subject property to G-H Overlay Zone District. (orig. 1-20-76)
 - (b) A site plan depicting: (orig. 1-20-76)
 - (b-1) The location of the subject geologic hazard(s). (orig. 1-20-76)

- (b-2) The location of the proposed land use(s). (orig. 1-20-76)
- (b-3) The location of the surrounding land uses(s). (orig. 1-20-76)
- (b-4) The location of the surrounding geologic hazard(s). (orig. 1-20-76)
- (c) A written report on the area depicted in the site plan, including: (orig. 1-20-76)
 - (c-1) Description of subject geologic hazard(s) and proposed land use(s). (orig. 1-20-76)
 - (c-2) Description of surrounding geologic hazard(s) and surrounding land use(s); (orig. 1-20-76)
 - (c-3) The effects of the subject geologic hazard(s) on the proposed use(s) and surrounding land use(s). (orig. 1-20-76)
 - (c-4) The effects of the proposed use(s) on the subject geologic hazard(s) and surrounding geologic hazard(s). (orig. 1-20-76)
- (d) Any additional material required by the Board of Adjustment relating to special design criteria for any proposed land use(s). (orig. 1-20-76)

(2) Geologic Hazard Abatement:

In addition to the data and documentation required in paragraphs D.3.f.(1)(b) through (d) above, an applicant who proposes to abate the geologic hazard shall further submit: (orig. 1-20-76; am. 12-17-02; am. 7-11-07)

- (a) A detailed report of the proposed method of abating the geologic hazard. (orig. 1-20-76)
- (b) An addendum to the site plan, written report, and additional material required by paragraphs D.3.f.(1)(b) through (d) above, which shall state the projected effect of: (orig. 1-20-76; am. 12-17-02; am. 7-11-07)
 - (b-1) Abatement procedures on subject geologic hazard(s), surrounding geologic hazard(s) and surrounding land use(s). (orig. 1-20-76)
 - (b-2) Abated geologic hazard(s) on proposed land use(s), surrounding land use(s) and surrounding geologic hazard(s). (orig. 1-20-76)
- (c) Any geologic hazard abatement procedures required by the Board of Adjustment shall be inspected and the results certified by a professional geologist qualified in the field of engineering geology as being in compliance with plans submitted or additional restrictions imposed by the Board of Adjustment within time limits established by the Board of Adjustment. (orig. 1-20-76; am. 6-15-76)
- (3) All geologic reports and items in paragraphs D.3.f.(1)(c), D.3.f.(1)(d), D.3.f.(2)(a) and D.3.f.(2)(b) above, shall be prepared by a professional geologist qualified in the field of engineering geology and all engineering reports and items in paragraphs D.3.e.(1)(b), D.3.f.(1)(d), D.3.f.(2)(a) and D.3.f.(2)(b) above, shall be prepared by a registered professional engineer (as defined by C.R.S., 1974, 12-25-103, or as amended) qualified in the appropriate field(s). (orig. 1-20-76; am. 6-15-76; am. 12-17-02; am. 7-11-07)
- (4) Any building for which the Board of Adjustment requires special engineering criteria shall be inspected and construction certified by a registered professional engineer as to compliance with plans submitted or additional restrictions imposed by the Board of Adjustment within time limits established by the Board of Adjustment. (orig. 1-20-76; am. 12-17-02)

- g. To hear and decide upon wildfire mitigation site plans submitted as a request for a Special Exception for any property located within the Wildfire Hazard (W-H) Overlay Zone District, provided that the following conditions and restrictions are met by the applicant; and the Board of Adjustment determines, based on the evidence submitted and restrictions imposed, that the wildfire mitigation site plan for the subject property will lead to a reasonable reduction in the dangers from the wildfire hazard. (orig. 1-27-76; am. 12-5-95; am. 7-11-07)
- (1) It shall be the sole responsibility of the applicant to supply the Board of Adjustment with the following data and documentation: (orig. 1-27-76)
- (a) A written report consisting of the following: (orig. 12-5-95)
- (a-1) A narrative description of the physical characteristics of the site, including topography, major landforms, and aspect/orientation. (orig. 12-5-95)
- (a-2) A description of the major existing plant communities and timber types, including assessment of age, condition presence of disease, timber stand densities, and types and quantities of ladder fuels, if present. (orig. 12-5-95)
- (a-3) A general description of the type and location of wildfire hazards and existing land uses within 1/4 mile of the site. (orig. 12-5-95)
- (a-4) An evaluation of the site based on the analysis of the characteristics, as outlined above, to define areas of low, moderate, and high wildfire hazards, including fire chimneys and saddles. (orig. 12-5-95)
- (a-5) An evaluation of the existing land uses in relation to the on-site wildfire hazards and adjoining land uses and wildfire hazards. (orig. 12-5-95)
- (b) A site plan depicting the following: (orig. 1-27-76)
- (b-1) The location of the subject wildfire hazard(s) based on an assessment of the written report. (orig. 1-27-76; am. 12-5-95)
- (b-2) The location of the existing land uses and/or structures, including roads and driveways, and other relevant infrastructure improvements. (orig. 12-5-95)
- (b-3) The location of the surrounding land use(s), roadways, and other relevant infrastructure within 1/4 mile of the site. (orig. 1-27-76; am. 12-5-95)
- (b-4) The location of the surrounding wildfire hazard(s) within 1/4 mile of the site. (orig. 1-27-76 am. 12-5-95)
- (c) A detailed wildfire mitigation report describing the following: (orig. 12-5-95)
- (c-1) The techniques and/or strategies to be used to mitigate wildfire within the project area. The techniques and/or strategies should be directly related to identified wildfire hazards within the project area and should include those site and building factors which contribute to the risks associated with wildfire. Examples of contributing factors are: marginal water supplies and delivery systems, either on-site or off-site; the capabilities and response times of the local fire protection district; the presence of "heat traps" such as decks and roof overhangs; fuel sources, and topography. Examples of building design and technology-based mitigation strategies are: fire resistive construction techniques and materials; irrigated lawns or groundcovers around the structure; fire department-approved suppression systems; monitored suppressions systems and/or monitored smoke detection/alarm systems. (orig. 12-5-95)

(c-2) A detailed assessment describing the projected effect of the mitigation procedures on subject wildfire hazard(s) and surrounding land use(s). (orig. 12-5-95)

(d) Any additional material required by the Board of Adjustment. (orig. 1-27-76; am. 12-5-95)

(2) Preparation

All wildfire reports and items described above shall be prepared and supervised by a graduate forester with a minimum of 2 years wildfire fighting experience in the Rocky Mountain Area. (orig. 1-27-76; 12-5-95)

(3) Evaluation

The wildfire assessment and any related documentation shall be evaluated as to accuracy and adequacy by the Colorado State Forest Service or other review entities as deemed qualified by the Director of Planning and Zoning. (orig. 12-5-95; am. 12-17-02; am. 3-3-15)

(4) Completion

Any wildfire hazard mitigation work approved by the Board of Adjustment as part of the wildfire hazard mitigation site plan, or for mitigation work for which the Board of Adjustment requires special implementation plans, shall be inspected and the results certified as to compliance with the plans submitted or additional restrictions imposed within time limits established by the Board of Adjustment. Inspections and certifications shall be conducted by the Colorado State Forest Service or other entities as deemed qualified by the Board of Adjustment. (orig. 12-5-95)

4. To hear and decide requests for variances from the requirements of the cut/fill vertical disturbance area for private roads and driveways that do not meet the provisions of the Land Disturbance Section of this Zoning Resolution. In ruling upon such Variance requests, the Board shall consider any technical evaluations presented, and all relevant factors, and standards including the following: (orig. 11-12-02; am. 12-17-02; am. 7-11-07)
 - a. The visibility of the disturbance from off-site properties. (orig. 11-12-02)
 - b. The ability to revegetate the disturbance area. (orig. 11-12-02)
 - c. The ability to effectively address erosion control and drainage issues (orig. 11-12-02)
 - d. The technical reports that slope stability has been adequately addressed. (orig. 11-12-02)
 - e. The availability of alternate building sites or fewer building sites (orig. 11-12-02)
 - f. Compliance with the provisions of the Land Disturbance Section of this Zoning Resolution. (orig. 11-12-02; am. 12-17-02; am. 7-11-07)
 - g. Whether the variance request presents the most appropriate means of minimizing the disturbance area, or whether alternate methods (e.g., selecting a different route or incorporating retaining walls) would be preferable. (orig. 11-12-02)
5. No relief, variance or exception shall be granted which shall effectively change a land use on a permanent basis. (orig. 12-6-71; am. 1-27-76)
6. No relief, variance or exception shall be granted from a provision of the Land Development Regulation. (orig. 12-6-71; am. 1-27-76; am. 12-17-02)
7. No relief, variance or exception shall be granted in circumstances which are self-imposed by the applicant. (orig. 12-6-71; am. 1-27-76; am. 12-17-02)
8. No Variance shall be granted based solely on economic hardship. (orig. 12-17-02)

9. Affected state and public agencies shall be requested to comment on applications made pursuant to the above paragraphs D.1. through D.3., prior to consideration by the Board of Adjustment. (orig. 7-13-76; am. 12-17-02)

Commissioners shall hold the funds from the sale and those funds will be distributed to the park district for the acquisition of land or other capital outlay projects or the development of sites for park purposes. Notably, the park and school fees statute does not indicate a standard for approval or denial of the request to sell the property.

County Regulations:

The County's Land Development Regulation (LDR) was adopted to generally comply with the park and school fee statutory requirements and contemplates either the dedication of land to meet the park requirements or the payment of fees. The LDR also includes language relating to the sale of park land. The requirements for the sale are as follows:

1. The park and recreation district must have declared the dedicated property is surplus land.
2. The park and recreation district must sell the land through a process that legitimately establishes the fair market value of the land, and any rights of first refusal of the original subdivider must be honored.
3. The park and recreation district declares that the proceeds from the sale will be used to purchase new land or will be used to pay for improvements to existing facilities.
4. The sale of the property must be approved by the Board of County Commissioners at a public hearing after proper notification.

This section generally follows the statutory requirements of C.R.S. §30-28-133(4), as discussed above.

Neither the statute nor the regulation addresses how to handle the right of reverter contained in the deeds.

DISCUSSION:

In order to extinguish the right of reverter that currently exists on the property, it will be necessary for Foothills to convey the property back to the County. Subsequent to that conveyance, the County has two options:

1. Convey the property back to Foothills free of the right of reverter provision with additional language indicating if the property is sold the proceeds of the sale will be required to be used by Foothills in accordance with C.R.S. 30-28-133(4); or
2. The County receives the property and then proceeds with the sale of the property in accordance with the County's land sale policy. Once the sale is complete, the County will provide notice to Foothills that the proceeds are available and able to be requested as set forth in the park and school fees section of the LDR.

Another issue to consider is that the property Foothills desires to sell is currently zoned open space and will require a rezoning to allow additional development. In order to rezone property zoned as open space, the property would first have to comply with the Open Space Rezoning requirements of the Zoning Resolution. As part of the Open Space Rezoning analysis, the Board will be required to look at the open space value of the property and make an assessment of whether or not the property should remain open space based on specific criteria contained in the Zoning Resolution. If the Board determines that the property is eligible to be rezoned, then the applicant can move forward with the rezoning of the property.

As shown in the references to the statutes and regulations above, Foothills would need to obtain approval from the Board of County Commissioners on the sale of the park land and also obtain permission from the Board of County Commissioners to rezone the land.

FISCAL IMPACT: There is little fiscal impact to the County with respect to this decision, although staff time will be spent in implementing the decision. Foothills could benefit directly from the decision.

RECOMMENDATIONS: Staff recommends moving forward with public hearings to determine if the property may be sold and whether the property is eligible to be rezoned from open space. The hearings will be held concurrently. Moreover, if direction is given by the Board to sell the park land, staff recommends that it be conveyed to Foothills free of the right of reverter provision, but with additional language indicating that the proceeds of the sale will be required to be used in accordance with C.R.S. 30-28-133(4) as indicated in Option 1 above.

ORIGINATOR:

Jeanie Rossillon, Director of Development and Transportation

CONTACTS FOR ADDITIONAL INFORMATION:

John Wolforth, Director of Planning & Zoning
Mike Schuster, Assistance Director of Planning & Zoning
Kourtney Hartmann, County Attorney's Office

C.R.S. § 30-28-133 Subdivision regulations
Effective: August 11, 2010

(4) Subdivision regulations adopted by the board of county commissioners pursuant to this section shall also include, as a minimum, provisions governing the following matters:

(a) Sites and land areas for schools and parks when such are reasonably necessary to serve the proposed subdivision and the future residents thereof. Such provisions *may* include:

(I) Reservation of such sites and land areas, for acquisition by the county;

(II) Dedication of the sites and land areas to the county, to a school district, or to the public or, in lieu thereof, payment of a sum of money not exceeding the fair market value of the sites and land areas or a combination of such dedication and such payment; except that the value of the combination shall not exceed the fair market value of the sites and land areas. Any sums, when required, or moneys to be paid to the board of county commissioners pursuant to this paragraph (a) may, if approved by the board of county commissioners, be paid directly to a school district. **If the sites and land areas are dedicated to the county, to a school district, or the public, the board of county commissioners may, at the request of the affected entity, sell the land.** The subdivider shall have a right of first refusal to purchase all or a portion of any land dedicated by the subdivider to a county, school district, or other public entity pursuant to this subparagraph (II) before the land is sold, transferred, or conveyed to any party other than a school district. Prior to selling or otherwise transferring ownership of the land, the county, school district, or other public entity selling the land shall provide written notice to the subdivider of its intention to sell or transfer ownership of all or any portion of the land. The subdivider shall then have sixty days to provide written notice to the county, school district, or other public entity of the subdivider's interest in purchasing all or a portion of the land to be sold. The purchase of the land by the subdivider shall be upon such terms and conditions and for such consideration as the parties may mutually agree; however, **in no event shall the purchase price exceed the fair market value of the land at the time the subdivider dedicated the land to the county, school district, or other public entity. Any right of first refusal created pursuant to this subparagraph (II) shall expire twenty years from the date the land was dedicated by the subdivider to a county, school district, or other public entity. Except as provided in subsection (4.3) of this section, any such sums, when required, or moneys paid to the board of county commissioners from the sale of the dedicated sites and land areas shall be held by the board of county commissioners:**

(A) For the acquisition of reasonably necessary sites and land areas *or for other capital outlay purposes for schools or parks;*

(B) For the *development of the sites and land areas for park purposes;* or

(C) For growth-related planning functions by school districts for educational purposes;

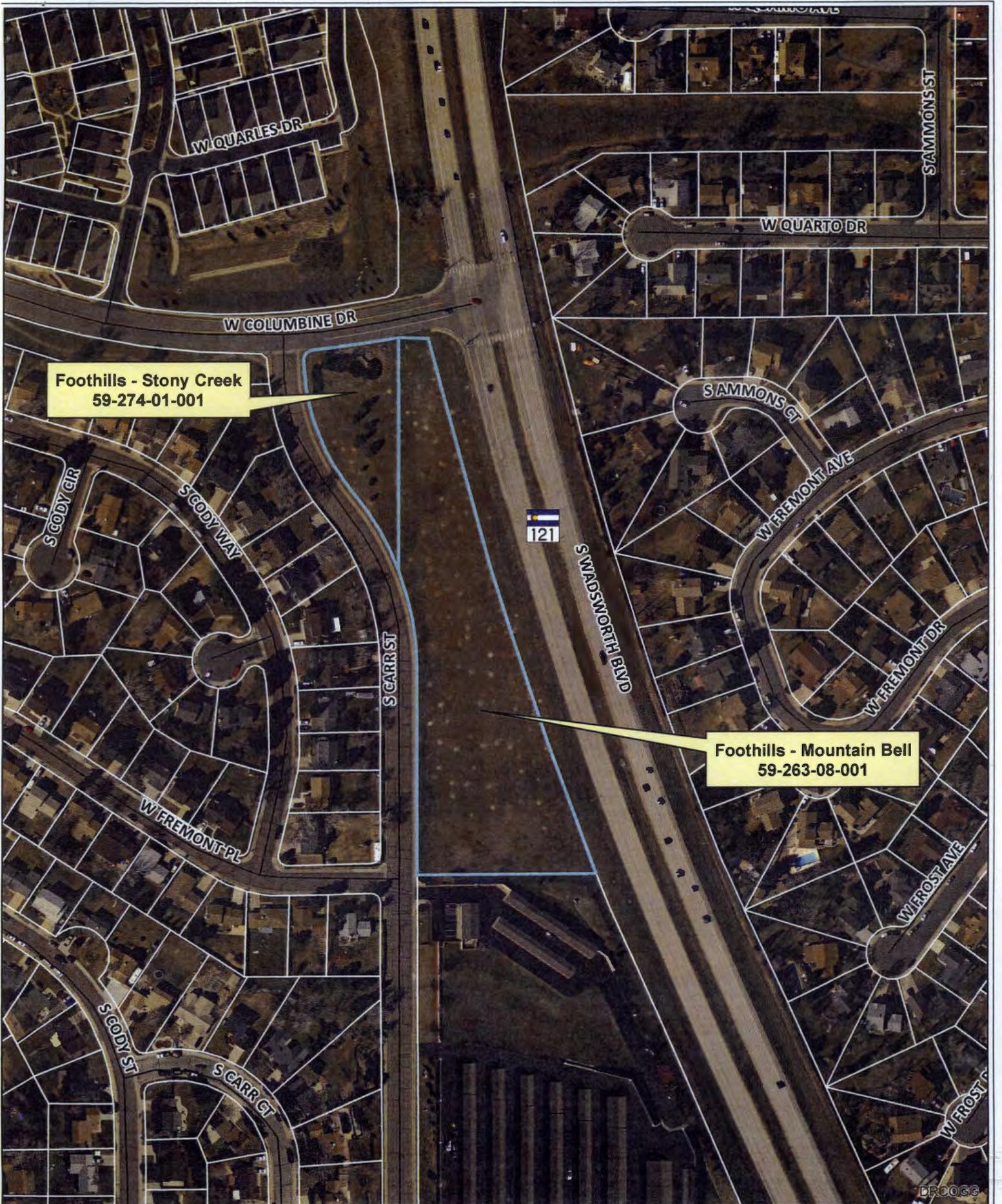
(III) Dedication of such sites and land areas for the use and benefit of the owners and future owners in the proposed subdivision;

(b) Standards and technical procedures applicable to storm drainage plans and related designs, in order to ensure proper drainage ways, which may require, in the opinion of the board of county commissioners, detention facilities which may be dedicated to the county or the public, as are deemed necessary to control, as nearly as possible, storm waters generated exclusively within a subdivision from a one hundred year storm which are in excess of the historic runoff volume of storm water from the same land area in its undeveloped and unimproved condition;

(c) Standards and technical procedures applicable to sanitary sewer plans and designs, including soil percolation testing and required percolation rates and site design standards for on-lot sewage disposal systems when applicable;

(d) Standards and technical procedures applicable to water systems.

(4.3) After final approval of a subdivision plan or plat and receipt of dedications of sites and land areas or payments in lieu thereof required pursuant to subparagraph (II) of paragraph (a) of subsection (4) of this section, the board of county commissioners shall give written notification to the appropriate school districts and local government entities. Following such notice, a school district or local government entity may request periodic transfer on no longer than an annual basis of such land or moneys to the district or entity. When a board of county commissioners determines that the school district or local government entity has demonstrated a need for the land or moneys based on a long-range capital plan or evidence of the impact of the subdivision on the district or entity, or both, it shall periodically transfer on no longer than an annual basis the land or moneys to the appropriate school district or local government entity. The district or entity shall use the transferred land or moneys only for a purpose authorized by sub-subparagraphs (A) to (C) of subparagraph (II) of paragraph (a) of subsection (4) of this section. Any moneys received by the board of county commissioners that are transferred pursuant to this subsection (4.3) are not county revenues for purposes of paragraph (d) of subsection (7) of section 20 of article X of the state constitution.



Foothills - Stony Creek
59-274-01-001

Foothills - Mountain Bell
59-263-08-001



2014 Orthophoto
Stateplane Coordinate System
Colorado Central Zone
Datum: NAD83
Created: Nov 17, 2016



1:2,400
1 inch = 200 feet



Jefferson County Planning & Zoning
100 Jefferson County Parkway
Suite 3550
Golden, CO 80419
303.271.8700

This map has been prepared from the best available records. However, this product is sold "as is" and there is no express or implied warranty of any kind from Jefferson County for the completeness, accuracy, or correctness of this information, including but not limited to warranties of title or merchantability or fitness for a particular purpose.

Jefferson County shall not be liable for damages of any kind arising from use of this product or for any errors or inaccuracies.

The map is 1:30,000 accuracy and is for planning and internal purposes only.

RECOMMENDATIONS:

These improvements will significantly reduce the peak rates of runoff coming from development upstream of Colfax Avenue. This will reduce the flooding frequently experienced by properties in Jefferson County. Staff recommends approval of a resolution approving the IGA.

ORIGINATOR:

John Conn, Transportation and Engineering, X8496

CONTACTS FOR ADDITIONAL INFORMATION:

Jeanie Rossillon, Director, Development and Transportation, X8575

Steve Durian, Director, Transportation and Engineering, X8498

ATTACHMENT:

- Agreement Regarding Design and Construction of Drainage and Flood Control Improvements for Lena Gulch – Tributary H at CDOT Infield Upstream of 6th Avenue

AGREEMENT REGARDING
DESIGN AND CONSTRUCTION
OF DRAINAGE AND FLOOD CONTROL IMPROVEMENTS FOR
LENA GULCH – TRIBUTARY H AT CDOT INFIELD UPSTREAM OF 6TH AVENUE
CITY OF GOLDEN, JEFFERSON COUNTY

Agreement No. 16-08.03
Project No. 106303

THIS AGREEMENT, dated _____, by and between URBAN DRAINAGE AND FLOOD CONTROL DISTRICT (hereinafter called "DISTRICT"), CITY OF GOLDEN (hereinafter called "CITY"), and JEFFERSON COUNTY (hereinafter called "COUNTY") and collectively known as "PARTIES";

WITNESSETH:

WHEREAS, DISTRICT, in a policy statement previously adopted, (Resolution No. 14, Series of 1970 and Resolution No. 11, Series of 1973) expressed an intent to assist public bodies which have heretofore enacted floodplain regulation measures; and

WHEREAS, PARTIES participated in a joint planning study titled "Pleasantview Area Watershed Outfall Systems Planning – Preliminary Design" by Turner Collie & Braden, Inc., dated February 1999 (hereinafter called "PLAN"); and

WHEREAS, PARTIES now desire to proceed with design and construction of drainage and flood control improvements for Lena Gulch Tributary H at CDOT Infield upstream of 6th Avenue (hereinafter called "PROJECT"); and

WHEREAS, DISTRICT has adopted at a public hearing a Five-Year Capital Improvement Program (Resolution No. 57, Series of 2015) for drainage and flood control facilities in which PROJECT was included in the 2016 calendar year; and

WHEREAS, DISTRICT has heretofore adopted a Special Revenue Fund Budget for calendar year 2016 subsequent to public hearing (Resolution No. 47, Series of 2015) which includes funds for PROJECT; and

WHEREAS, DISTRICT's Board of Directors has authorized DISTRICT financial participation for PROJECT (Resolution No. 44, Series of 2016); and

WHEREAS, the City Council of CITY, the Board of Commissioners of COUNTY, and the Board of Directors of DISTRICT have authorized, by appropriation or resolution, all of PROJECT costs of the respective PARTIES.

NOW, THEREFORE, in consideration of the mutual promises contained herein, PARTIES hereto agree as follows:

1. SCOPE OF AGREEMENT

This Agreement defines the responsibilities and financial commitments of PARTIES with respect to PROJECT.

2. SCOPE OF PROJECT

- A. Final Design. PROJECT shall include the final design of improvements in accordance with the recommendations defined in PLAN. Specifically, the final design of facilities shall be located on Tributary H of Lena Gulch at the CDOT Infield downstream of 6th Avenue, as shown on Exhibit A.
- B. Construction. PROJECT shall include construction by DISTRICT of the drainage and flood control improvements as set forth in the final design including vegetation establishment.

3. PUBLIC NECESSITY

PARTIES agree that the work performed pursuant to this Agreement is necessary for the health, safety, comfort, convenience, and welfare of all the people of the State, and is of particular benefit to the inhabitants of PARTIES and to their property therein.

4. PROJECT COSTS AND ALLOCATION OF COSTS

- A. PARTIES agree that for the purposes of this Agreement PROJECT costs shall consist of and be limited to the following:
 - 1. Final design services;
 - 2. Construction of improvements;
 - 3. Contingencies mutually agreeable to PARTIES.
- B. It is understood that PROJECT costs as defined above are not to exceed \$905,000 without amendment to this Agreement.

PROJECT costs for the various elements of the effort are estimated as follows:

<u>ITEM</u>	<u>AMOUNT</u>
1. Final Design	\$ 60,000
2. Construction *	\$790,000
3. Contingency *	\$ 45,000
Grand Total	\$895,000

* It is anticipated that additional funds for construction shall be added to this Agreement at a future date.

This breakdown of costs is for estimating purposes only. Costs may vary between the various elements of the effort without amendment to this Agreement provided the total expenditures do not exceed the maximum contribution by all PARTIES plus accrued interest, if applicable.

C. Based on total PROJECT costs, the maximum percent and dollar contribution by each party shall be:

	<u>Percentage Share</u>	<u>Maximum Contribution</u>
DISTRICT	47%	\$420,000 *
CITY	23%	\$210,000 *
COUNTY	30%	\$265,000 **
TOTAL	100%	\$895,000

* It is anticipated that additional contributions will be added to this Agreement at a future date.

** PARTIES acknowledge and agree that COUNTY's not-to-exceed contribution to PROJECT shall be \$265,000, and COUNTY shall not be obligated under any circumstance to contribute additional funds to PROJECT at a future date. Any additional costs for PROJECT shall be the responsibility of DISTRICT and CITY.

5. MANAGEMENT OF FINANCES

As set forth in DISTRICT policy (Resolution No. 11, Series of 1973, Resolution No. 49, Series of 1977, and Resolution No. 37, Series of 2009), the funding of a local body's one-half share may come from its own revenue sources or from funds received from state, federal or other sources of funding without limitation and without prior DISTRICT approval.

Payment of CITY and DISTRICT's full share (CITY - \$210,000; DISTRICT - \$420,000) shall be made to DISTRICT subsequent to execution of this Agreement and within 30 days of request for payment by DISTRICT. Payment of COUNTY's full share (County - \$265,000) shall be made to DISTRICT in 2017, as COUNTY has not budgeted or appropriated funds for PROJECT in 2016. If COUNTY fails to make payment to DISTRICT on or before March 31, 2017, then this Agreement shall be terminated by PARTIES and DISTRICT shall return all funds previously deposited to PARTIES. The payments by PARTIES shall be held by DISTRICT in a special fund to pay for increments of PROJECT as authorized by PARTIES, and as defined herein. DISTRICT shall provide a periodic accounting of PROJECT funds as well as a periodic notification to CITY and COUNTY of any unpaid obligations. Any interest earned by the monies contributed by PARTIES shall be accrued to the special fund established by DISTRICT for PROJECT and such interest shall be used only for PROJECT upon approval by the contracting officers (Paragraph 13). Within one year of completion of PROJECT if there are monies including interest earned remaining which are not committed, obligated, or disbursed, each party shall receive a share of such monies, which shares shall be computed as were the original shares; or, at CITY and COUNTY request, CITY or COUNTY's share of remaining monies shall be transferred to another special fund held by DISTRICT.

6. FINAL DESIGN

The contracting officers for PARTIES, as defined under Paragraph 13 of this Agreement, shall select an engineer mutually agreeable to all PARTIES. DISTRICT shall contract with selected engineer and shall supervise and coordinate the final design including right-of-way delineation subject to approval of the contracting officer for CITY and COUNTY. Payment for final design shall be made by DISTRICT as the work progresses from the PROJECT fund established as set forth above.

Final design services shall consist of, but not be limited to, the following:

- A. Preparation of a work plan schedule identifying the timing of major elements in the design;
- B. Preparation of detailed construction plans and specifications;
- C. Preparation of an estimate of probable construction costs of the work covered by the plans and specifications;
- D. Preparation of an appropriate construction schedule.

DISTRICT shall provide any written work product by the engineer to CITY and COUNTY.

7. OWNERSHIP OF PROPERTY AND LIMITATION OF USE

CITY shall own the property either in fee or non-revocable easement and shall be responsible for same. It is specifically understood that the right-of-way is being used for drainage and flood control purposes. The properties upon which PROJECT is constructed shall not be used for any purpose that shall diminish or preclude its use for drainage and flood control purposes. CITY may not dispose of or change the use of the properties without approval of DISTRICT. If, in the future, CITY disposes of any portion of or all of the properties acquired upon which PROJECT is constructed pursuant to this Agreement; changes the use of any portion or all of the properties upon which PROJECT is constructed pursuant to this Agreement; or modifies any of the improvements located on any portion of the properties upon which PROJECT is constructed pursuant to this Agreement; and CITY has not obtained the written approval of DISTRICT and COUNTY prior to such action, CITY shall take any and all action necessary to reverse said unauthorized activity and return the properties and improvements thereon, acquired and constructed pursuant to this Agreement, to the ownership and condition they were in immediately prior to the unauthorized activity at CITY's sole expense. In the event CITY breaches the terms and provisions of this Paragraph 7 and does not voluntarily cure as set forth above, DISTRICT and COUNTY shall have the right to pursue a claim against CITY for specific performance of this portion of the Agreement.

8. MANAGEMENT OF CONSTRUCTION

- A. Costs. Construction costs shall consist of those costs as incurred by the most qualified contractor(s) including detour costs, licenses and permits, utility relocations, and construction related engineering services as defined in Paragraph 4 of this Agreement.
- B. Construction Management and Payment
 - 1. DISTRICT, with the assistance of CITY and COUNTY, shall administer and coordinate the construction-related work as provided herein.

2. DISTRICT, with assistance and approval of CITY and COUNTY, shall select and award construction contract(s).
 3. DISTRICT shall require the contractor to provide adequate liability insurance that includes CITY and COUNTY. The contractor shall be required to indemnify CITY and COUNTY. Copies of the insurance coverage shall be provided to CITY and COUNTY.
 4. DISTRICT, with assistance of CITY and COUNTY, shall coordinate field surveying; staking; inspection; testing; acquisition of right-of-way; and engineering as required to construct PROJECT. DISTRICT, with assistance of CITY and COUNTY, shall assure that construction is performed in accordance with the construction contract documents including approved plans and specifications and shall accurately record the quantities and costs relative thereto. Copies of all inspection reports shall be furnished to CITY and COUNTY on a weekly basis. DISTRICT shall retain an engineer to perform all or a part of these duties.
 5. DISTRICT, with approval of CITY and COUNTY, shall contract with and provide the services of the design engineer for basic engineering construction services to include addendum preparation; survey control points; explanatory sketches; revisions of contract plans; shop drawing review; as-built plans; weekly inspection of work; and final inspection.
 6. PARTIES shall have access to the site during construction at all times to observe the progress of work and conformance to construction contract documents including plans and specifications.
 7. DISTRICT shall review and approve contractor billings and send them to CITY and COUNTY for approval. DISTRICT shall remit payment to contractor based on billings approved by PARTIES.
 8. DISTRICT, with assistance and written concurrence by CITY and COUNTY, shall prepare and issue all written change or work orders to the contract documents.
 9. PARTIES shall jointly conduct a final inspection and accept or reject the completed PROJECT in accordance with the contract documents.
 10. DISTRICT shall provide CITY and COUNTY a set of reproducible "as-built" plans.
- C. Construction Change Orders. In the event that it becomes necessary and advisable to change the scope or detail of the work to be performed under the contract(s), such changes shall be rejected or approved in writing by the contracting officers. No change orders shall be approved that increase the costs beyond the funds available in the PROJECT fund, including interest earned on those funds, unless and until the additional funds needed to pay for the added costs are committed by all PARTIES.

9. MAINTENANCE

PARTIES agree that CITY shall own and be responsible for maintenance of the completed and accepted PROJECT. PARTIES further agree that DISTRICT, at CITY and COUNTY's request, shall assist CITY with the maintenance of all facilities constructed or modified by virtue of this Agreement to the extent possible depending on availability of DISTRICT funds. Such maintenance assistance shall be limited to drainage and flood control features of PROJECT. Maintenance assistance may include activities such as keeping flow areas free and clear of debris and silt, keeping culverts free of debris and sediment, repairing drainage and flood control structures such as drop structures and energy dissipaters, and clean-up measures after periods of heavy runoff. The specific nature of the maintenance assistance shall be set forth in a memorandum of understanding from DISTRICT to CITY, upon acceptance of DISTRICT's annual Maintenance Work Program.

DISTRICT shall have right-of-access to right-of-way and storm drainage improvements at all times for observation of flood control facility conditions and for maintenance when funds are available.

10. FLOODPLAIN REGULATION

CITY agrees to regulate and control the floodplain of Lena Gulch Tributary H within CITY in the manner prescribed by the National Flood Insurance Program and prescribed regulations thereto as a minimum.

PARTIES understand and agree, however, that CITY cannot obligate itself by contract to exercise its police powers. If CITY fails to regulate the floodplain of Lena Gulch Tributary H within CITY in the manner prescribed by the National Flood Insurance Program and prescribed regulations thereto as a minimum, DISTRICT may exercise its power to do so and CITY shall cooperate fully.

11. TERM OF AGREEMENT

The term of this Agreement shall commence upon final execution by all PARTIES and shall terminate three (3) years after the final payment is made to the construction contractor and the final accounting of funds on deposit at DISTRICT is provided to all PARTIES pursuant to Paragraph 5 herein, except for Paragraph 10. FLOODPLAIN REGULATION, Paragraph 7. OWNERSHIP OF PROPERTY AND LIMITATION OF USE, and Paragraph 9. MAINTENANCE, which shall run in perpetuity.

12. LIABILITY

Each party hereto shall be responsible for any suits, demands, costs or actions at law resulting from its own acts or omissions and may insure against such possibilities as appropriate.

13. CONTRACTING OFFICERS

- A. The contracting officer for CITY shall be the Director of Public Works, 1445 Tenth Street, Golden, Colorado 80401.
- B. The contracting officer for COUNTY shall be the Director of Transportation and Engineering, 100 Jefferson County Parkway, Golden, Colorado 80419-4570.

- C. The contracting officer for DISTRICT shall be the Executive Director, 2480 West 26th Avenue, Suite 156B, Denver, Colorado 80211.
- D. The contracting officers for PARTIES each agree to designate and assign a PROJECT representative to act on the behalf of said PARTIES in all matters related to PROJECT undertaken pursuant to this Agreement. Each representative shall coordinate all PROJECT-related issues between PARTIES, shall attend all progress meetings, and shall be responsible for providing all available PROJECT-related file information to the engineer upon request by DISTRICT or CITY. Said representatives shall have the authority for all approvals, authorizations, notices or concurrences required under this Agreement. However, in regard to any amendments or addenda to this Agreement, said representative shall be responsible to promptly obtain the approval of the proper authority.

14. RESPONSIBILITIES OF PARTIES

DISTRICT shall be responsible for coordinating with CITY and COUNTY the information developed by the various consultants hired by DISTRICT and for obtaining all concurrences from CITY and COUNTY needed to complete PROJECT in a timely manner. CITY and COUNTY agree to review all concept plans, preliminary design plans, and final plans and specifications; and to provide comments within 21 calendar days after the drafts have been provided by DISTRICT to CITY and COUNTY.

15. AMENDMENTS

This Agreement contains all of the terms agreed upon by and among PARTIES. Any amendments to this Agreement shall be in writing and executed by PARTIES hereto to be valid and binding.

16. SEVERABILITY

If any clause or provision herein contained shall be adjudged to be invalid or unenforceable by a court of competent jurisdiction or by operation of any applicable law, such invalid or unenforceable clause or provision shall not affect the validity of the Agreement as a whole and all other clauses or provisions shall be given full force and effect.

17. APPLICABLE LAWS

This Agreement shall be governed by and construed in accordance with the laws of the State of Colorado. Jurisdiction for any and all legal actions regarding this Agreement shall be in the State of Colorado and venue for the same shall lie in the county where PROJECT is located.

18. ASSIGNABILITY

No party to this Agreement shall assign or transfer any of its rights or obligations hereunder without the prior written consent of the nonassigning party or parties to this Agreement.

19. BINDING EFFECT

The provisions of this Agreement shall bind and shall inure to the benefit of PARTIES hereto and to their respective successors and permitted assigns.

20. ENFORCEABILITY

PARTIES hereto agree and acknowledge that this Agreement may be enforced in law or in equity, by decree of specific performance or damages, or such other legal or equitable relief as may be available subject to the provisions of the laws of the State of Colorado.

21. TERMINATION OF AGREEMENT

This Agreement may be terminated upon thirty (30) days' written notice by any party to this Agreement, but only if there are no contingent, outstanding contracts. If there are contingent, outstanding contracts, this Agreement may only be terminated upon the cancellation of all contingent, outstanding contracts. All costs associated with the cancellation of the contingent contracts shall be shared between PARTIES in the same ratio(s) as were their contributions.

22. PUBLIC RELATIONS

It shall be at CITY and COUNTY's sole discretion to initiate and to carry out any public relations program to inform the residents in PROJECT area as to the purpose of PROJECT and what impact it may have on them. Technical information shall be presented to the public by the selected engineer. In any event DISTRICT shall have no responsibility for a public relations program, but shall assist CITY and COUNTY as needed and appropriate.

23. NO DISCRIMINATION IN EMPLOYMENT

In connection with the performance of work under this Agreement, PARTIES agree not to refuse to hire, discharge, promote or demote, or to discriminate in matters of compensation against any person otherwise qualified because of race, color, ancestry, creed, religion, national origin, gender, age, military status, sexual orientation, marital status, or physical or mental disability and further agree to insert the foregoing provision in all subcontracts hereunder.

24. APPROPRIATIONS

Notwithstanding any other term, condition, or provision herein, each and every obligation of CITY, COUNTY, and/or DISTRICT stated in this Agreement is subject to the requirement of a prior appropriation of funds therefore by the appropriate governing body of CITY and COUNTY and/or DISTRICT.

25. NO THIRD PARTY BENEFICIARIES

It is expressly understood and agreed that enforcement of the terms and conditions of this Agreement, and all rights of action relating to such enforcement, shall be strictly reserved to PARTIES, and nothing contained in this Agreement shall give or allow any such claim or right of action by any other or third person on such Agreement. It is the express intention of PARTIES that any person or party other than any one of PARTIES receiving services or benefits under this Agreement shall be deemed to be an incidental beneficiary only.

26. ILLEGAL ALIENS

PARTIES agree that any public contract for services executed as a result of this intergovernmental agreement shall prohibit the employment of illegal aliens in compliance with §8-17.5-101 C.R.S. *et seq.* The following language shall be included in any contract for public services: "The Consultant

or Contractor shall not and by signing this Agreement certifies that it does not knowingly employ or contract with an illegal alien to perform work under this Agreement. Consultant or Contractor shall not enter into a subcontract with a subcontractor that fails to certify to the Consultant or Contractor that the subcontractor shall not knowingly employ or contract with an illegal alien to perform work under this public contract for services. Consultant or Contractor affirms that they have verified through participation in the Colorado Employment Verification program established pursuant to 8-17.5-102 (5)(c) C.R.S. or the Electronic Employment Verification Program administered jointly by the United States Department of Homeland Security and the Social Security Administration that Consultant or Contractor does not employ illegal aliens. Consultant or Contractor is prohibited from using these procedures to undertake pre-employment screening of job applicants while the public contract for services is being performed.

In the event that the Consultant or Contractor obtains actual knowledge that a subcontractor performing work under this Agreement knowingly employs or contracts with an illegal alien, the Consultant or Contractor shall be required to:

- A. Notify the subcontractor and PARTIES within three days that the Consultant or Contractor has actual knowledge that the subcontractor is employing or contracting with an illegal alien; and
- B. Terminate the subcontract with the subcontractor if within three days of receiving the notice required the Subcontractor does not stop employing or contracting with the illegal alien; except that the Consultant or Contractor shall not terminate the contract with the Subcontractor if during such three days the Subcontractor provides information to establish that the subcontractor has not knowingly employed or contracted with an illegal alien.

Consultant or Contractor is required under this Agreement to comply with any reasonable request by the Colorado Department of Labor and Employment (CDL) made in the course of an investigation the CDL is undertaking pursuant to its legal authority.

Violation of this section of this Agreement shall constitute a breach of this Agreement and may result in termination by PARTIES. Consultant or Contractor shall be liable to PARTIES for actual and consequential damages to PARTIES resulting from such breach pursuant to §8-17.5-101(3) C.R.S. PARTIES shall also report any such breach to the Office of the Secretary of State.

Consultant or Contractor acknowledges that the CDL may investigate whether Consultant or Contractor is complying with the provision of the Agreement. This may include on-site inspections and the review of documentation that proves the citizenship of any person performing work under this Agreement and any other reasonable steps necessary to determine compliance with the provisions of this section."

27. GOVERNMENTAL IMMUNITIES

PARTIES hereto intend that nothing herein shall be deemed or construed as a waiver by any party of any rights, limitations, or protections afforded to them under the Colorado Governmental

Immunity Act (§ 24-10-101, *et seq.*, C.R.S.) as now or hereafter amended or otherwise available at law or equity.

28. INTENT OF AGREEMENT

Except as otherwise stated herein, this Agreement is intended to describe the rights and responsibilities of and between PARTIES and is not intended to and shall not be deemed to confer rights upon any person or entities not named as PARTIES, nor to limit in any way the powers and responsibilities of CITY, COUNTY, or DISTRICT or any other entity not a party hereto.

29. EXECUTION IN COUNTERPARTS – ELECTRONIC SIGNATURES

This Agreement, and all subsequent documents requiring the signatures of PARTIES to this Agreement, may be executed in two or more counterparts, each of which shall be deemed an original, but all of which shall constitute one and the same instrument. PARTIES approve the use of electronic signatures for execution of this Agreement, and all subsequent documents requiring the signatures of PARTIES to this Agreement. Only the following two forms of electronic signatures shall be permitted to bind PARTIES to this Agreement, and all subsequent documents requiring the signatures of PARTIES to this Agreement.

- A. Electronic or facsimile delivery of a fully executed copy of a signature page; or
- B. The image of the signature of an authorized signer inserted onto PDF format documents.

Documents requiring notarization may also be notarized by electronic signature, as provided above. All use of electronic signatures shall be governed by the Uniform Electronic Transactions Act, CRS §§ 24-71.3-101 to -121.

WHEREFORE, PARTIES hereto have caused this instrument to be executed by properly authorized signatories as of the date and year first above written.

URBAN DRAINAGE AND
FLOOD CONTROL DISTRICT

By _____

Name _____

Title Executive Director

Checked By

CITY OF GOLDEN

By _____

Name _____

Title _____

JEFFERSON COUNTY

By _____

Name Libby Szabo

Title Chairman

Date _____

Jefferson County Cultural Council

Openings total - 2

1 - District 2

1 - District 3

1. Martha Gould - District 2
2. Michelle Moorman Applegate - District 2
3. Diane O'Grady - District 2
4. Frank Plaut - District 2

5. John Davis - District 3
6. Peg Farrar - District 3
7. Barb Moritzky - District 3

Purpose: There are seven county cultural council districts in the Scientific Cultural Finance District (SCFD) organization. Each is made up of volunteer appointees who manage the SCFD Tier III grant application process for their respective counties. Council members should adhere to the concepts of stewardship of public funds and seek to create a fair, ethical, respectful, open and objective evaluation process through which these public funds are distributed. Councils make funding recommendations to the Jefferson County Commissioners as to how SCFD Tier III funds should be allocated.

Duties:

- Develop and revise county grant guidelines, criteria and assessment protocol.
- Participate in District-wide Grant Workshops to explain the application process and county guidelines to eligible applicants.
- Review grants applications, report forms and interviews applicants for funding.
- Develop funding recommendations to submit to the Board of County Commissioners.
- Refer eligibility and district policy questions to the SCFD office.
- Evaluate the grant making process, council procedures and implement improvements.

Meetings:

Set by the Council.

Members and length of terms:

Seven regular members for three-year terms and cannot serve more than two succeeding terms (Six years).

Two members shall represent each of the three County Commissioner districts and one shall be at-large. Members cannot serve more than two succeeding terms.

Openings were advertised via Website, BCC Actions and Press Release

Board of Adjustment

Openings total - 3
2 regular, 1 alternate

1. Mindi Grissom
2. Dave Iadarola
3. David Wray

Purpose: In quasi-judicial hearings, determine requests for variances and special exceptions from the provisions set forth in the Zoning Resolution and consider appeals of decisions or requirements made by a County official or agency made in enforcement of the Zoning Resolution.

Members and length of terms:

The Board of Adjustment is made up of volunteers who are appointed by the Board of County Commissioners. Five regular members of the Board of Adjustment are appointed for three-year terms and two alternate members are appointed for one-year terms.

Openings were advertised via Website, BCC Actions and Press Release

BOARD OF COUNTY COMMISSIONERS BRIEFING PAPER
Human Services Department
Community and Workforce Development Division

REAPPOINTMENT OF VETERANS SERVICE OFFICER
December 6, 2016

For Information

For Discussion/Approval
Prior to Future Hearing

For Action

ISSUE: Reappointment of Veterans Service Officer for Jefferson County, Colorado

BACKGROUND: Per Colorado Revised Statutes (C.R.S. 28-5-801) (1): The board of county commissioners of each county in this state shall establish a county veterans service office and shall appoint a county veterans service officer for such county, and such board of county commissioners may also appoint any assistant and such clerical help as may be deemed necessary, each at such compensation as shall be fixed by such board, together with the necessary and actual traveling and other expenses incurred in their work as shall be approved by such board of county commissioners and such other expenses as such board may deem necessary for the proper operation of such office, payable monthly out of the county general fund in the manner provided by law.

(C.R.S. 28-5-801) (2): Such appointments shall be for the term of two years. At the expiration of such term or in case of a vacancy, the board of county commissioners making the appointments may either reappoint the present incumbents to the positions of county veterans service officer or assistant, or may consider new applicants and make appointments of other applicants as such county veterans service officer or assistant in the manner specified in this article.

DISCUSSION: Peter P. Mortaro has served the last two years as the Veterans Service Officer for Jefferson County, Colorado. His term will end on December 31, 2016. Mr. Mortaro is seeking reappointment for an additional two year term.

FISCAL IMPACT: Salary and benefits are funded out of Jefferson County General Fund. Funding is included in the 2017 County budget.

RECOMMENDATION: That the Board of County Commissioners reappoints Peter P. Mortaro to serve as Veterans Service Officer for Jefferson County, Colorado for a two year period commencing January 1, 2017, through December 31, 2018.

ORIGINATOR: Lynn Johnson, Human Services Department Director (x 4002)

CONTACT: Kat Douglas, Community and Workforce Development Division Director (x 8372)

VENTANA
C A P I T A L

November 17, 2016

VIA E-MAIL AND U.S. MAIL

Mr. Sean Forey, Mayor
Town of Morrison
321 Highway 8
Morrison, CO 80465

RE: Red Rocks Centre – Application for Disconnection of a Tract of Land from the Town of Morrison

Dear Mayor Forey:

I am writing to you and the Board of Trustees (“Trustees”) of the Town of Morrison (“Town”) on behalf of Tharaldson Ethanol Plant I, L.L.C. (“Tharaldson”), owner of the Red Rocks Centre property (“Property”) regarding the above-captioned matter. Specifically, by this letter, Tharaldson requests that you and the Trustees, as the governing body of the Town, enact an ordinance disconnecting approximately 310 acres (“Disconnection Tract”) of the Property from the Town. The Disconnection Tract is located within and adjacent to the boundary of the Town.

The purpose of this request is to enable Tharaldson to petition for and satisfactorily complete the annexation and zoning of the entire Disconnection Tract into the City of Lakewood (“City”). This letter is subject to and conditioned upon the approval by Tharaldson and the Town of a Disconnection Agreement detailing the terms and conditions of disconnection.

By way of background, this application is based on multiple discussions held between and among representatives of Tharaldson, the Town and the City over a period of several months. As a result of these discussions, it is Tharaldson’s belief that the proposed disconnection meets the needs and objectives of the two jurisdictions as well as the development objectives of Tharaldson, and thus is mutually acceptable to all parties. Furthermore, it is also Tharaldson’s understanding that the best interests of the Town will not be prejudiced by the proposed disconnection, nor will it adversely affect any affected special district. Lastly, because the disconnection and annexation ordinances will be recorded simultaneously, the effective dates of the disconnection and annexation are intended to occur essentially concurrently, thus Jefferson County will not be adversely affected.

This application is made pursuant to CRS 31-12-501 through 503, and Section 10-9-2 of the Morrison Municipal Code. In accordance with CRS 31-12-501(1), a notice and copy of this

letter application are being provided as required to the Jefferson County Board of County Commissioners and to the board of directors of the following affected special districts:

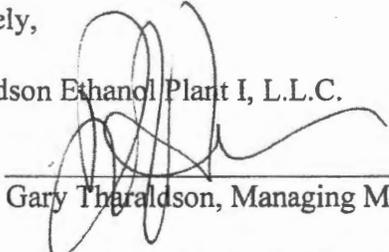
- 1) Mount Carbon Metropolitan District.
- 2) RRC Metropolitan Districts No. 1, 2, and 3.
- 3) Foothills Park & Recreation District.
- 4) West Metro Fire Protection District.
- 5) Regional Transportation District (RTD)
- 6) Urban Drainage and Flood Control District

Thank you for considering this request. If you have any questions regarding it, please contact Andrew Trietley at (303) 346-7006 or atrietley@ventanacap.com.

Sincerely,

Tharaldson Ethanol Plant I, L.L.C.

By:



Gary Tharaldson, Managing Member

By Darwin Horan in his individual capacity and as Manager of Ventana Capital, a Colorado limited liability company, Attorney-in-Fact to Gary Tharaldson, President of Tharaldson Ethanol Plant I, L.L.C.

- cc: Town of Morrison Board of Trustees (via e-mail and U.S. mail)
Jefferson County Board of County Commissioners (via e-mail and U.S. mail)
Mount Carbon Metropolitan District (via e-mail and U.S. mail)
RRC Metropolitan Districts No. 1, 2, and 3 (via e-mail and U.S. mail)
Foothills Park & Recreation District (via e-mail and U.S. mail)
West Metro Fire Protection District (via e-mail and U.S. mail)
Regional Transportation District (RTD) (via e-mail and U.S. mail)
Urban Drainage and Flood Control District (via e-mail and U.S. mail)

NOTICE OF APPLICATION FOR DISCONNECTION
TOWN OF MORRISON, COLORADO

Pursuant to CRS 31-12-501(1), please be advised that an application for disconnection of a tract of land from the Town of Morrison, Colorado, has been made on this date to the Board of Trustees of the Town of Morrison by Tharaldson Ethanol Plant I, L.L.C. A copy of the application for disconnection is attached to this notice for your consideration in accordance with the provisions of CRS 31-12-501 (2)(a) and (2)(b).

November 17, 2016
Tharaldson Ethanol Plant I, L.L.C.

BOARD OF COUNTY COMMISSIONERS BRIEFING PAPER

County Surveyor
12/6/2016

For Information

For Discussion/Approval
Prior to Future Hearing

For Action

ISSUE:

Does the BCC want to adjust the salary for the Surveyor to part time as allowed by statute for the coming term and adjust the salary accordingly?

BACKGROUND:

Section 30-2-102(4) provides that an elected official's salary cannot be increased or decreased during the term of office. Therefore the Surveyor's salary must be set at this point for the next term.

For the past term of the Surveyor, 30-2-102(2.2) provided that the salary for the County Surveyor was \$5,500. 30-2-102(4) allows the BCC to reduce the salary for part time. The salary for the Surveyor for the prior term was reduced to \$2,750 (half of the statutory amount). The statutory amount for the Surveyor for the current term is \$7,150. Half would be \$3,575.

DISCUSSION:

The Jefferson County Surveyor does not have many responsibilities or perform many functions. Elected Surveyors in rural areas without county staff surveyors provide more services to the public. In the past, the BCC had statutory authority to set the salary for the County Surveyor and set it at \$0. Surveyors have not been on site and have referred questions from the public to county staff for resolution. The current Surveyor, Robert Hennessey, indicates that he answers two or three calls a month with questions from the public and usually emails them information from the county website. He occasionally becomes involved in property issues. He indicates that the amount of time he spends varies, but estimates ten hours per month.

ORIGINATOR:

Ellen Wakeman, County Attorney