VOLUME 2

Tehama County

MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

2018 PLAN UPDATE

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Tehama County

Multi-Jurisdictional Hazard Mitigation Plan

Volume 2

Planning-Area-Wide Elements

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CITY OF CORNING

Tehama County

MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

2018 PLAN UPDATE

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CITY OF CORNING ADOPTION RECORDS

To comply with DMA 2000, the Corning City Council has officially adopted the 2018 Tehama County Multi-Jurisdictional Hazard Mitigation Plan Volume 1 and the City of Corning Volume 2 Annex. The adoption of the 2018 MJHMP in its entirety recognizes the City's commitment to reducing the impacts of natural hazards within the City and County. See below record of Adoption.

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Section 1. City of Corning

This Annex details the hazard mitigation planning elements specific to the City of Corning, a previously participating jurisdiction to the Tehama County Hazard Mitigation Plan. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the base plan document. As such, all sections of the base plan, including the planning process and other procedural requirements apply to and were met by the City. This Annex provides additional information specific to the City of Corning, with a focus on providing additional details on the planning process, risk assessment, and mitigation strategy for this community.

Hazard Mitigation Plan Point of Contact

Primary Point of Contact
Dawn Grine, Director of Public Works
794 Third Street
Corning, CA 96021
Telephone: (530) 824-7029
e-mail Address: dgrine@corning.org

Alternate Point of Contact
Kristina Miller
794 3rd St.
Corning Ca. 96021
Telephone: 530-824-7034
e-mail Address: kmiller@corning.org

1.1 Introduction

Corning is 22 miles northwest of Chico, California and 100 miles north of Sacramento. The city limits encompass 2.9 square miles and the most I-5 trucking and traveler services between Medford, Oregon and Bakersfield, California. The City is known as the Olive City, with its landmark business, the "Olive Pit," serving travelers for several generations at the Corning Road / Solano Avenue interchange of I-5. Corning is the center of the California boutique olive oil industry with three award-winning gourmet olive oil presses in operation: Corning Olive Oil Company and Lucero Olive Oil in Corning, and Pacific Sun in nearby Gerber. Corning is mainly agricultural land at an elevation of 277 feet above sea level, with the Coastal Mendocino Mountain Range to the west and the Sierra Nevadas to the east. The Sacramento River supports agriculture, including much of the state's crops of almonds, walnuts and prunes. Figure 1-1 displays a map and the location of the City of Corning within Tehama County. The following is a summary of key information about the jurisdiction and its history:

- **Date of Incorporation—**1907
- **Current Population—**7,663 (U.S. Census Bureau, 2010)
- **Population Growth—**The City has experienced an estimated slow rate of decline, -1.7% since 2010 (U.S. Census Bureau, 2017)

1.1.1 Geography and Climate

The City of Corning is located in a relatively flat area bordered by Northern Coast Mendocino Mountain Range to the west and the northern Sierra Nevada to the east. The Mediterranean climate type of the City is characterized by hot, dry summers and cool, rainy winters. The average annual rainfall is approx. 23 inches per year. The average

temperature is 64°F. The average low temperature is 51°F. The average high temperature is 76°F. During the summer, daily temperatures range from 50°F to more than 100°F. The inland location and surrounding mountains shelter the area from much of the ocean breezes that keep the coastal regions moderate in temperature.

Most precipitation in the area results from air masses that move in from the Pacific Ocean, usually from the west or northwest during the winter months, though the south winds occasionally bring cooling breezes as well. More than half the total annual precipitation falls during the winter rainy season (November through February). The prevailing winds are moderate in speed and vary from moisture-laden breezes from the south to dry land flows from the north.

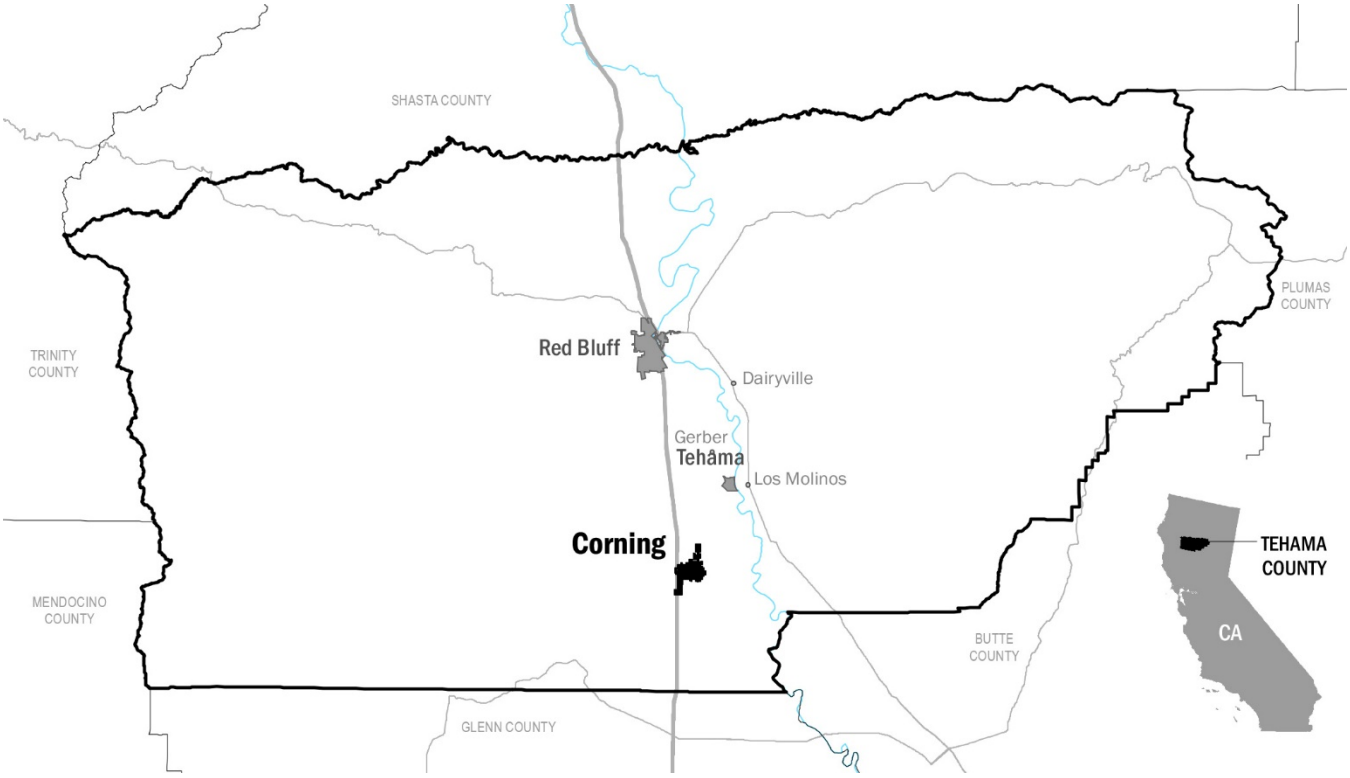


Figure 1-1: City of Corning Location

1.1.2 Historical Overview

John Corning was born in Troy, New York, in 1826. His uncle was Erastus Corning, president of the New York Central Railroad for many years. John Corning began his railroading career at the age of 32, on the Michigan Central Railroad. Three years later, he was hired by his uncle, Erastus, and worked for the New York Central Railroad. John Corning became Assistant Superintendent within a short period. He became Assistant Superintendent of the Central Pacific Railroad in 1868. He maintained this position until his death, in 1878, at the age of 52. The first railroad train arrived in Corning on October 1, 1882.

Mission olives were planted in the Corning area for oil production in the 1890s. In 1897, Nevadillo Blanco and Manzanillo olives became the oil-producing olives of choice. The inhabitants of the Maywood Colony, as Corning was then known, were shareholders in the Maywood Colony Canning and Olive Pickling Association. Initially, and for many years to follow, Corning, California, was known as “Corning--The Clean Town.” On December 28, 1923, Warren N. Woodson changed the slogan to “Corning--The Olive Town” or “Olive City”.

1.1.3 Structure of Government

The City of Corning was incorporated in 1907 and operates under the council/manager form of government. The Council, as the legislative body, represents the entire community and is empowered by the general laws of the State of California to formulate City-wide policy.

In the California State Legislature, Corning is in the 4th Senate District, represented by Republican Jim Nielsen, and in the 3rd Assembly District, represented by Republican James Gallagher. In the United States House of Representatives, Corning is in California's 1st congressional district, currently represented by Republican Doug LaMalfa.

1.1.4 Transportation

Interstate 5 passes through Corning as does the California Northern Railroad. The California Northern has been leasing and operating the 110.7 mile line between Davis and Tehama through Corning from Southern Pacific (now Union Pacific) since September 26, 1993. The line was originally built by Southern Pacific's subsidiary, the Northern Railway Company, in August/September 1882.

Tehama Rural Area Express (TRAX) provides transit service throughout the County. TRAX buses run on fixed schedules and have city routes within Red Bluff and Corning and regional routes that connect Red Bluff, Corning & Los Molinos.

1.1.5 Real Estate

There were 2,871 housing units at an average density of 820.2 per square mile (312.3/km²), of which 1,113 (45.6%) were owner-occupied, and 1,327 (54.5%) were occupied by renters (U.S. Census Bureau, 2017). The homeowner vacancy rate was 4.1%; the rental vacancy rate was 6.9%. According to 2010 Census, 3,765 people (49.1% of the population) lived in owner-occupied housing units and 3,873 people (50.5%) lived in rental housing units (U.S. Census Bureau, 2017). Table 1-1 shows housing unit counts by type.

Table 1-1: House Unit Types

Total	Single Detached	Single Attached	Two to Four Units	Five Plus Units	Mobile Homes	Occupied Units
2,864	1,804	45	298	598	119	2,589

Source: California Department of Finance, Demographic Research Unit: Population and Housing Estimates for Cities, Counties, and the State, January 1, 2011-2017, with 2010 Benchmark

The median home value in Corning, California, is $160,700. Home appreciation is -22.09% over the last 10 years due to the Great Recession. The City is currently experiencing a rise in home values. The median age of Corning, California, real estate is 36 years. (Sperling's Best Places, n.d.)

Development Trends

The City and adjacent agricultural areas have seen a slow to moderate increase in population growth over the last 5 years. Table 1-2 lists single family new house construction building permits from 1996 to 2017. This moderate rate of growth is anticipated to continue in the future (Corning, 2015). California law requires counties and cities to prepare and adopt a comprehensive long-range plan to guide community development. The plan must consist of an integrated and internally consistent set of goals, policies, and implementation measures and must focus on issues of the greatest concern to the community. City actions such as those relating to land use allocations, annexations, zoning, subdivisions and design review, redevelopment, and capital improvements, must be consistent with the plan. Corning adopted its general plan under this state mandate in June 2015. The City has also adopted an infrastructure master plan and has fees to ensure that the City keeps up with growth. Future growth and development will be managed as identified in the plan.

Table 1-2: Single-family new house construction building permits

Year	No. of Residential Structures	Average Home Value
1996	6	$83,300
1997	9	$72,400
1998	3	$81,300
1999	5	$85,300
2000	4	$78,700
2001	12	$89,500
2002	18	$88,500
2003	26	$108,100
2004	45	$133,300
2005	74	$139,500
2006	20	$180,000
2007	23	$150,800
2008	25	$157,000
2009	5	$175,100
2010	5	$143,600
2011	0	n/a
2012	0	n/a
2013	1	$125,000
2014	1	$100,000
2015	2	$260,000
2016	3	$540,900
2017*	0	n/a

*Note: *January 2017- July 2017*
Source: City of Corning Building and Safety Department

1.2 What's New

This section of annex includes background information on the 2012 HMP and the 2018 MJHMP Updates. The MJHMP 2012 Mitigation Actions were reviewed and have been changed, updated, and revised to reflect new priorities overtime. The sections below describe the background and planning process for changes and updates.

1.2.1 Plan Consolidation and Focus

When choosing the priority hazards to be profiled for this 2018 MJHMP Update, the City of Corning's planning team discussed the impact of hazardous materials, transportation loss (services and highway), utility loss/ disruption/ substation failure, water/ wastewater disruption, biological/ health/ pandemic flu, economic disruption, telecommunications/ data loss, and explosions as hazards that affect the City. It was agreed that the City does not directly provide these services and can only develop mitigation strategies to reduce the impact of the risks. When applicable, these hazards are discussed as secondary hazards in the priority natural hazard profiles/ vulnerability assessments.

In addition, the planning team has decided to profile Drought in this 2018 MJHMP Update based on changes in development and new priorities.

Since the 2012 HMP was adopted, there were no changes to the built environment that have increased or decreased vulnerability to the City.

1.2.2 5 Year Mitigation Action Review and Update

During the 2018 MJHMP update process, each of the 2012 "County Wide" and "City of Corning" specific mitigation actions were examined for relevancy, future implementation and evaluated for potential follow-on effort. It was determined that many of the City's 2012 mitigation actions were orientated towards overall coordination or were not detailed enough for implementation at a local jurisdictional level. Upon review of the updated vulnerability assessment data, significant changes were made to the 2012 mitigation actions in order to reflect changes in priorities.

The 2018 MJHMP mitigation actions located in Table 1-3 of this annex provides a listing of 2012 mitigation actions and an explanation of why each action was completed, deleted, or deferred. Mitigation Actions previously developed under the 2012 HMP have been completely refreshed as a result of the newly completed risk assessment, planning process and implementation strategy.

Table 1-3: MJHMP Mitigation Action Record of Revision Review

Program/ Project	Completed, Deleted or Deferred	Explanation
Flood Hazard Mitigation		
Partnerships with local jurisdictions and mutual stakeholders to collaboratively prevent disaster damage	Delete	Too vague; this is inherent of mitigation plan implementation.
Upgrade Electrical and Communication systems to accommodate emergency response at City Hall.	To be completed.	To be implemented after systems are upgraded.
Update and rewrite the Emergency Operations Plan	Delete	This is an operational / business process change beyond the scope of a mitigation plan or HMGP mission.
Public Outreach Program (Develop and maintain public awareness education for protecting private property from all hazard's effects.)	On-Going	More detail has been developed as part of 2018 Plan. I.e. Home Elevation…see below. There are areawide issues with this. This also counts for CRS Activity.
Inform Residents of impacts that could be caused by re-routing drainage features. I.e. No Adverse Impact concept for neighbors and other adjacent properties.	New	This is an area wide problem.
Develop blanket maintenance and operation agreement with MOU with Cal Fish Game for maintenance. Identify stream beds and other drainage corridors for debris removal.	New	This is an area wide problem. Look at gravel / siltation issues downstream of bridge culverts and other drainage features.
Acquire debris build up removal resources and techniques for monitoring and removal during storm events.	New	
Conduct a study of solution options and regulatory studies for increasing drain capacity under the railroad bridge at Jewett Creek and the Railroad Bridge.	To be completed.	Awaiting funding.
Continue drainage cleaning at the Jewett Creek Bridge (Kirkwood Road) and the Railroad Bridge.	On-Going.	On-Going as part of Yearly drainage maintenance program.
Conduct a study of solution options to fix the flooding issues at Blackburn Moon Drain.	Deferred, to be completed.	Awaiting funding.

Program/ Project	Completed, Deleted or Deferred	Explanation
Redesign and replace 2 small pipes previously installed to replace a collapsed culvert on Third Street.	Deferred, to be completed.	Awaiting funding.
Upgrade Storm Drain System	Deferred, to be completed.	Combine Blackburn and Third Street Culvert into one mitigation action with multiple bullet points.
Replace, upgrade levee that segregates the confluence of Jewett Creek and private property.	Deferred, to be completed.	Awaiting funding.
Elevate Home Program (Develop a program to assist citizens in elevating their homes which are located in repetitive flood areas)	Deferred, to be completed.	Start providing information on Flood Mitigation and Home elevation at planning desk. Attend home elevation training sessions.
Conduct a feasibility study to mitigate drainage / flood hazard at 2104 SOLANO ST. in the flood drainage area then create a retention basin.	Deferred, to be completed.	Water drains naturally there. Two options. Option 1: Convey drainage underground down Edith from Short Drive to Jewett Creek. Option 2: Buy-out and detention basin at 2104 Solano St.
Trash Pumps (additional 1-6 inch) (Purchase one additional 6-inch Trash Pump mounted on trailer for mobility. The Trash Pump would be used to augment an existing pump used for the removal excessive water and debris from flooded storm drains.) In addition to Trash Pump, purchase five (5) Discharge Suction Hoses (Purchase five 400 ft. discharge suction hoses for pumps used to discharge flood water.)	Deferred, to be completed.	Need this to clear debris from City drainage facilities. Plan to mobilize vactor trucks following major storms. This will not be funded by HMGP. Use this as backing of CIP and City budgetary purposes.
Update and repair Blackburn Moon drain.	Deleted	Repeated in another mitigation action.
Five (5) Discharge Suction Hoses (Purchase five 400 ft. discharge suction hoses for pumps used to discharge flood water.)	Combined with other mitigation actions	Combined with Trash Pump
Flood Mitigation Plan (Develop a Comprehensive Flood Mitigation Plan. The Plan will identify repetitive flood areas	Completed.	Completed as part of 2018.

Program/ Project	Completed, Deleted or Deferred	Explanation
and develop short and long-term flood mitigation strategies)		
Property Development Program (Develop City ordinances to address future housing developments in hazard prone areas, beyond 100-YR floodplain.)	On-Going	Look into updating floodplain regulations for areas of known flood risk outside the 100-YR SFHA. This addresses the lack of FEMA flood insurance studies in the areas.
Double check site conditions and special flood hazard area (SFHA) elevation vs. building first floor elevation at Centennial High School. Inform, Corning PD of flood risk at High School for emergency operations.	New	New after 2018 risk assessment
Upgrade / Replace or Construct new drainage infrastructure for undersized dry wells across the city.	New	New from 2018 mitigation plan update.
Develop the ability to document damage and high-water marks within the City of Corning. This will provide historical flooding in areas beyond the SFHA.	New	New from 2018 mitigation plan update. CRS credit activity possible.
Identify properties subject to flooding which are not on FEMA Map but which require raising floors of dwelling and garage at time of new construction.	New	New for 2018 mitigation plan update.
Hazardous Materials		
Specialized hazardous materials incident response training for Corning Volunteer Fire Department.	Delete	Not a natural Hazard event. Planning Committee chose to not profile hazardous material spill as hazard in the natural hazard mitigation plan.
Build concrete containment chambers for gaseous chlorine.	Delete	Not a natural Hazard event. Planning Committee chose to not profile hazardous material spill as hazard in the natural hazard mitigation plan.
Serve Storm Hazard		

Program/ Project	Completed, Deleted or Deferred	Explanation
Public Works Corporate Shop Generator (Procure a 30KW generator to operate Public Works Maintenance Operations Yard during a loss of utility service.)	Deferred, to be completed.	This must be a fixed generator that is not mobile for a "long-term" mitigation solution for HMGP award.
50KW Mobile Generator with trailer (Procure a 50KW generator mounted on a trailer would provide backup electricity for pumping gas, flood control; pump stations, storm and emergency backup power for an evacuation shelter.)	Deferred, to be completed.	This can be an EMPG Grant Funded Item as "equipment purchase". Will not be funded under HMGP or other mitigation grant program.
Electrical upgrade for remodeled Emergency Operations Center (EOC).	Deleted	Combined with other mitigation action.
Information Technology System Upgrade	Delete	Not indicative of Mitigation Planning. Combined with Phone System Upgrade.
Upgrade 9-1-1 Telephone System	Completed	Completed in 2012. Fire Department recently upgraded their dispatch system in January 2017
Telephone System Upgrade (Install T1 line (AT T) SSN7 System; 35 lines capability for the Police department phone system. The current telephone system is outdated. The new system would have dedicated phone lines to the EOC and would be integrated with other first responder systems.)	Completed	Completed in 2012.
Develop hazard tree replacement / care program.	New	New from 2018 mitigation plan update.
Earthquake		
Construct Seismic Upgrades to city owned infrastructure.	Deferred, to be completed.	This includes City Hall and Fire Station. Apply for 25/75 Grant for Seismic Upgrade of Unreinforced Masonry Buildings in the Downtown area
Construct Fire Station Seismic Upgrade.	Deleted.	Combined with other.

Program/ Project	Completed, Deleted or Deferred	Explanation
Develop Seismic Upgrade Program for local business / gathering facilities that were built before benchmark years.	New	New from 2018 mitigation plan update.
Wild Land/Urban Interface Fire		
Fire Station Expansion	Deleted.	Not related to wildland fires.
High Fire Zone Assessment Program	Deleted.	Exposure and vulnerability very low in the City for wildfire. Deleted to re-direct resources to other more prevalent hazards.
Chipper Program	Deleted.	Exposure and vulnerability very low in the City for wildfire. Deleted to re-direct resources to other more prevalent hazards.
Fuel Management Program	Deleted.	Exposure and vulnerability very low in the City for wildfire. Deleted to re-direct resources to other more prevalent hazards.
Dormmate Orchard fire mitigation program development.	New	New from 2018 mitigation plan update.

1.2.3 Implementation into Other Planning Mechanisms

The 2012 City of Corning All-Hazard Mitigation Plan has been formally incorporated into the City of Corning 2014-2034 General Plan Update. Risk assessment and vulnerability data from the 2012 HMP was considered when establishing new goals, objectives and implementation measures for seismic and geologic hazards, flood protection, fire safety and law enforcement and hazardous materials.

1.2.4 Successful Mitigation Activities Since 2012

The 2012 Corning HMP has been implemented through various on-going projects, plans and programs. With respect to the mitigation action items and strategy developed in 2012, the City has been making improvements toward reducing natural hazard risk to life and property within the City limits. Significant risk reduction efforts have been made for floodplain management, flood damage prevention, and fire hazard abatement. These successful policies, programs, and projects are summarized below.

1.2.4.1 Telephone System Upgrade

Related 2012 HMP Initiative:

Provide education on hazardous conditions.

In 2014, the Corning Police Department upgraded its emergency E911 equipment with a California Telecommunications E911 Program grant. The cost was $165,900 and upgrades included the installation of two workstations, the E911 equipment, voice recorder and a four-year maintenance agreement.

The Corning Fire Department received $172,300 from the same grant funding source in 2016 to upgrade their E911 equipment that included one (1) Vesta (2 position) CPE with 8 Channel Recorder Audiolog voice recorder by Verint and a four-year maintenance agreement

In 2017, the Corning Fire Department upgraded their Positron Radio System which reduced technical problems that was causing caller delays for 911 service.

1.2.4.2 Dormant Olive Orchard Tree Removal

Related 2012 HMP Initiative:

Reduce the possibility of damage and losses to existing and future assets, including people, critical facilities/infrastructure, and public facilities due to structural fire/wildfire.

On the northwest side of the City Limits, two neglected and abandoned olive orchards were recently removed by their property owners. One orchard was within the City Limits and the other was located in Tehama County bordering the City Limits of Corning. It took great efforts and several years before the neglected fields were abated by the property owners.

The dead and dried out trees posed a great threat of fire that was a danger to a neighboring apartment complex and residential homes. The fields were often times filled with homeless people and campfires only increased the threat of fire.

There are many other orchards within the sphere of influence of the City of Corning, some of them bordering the City Limits boundaries. Most of these orchards are maintained and do not pose a high risk of fire; but should not be ignored as a potential hazard. See Figure 1-2 for Orchard Removal Photos.

Figure 1-2: Orchard Removal due to Wildfire Risk

1.2.4.3 Drainage Maintenance

Related 2012 HMP Initiative:

Update storm water system plans and improve storm water facilities that affect high-risk assets.

Annually, $18,000 is budgeted for the clearing and cleaning of local streambeds and drainage ditches within the City Limits. Early in the fall months the City contracts with Salt Creek Conservation Camp of Paskenta, CA to bring in court-ordered community service workers for such work.

1.3 Planning Methodology

The City of Corning followed the planning process detailed in Section 3 of the base plan. In addition to providing representation on the Tehama County Hazard Mitigation Planning Committee (HMPC) and Steering Committee, the City formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 1-4.

Table 1-4: 2018 MJHMP Update Stakeholder List

Planning Committee Dept. / Members	Position / Role	CRS Category
Dawn Grine, Dir. Public Works	Planning Lead, Steering Committee Rep.	Structural Projects
Dan Redding, Building Official	Review of Mitigation action and plan.	Preventive Measures
John Stoufer, City Planning	Land Use and Planning Review	Preventive Measures
Martin Spannaus, Fire Chief	Review of Wildfire Profiles and Wildfire Mitigation Actions	Emergency Services
Citizen Advisory		
Steve Kimbrough	Public Advisory	Public Information
Rosie Flores	Farmers Insurance Agent	Property Protection
Gary Strack	Public Advisory	Public Information

1.4 Risk Assessment

The intent of this section is to profile the City of Corning's hazards and assess the City's vulnerability separate from that of the planning area as a whole, which has already been assessed in Sections 4 (Risk Assessment) Volume One. The hazard profiles in Volume One discuss overall impacts to the planning area and describes the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the City of Corning is included in this section of the Annex. This vulnerability assessment analyzes the property, population, critical facilities, and other assets at risk to hazards specific to the City of Corning. For more information about how hazards affect the County as a whole, see Section 4 Risk Assessment in the main plan.

Each hazard vulnerability assessment for the City of Corning Annex includes a hazard profile/problem description as to how each medium or high significant hazard affects the City and includes information on past hazard occurrences. The intent of this section is to provide jurisdictional specific information on hazards and further describe how the hazards and risks differ across the planning area.

1.4.1 Hazard Screening Criteria

Per FEMA Guidance, the first step in developing the Risk Assessment is identifying the hazards. The City Planning Committee reviewed a number of previously prepared hazard mitigation plans and other relevant documents to determine the universe of natural hazards that have the potential to affect the County and the nearby region. Table 1-5 provides a crosswalk of hazards identified in the 2012 Tehama County HMP, 2012 City of Corning HMP, the 2012 City of Corning General Plan and 2013 California State HMP. Twelve different hazards were identified based on a thorough document review. The crosswalk was used to develop a preliminary hazards list providing a framework for City of Corning HMP Planning Team members to evaluate which hazards were truly relevant to the City and which ones are not. For example, tsunami was considered to have no relevance to the County, while earthquake, flood and wildfire were indicated in every hazard documentation.

Table 1-5: Document Review Crosswalk

Hazards	2012 Tehama County HMP	2012 City of Corning HMP	2012 City of Corning General Plan	2009 Tehama County General Plan	2013 CA State HMP
Natural Hazards					
Avalanche	■				■
Climate Change	■	■	■		■
Dam Failure	■				■
Drought	■				■
Earthquake	■	■	■	■	■
Flood	■	■	■	■	■
Landslide	■				■
Levee Failure					■
Severe Weather	■	■			■
Tsunami					■
Volcanoes					■
Wildfire	■	■		■	■
Human Caused Hazards					
Economic Disruption		■			
Biological/Health/Pandemic Flu		■			
Water/Wastewater Disruption		■			
Utility Loss/ Disruption/ Substation Failure		■			
Transportation Loss – Services & Highway		■			
Hazardous Materials		■	■		

1.4.2 Climate Change

Climate refers to patterns of temperature, precipitation, humidity, wind and seasons. Climate shapes natural ecosystems and the human economies and cultures that depend on them. “Climate change” refers to changes over a long period of time. It is generally perceived that climate change will have a measurable impact on the occurrence and severity of natural hazards around the world. Impacts include the following:

- Snow cover losses will continue, and declining snowpack will affect snow-dependent water supplies and stream flow levels around the world.
- Drought and the frequency, intensity, and duration of heat waves are expected to increase.
- More extreme precipitation is likely, increasing the risk of flooding.
- The world's average temperature is expected to increase.

Climate change will affect communities in a variety of ways. Impacts could include an increased risk for extreme events such as drought, storms, flooding, and forest fires; more heat-related stress; and the spread of existing or new vector-born disease into a community. In many cases, communities are already facing these problems to some degree. Climate change can affect the frequency, intensity, extent and/or magnitude of the problems.

This hazard mitigation plan addresses climate change as a secondary impact for each identified hazard of concern. Each chapter addressing one of the hazards of concern includes a section with a qualitative discussion on the probable impacts of climate change for that hazard.

1.4.3 Vulnerability Assessment and Total Assets at Risk

This section presents the vulnerability assessment for Corning and identifies Corning's total assets at risk, including people, values at risk, critical facilities and infrastructure. Growth and development trends are also presented for the community. This data is not hazard specific, but is representative of total assets at risk within the community.

1.4.4 Population and Asset Inventory

In order to describe vulnerability for each hazard, it is important to understand the "total" population and "total" assets at risk within the City. The exposure for each hazard described in this section will refer to the percent of total population or percent of total assets similar to Volume 1. This provides the possible significance or vulnerability to people and assets for the natural hazard event and the estimated damage and losses expected during a "worst case scenario" event for each hazard. Sections below provide a description of the total population, critical facilities, and parcel exposure inputs.

1.4.4.1 Population

In order to develop hazard-specific vulnerability assessments, populations near natural hazard risks have been determined to understand the total "at risk" population. We can understand how geographically defined hazards may affect the City by analyzing the extent of the hazard in relation to the location of population. For purposes of the vulnerability assessment approximately 7,663[1] (100%) of the City's population is exposed to one or more hazards within or near the City boundaries. Each natural hazard scenario affects the City residents differently depending on the location of the hazard and the population density of where the hazard could occur. Vulnerability assessment sections presented later in this section summarize the population exposure for each natural hazard.

[1] According to the 2010 U.S. Census Block pre-joined TIGER spatial data, the total population for the City in 2010 was 7,663.

1.4.4.2 Vulnerable Populations

The severity of a disaster depends on both the physical nature of the extreme event and the socioeconomic nature of the populations affected by the event. Important socioeconomic factors tend to influence disaster severity. A core concept in a vulnerability analysis is that different people, even within the same region, have a different vulnerability to natural hazards.

1.4.4.2.1 Income and Housing Condition

Income or wealth is one of the most important factors in natural hazard vulnerability. This economic factor affects vulnerability of low income populations in several ways. Lower income populations are less able to afford housing and other infrastructure that can withstand extreme events. Low income populations are less able to purchase resources needed for disaster response and are less likely to have insurance policies that can contribute to recovery efforts. Lower income elderly populations are less likely to have access to medical care due to financial hardship. Because of these and other factors, when disaster strikes, low income residences are far more likely to be injured or left without food and shelter during and after natural disasters.

Figure 1-3 shows the median household income distribution for the City of Corning in 2015. The “median” is the value that divides the distribution of household income into two equal parts (e.g., the middle). The median household income in City of Corning in 2015 was estimated to be $31,667. In the United States during the same period, the median house household income was $53,889 (Bureau U. S., 2015). The most vulnerable residents (in terms of income and housing condition) to natural hazards are located in the western portion of the City along the I-5 corridor.

1.4.4.2.2 Age

Children and the elderly tend to be more vulnerable during an extreme natural disaster. They have less physical strength to survive disasters and are often more susceptible to certain diseases. The elderly often also have declining vision and hearing and often miss reports of upcoming natural hazard events. Children, especially young children, have the inability to provide for themselves. In many cases, both children and the elderly depend on others to care for them during day to day life.

Finally, both children and the elderly have fewer financial resources and are frequently dependent on others for survival. In order for these populations to remain resilient before and after a natural hazard event, it may be necessary to augment city residents with resources provided by the City, State and Federal emergency management agencies and organizations.

As seen in Figure 1-4, the block groups with the highest concentration of people under 18 years old are located around Interstate 5 (I-5) in the western portion of the City. Figure 1-5 shows that the highest concentration of people over the age of 65 is in the Central portion of the City along Marguerite Ave.

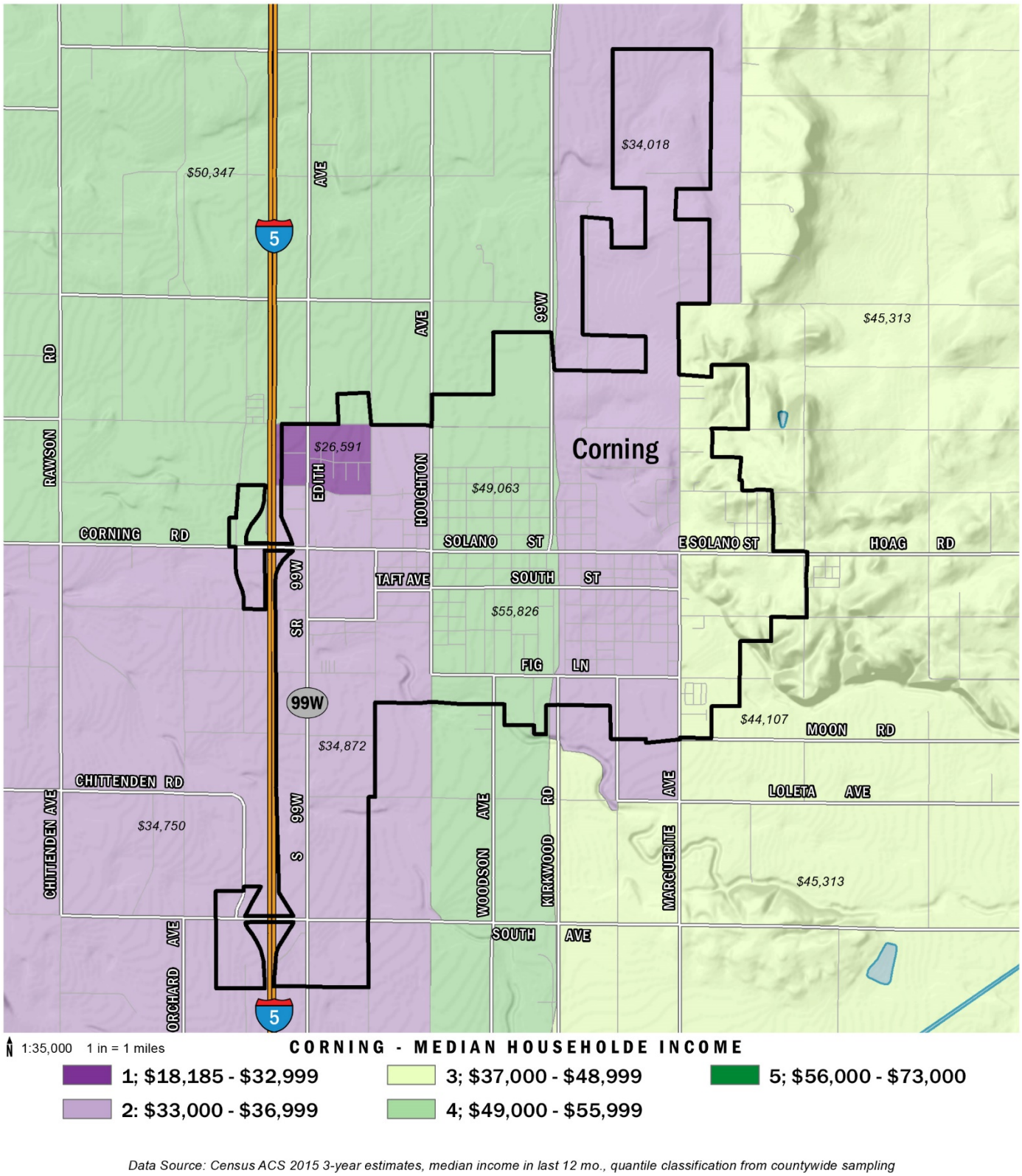
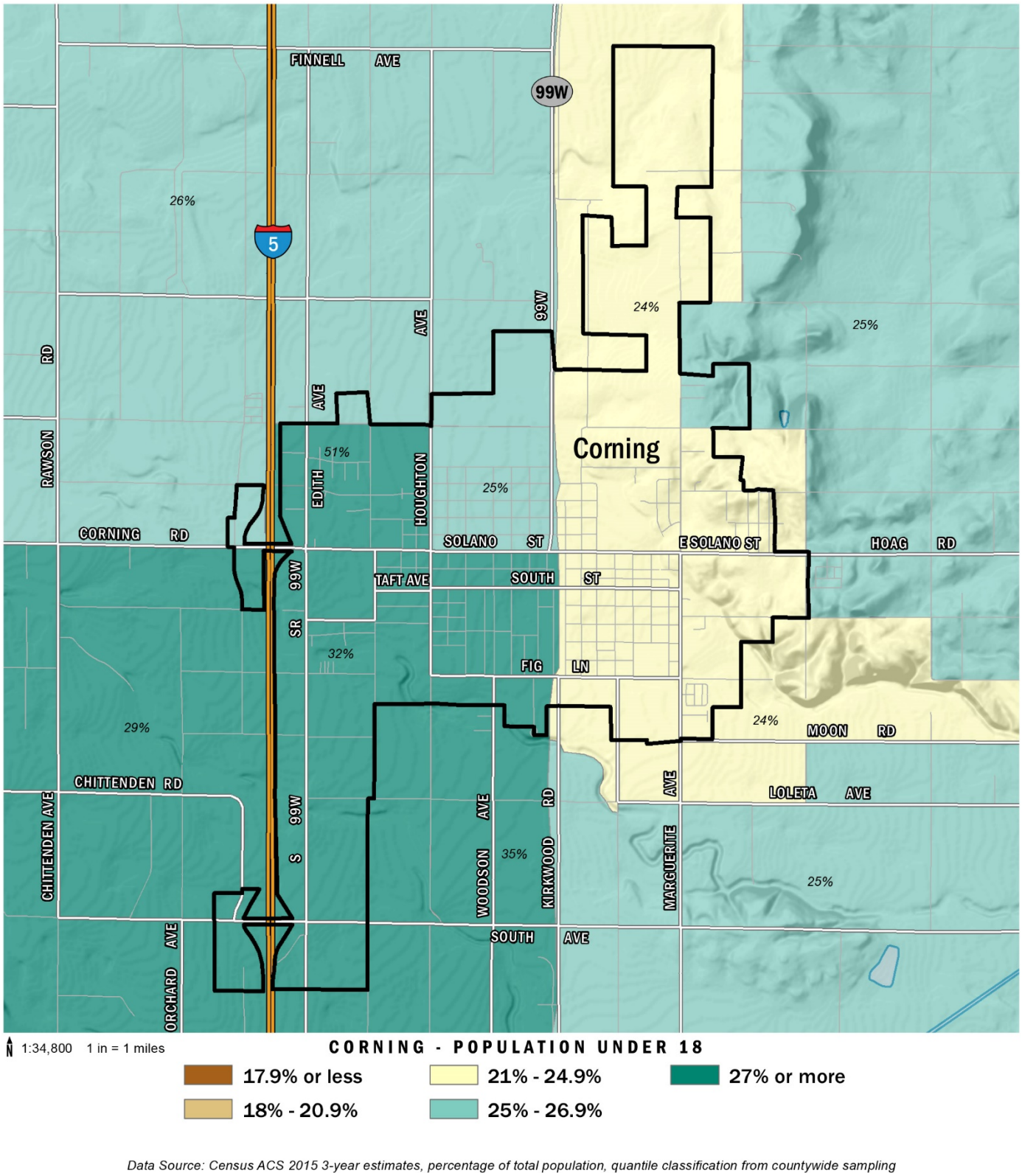
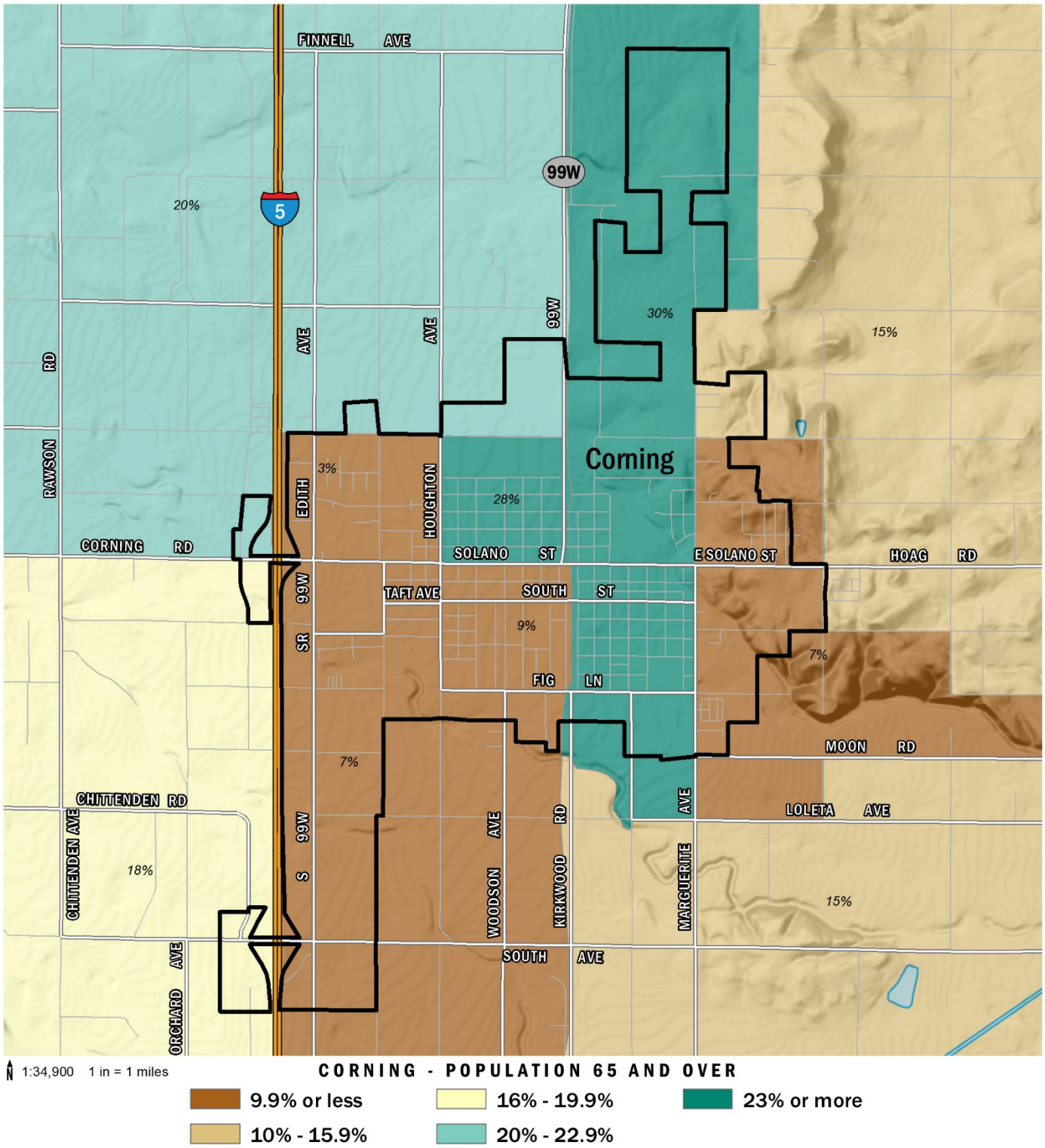


Figure 1-3: Median Household Income Distribution



Data Source: Census ACS 2015 3-year estimates, percentage of total population, quantile classification from countywide sampling

Figure 1-4: City of Corning Population Under 18



Data Source: Census ACS 2015 3-year estimates, percentage of total population, quantile classification from countywide sampling

Figure 1-5: City of Tehama Residents Over Age 65

1.4.5 Critical Facilities Inventory

Critical facilities are of concern when conducting hazard mitigation planning. Critical facilities are defined as essential services, and if damaged, would result in severe consequences to the health, safety, and welfare of the public.

An inventory of critical facilities based on data from the City of Corning, Tehama County and other publicly sourced information were used to develop a comprehensive inventory of facility points and lifelines for the City. Critical facility points include fire stations, schools, transportation, utilities, and government buildings. Lifelines include communication, electric power, liquid fuel, natural gas, and transportation routes. A current representation of the critical facilities and lifelines in the City of Corning are provided in Table 1-6 and Table 1-7. The Tehama County Public Works Department manages and maintains a complete list of critical facilities.

Table 1-6: City of Corning - Critical Facility Counts

Infrastructure Type	Total Feature Count
Essential Facility	24
EOC	-
Fire Station	2
Government Facility	12
Hospital	2
Police Station	1
School	7
High Potential Loss	22
Residential Child Care	-
Adult Residential Care	4
Child Care	14
Foster/Home Care	-
Home Care	-
Foster Care	-
Elder Care	2
Hotel	2
Transportation and Lifeline	11
Airport	-
Bridge	8
Bus Facility	1
FCC AM Tower	-
FCC Cell Tower	-
FCC FM Tower	-
Natural Gas Station	-
Substation	1
Waste Water Facility	1
Grand Total	**57**

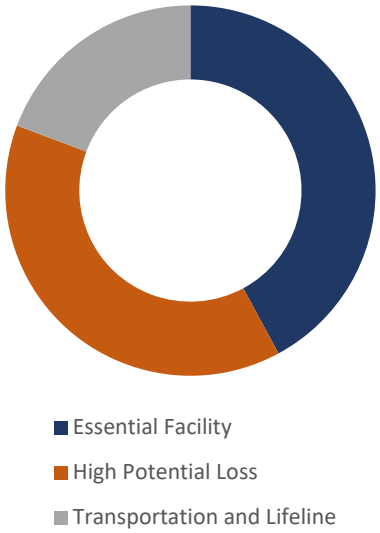


Table 1-7: City of Corning - Linear Utilities

Infrastructure Type (Linear)	Total Linear Mileage
Transportation and Lifeline	**47.5**
FEMA Levee	-
USACE Levee	-
Natural Gas Pipeline	-
Transmission Line	1.7
Railroad	1.3
Street	44.4
-Interstate	0.1
-Primary Highway	-
-State/County Highway	11.2
-Local Road	32.0
-Other Road	1.1
-4WD Road	-
Grand Total	**47.5**

1.4.6 Parcel Value Inventory

Total count and value of parcels within the City of Corning which could be exposed to a hazard event is referred to as parcel exposure in this Annex. A standardized hazard overlay was conducted to develop hazard exposure results for improved city parcels presented later in this section. For more information on this exposure method see Volume 1, Section 4. In the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a total loss and structures can be rebuilt. The Tehama County Assessor's data is pivotal to developing parcel values exposed to each hazard and includes current fair market value of assets at risk. City of Corning parcel information is summed and provided in Table 1-8. Both the market value and content value are the total value in the community at risk to a particular hazard.

Table 1-8: City of Corning - Parcel Counts and Value

	Total Parcels	Total Market Value Exposure ($)	Total Content Value Exposure ($)	Total Value ($)
City of Corning Parcels Totals	**2,524**	$352,747,126	$238,484,505	$591,231,631

1.4.7 Hazus Structure and Content Value Inventory

FEMA's loss estimation software, Hazus-MH 4.0, was used to analyze the City's building risk to flood and earthquake hazards. A Hazus level II assessment was performed leveraging county-wide assessor's data in lieu of default Hazus data aggregated to the Census Block or Tract level. Hazus software operates on structure square footage, structure replacement, and content replacement costs to estimate potential losses specific to a modeled flood or earthquake scenario. Table 1-9 and Figure 1-6 provide value data for building categories at the census block and census tract levels for the City of Corning. Census block and census tracts are used to provide input information for the Hazus analysis presented in this City Annex. It is important to note that the full inventory basis within the Hazus software is different than the sum of values from the

assessor's data due to a variance in replacement cost calculations. If a parcel has no market value or assessment value, Hazus calculates a default value based on construction type and year built.

Note: Data Source: Tehama County Assessor. Building values reflect fair market value where available. If no fair market value is available, this value reflects the assessed improvement value. Content replacement costs are calculated based on assessor's use codes translated to Hazus occupancy classes. Each HAZUS occupancy class prescribes a specific content cost multiplier used to calculate the content cost values shown above. Use codes including a "vacant" description have been removed along with agricultural use codes with no improvement value.

Table 1-9: Parcel-Based Hazus Input Values (City of Corning)

Building Type	Building Value ($)	Building Value (% of grand total)	Content Value ($)	Content Value (% of grand total)	Total Value ($)	Proportion of Value (%)
Agricultural	$ 61,027	0.0%	$ 61,027	0.0%	$ 122,054	0%
Commercial	$ 84,146,095	16.2%	$ 85,743,002	16.5%	$ 169,889,097	33%
Education	$ 301,170	0.1%	$ 301,170	0.1%	$ 602,340	0%
Governmental	$ -	0.0%	$ -	0.0%	$ -	0%
Industrial	$ 2,615,226	0.5%	$ 3,922,840	0.8%	$ 6,538,066	1%
Religion	$ 3,022,085	0.6%	$ 3,022,085	0.6%	$ 6,044,170	1%
Residential	$ 224,614,335	43.2%	$ 112,307,172	21.6%	$ 336,921,507	65%
Total	**$ 314,759,938**	**61%**	**$ 205,357,296**	**39%**	**$ 520,117,234**	

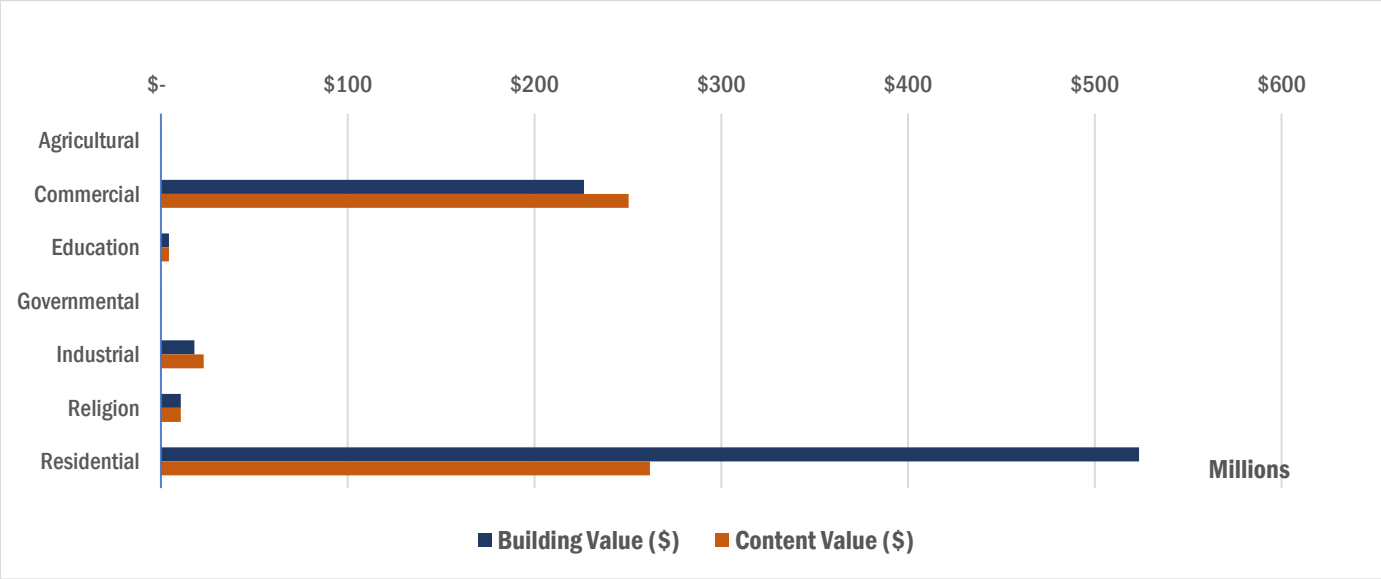


Figure 1-6: Hazus Inventory (Parcel-based) Building and Content Exposure Values

1.4.8 Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified as high or medium significant hazards within the City Limits. Impacts of past events and vulnerability of the City to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the base plan for more detailed information about these hazards and their impacts on the Tehama County planning area).

Methodologies for calculating loss estimates are the same as those described in Section 3.4 of the base plan. In general, the most vulnerable structures are those located within the flood risk areas, wildfire risk areas, and vulnerable buildings within violent earthquake shake zones. An estimate of the vulnerability of the City to each identified priority hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow.

This Annex provides an explanation of prevalent hazards within the City and how hazards may affect population and property within the jurisdiction. Most importantly the mitigation strategy presented in this plan responds to the particular vulnerabilities and provides prescriptions or actions to achieve the greatest reduction of vulnerability, which results in saved lives, reduced injuries, reduced property damage, and protection for the environment in the event of a natural hazard. This City Annex provides information for the following natural hazard threats:

Flooding
SECTION 1.4.9

Severe Weather
SECTION 1.4.10

Wildfire
SECTION 1.4.11

Drought
SECTION 1.4.12

Earthquake
SECTION 1.4.13

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1.4.9 Flood Hazard

The City of Corning is traversed by several stream systems and is at risk to both riverine flooding and localized stormwater flooding. As previously described in Section 4.7 of the base plan, the Tehama County Planning Area and the City of Corning have been subject to previous occurrences of flooding. Jewett and Burch Creek have relatively small hydrologic capacity and can be quickly overwhelmed during severe storm runoff events resulting in the overflowing of stream channel banks and the temporary inundate/ion of floodplains and connected low-lying areas. Portions of the City are located inside of the 100-YR flood zone as defined by the Federal Emergency Management Agency (FEMA). This is seen in Figure 1-7.

1.4.9.1 Regulatory Oversight

1.4.9.1.1 National Flood Insurance Program (NFIP)

The City of Corning has participated in the NFIP since 1982. See Table 1-10 for more information on the City's policies and historic flood insurance claims. Corning is currently in good standing with the provisions of the NFIP. Compliance is monitored by FEMA regional staff and by the California Department of Water Resources under a contract with FEMA. Maintaining compliance under the NFIP is an important component of flood risk reduction. See the Base Plan for general information on the NFIP.

Table 1-10: NFIP Status Table (City of Corning)

NFIP Status	Participating since 08/16/1982
Policies in Force	75
Policies in SFHA	51
Policies in non-SFHA	24
Total Claims Paid	13
Paid Losses	$ 84,404
Repetitive Loss Properties	N/A
Severe Repetitive Loss Properties	N/A
Repetitive Loss Payment by NFIP on Building	$ 0
Repetitive Loss Payment by NFIP on Contents	$ 0

The City of Corning will maintain NFIP compliance by continuing to enforce Chapter 15.17 (Flood Damage Prevention) of the City's Code of Ordinances. This ordinance prevents structures from being built within flood prone, mudslide or flood related erosion areas and is explained in detail in Section 1.4.9.1.3.

See Volume 1, Section 9.2.1 of the Base Plan for more information on the NFIP.

1.4.9.1.2 Community Rating System (CRS)

The City of Corning does not currently participate in FEMA's CRS Program.

See Volume 1, Section 9.2.2 of the Base Plan of the Base Plan for general information on CRS.

1.4.9.1.3 Chapter 15.17 Flood Damage Prevention

Chapter 15.17 of the City of Corning Code of Ordinances states that no structure or land shall hereafter be constructed, located, extended, converted, or altered without full compliance with the terms of this chapter and other applicable regulations. Violation of the requirements (including violations of conditions and safeguards) shall constitute a misdemeanor. Nothing herein shall prevent the city council from taking such lawful action as is necessary to prevent or remedy any violation.

This chapter includes methods of reducing flood losses which includes regulations to:

A. Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities;
B. Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
C. Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;
D. Control filling, grading, dredging, and other development which may increase flood damage;
E. Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas.

(Ord. No. 652, § 1, 5-28-2013)

1.4.9.2 Past Events

In addition to the past flooding events affecting Tehama County listed in Section 4.7.3.2 in the Base Plan, the City of Corning occasionally experiences localized flooding. Table 1-11 describes the localized flooding events in the City of Corning.

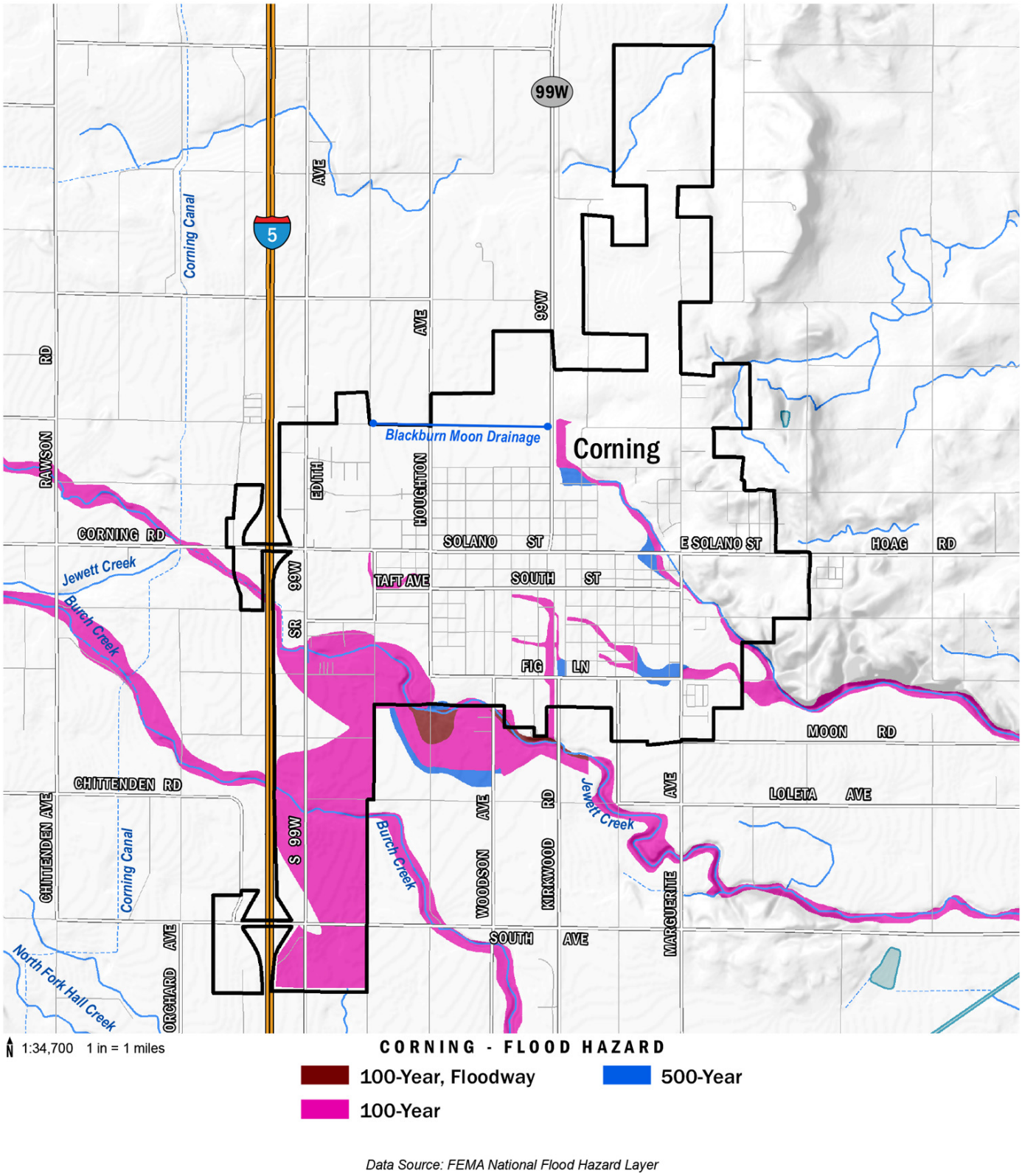
Table 1-11: City of Corning Flood Events

Date	Declaration #	Type of event	Estimated Damage
1/23/16		Street flooding occurred in Corning, with large amounts of 1/4-inch hail. Hail was close to 2FT Deep.	$5,000

Source: National Oceanic and Atmospheric Administration Storm Events Database

1.4.9.3 Location

The City of Corning lies on a gradually sloping valley. Areas in the east of the city are drained by the Central Drain and Blackburn Moon Drain. The southern portion of the city lies in the very flat floodplain of Jewett and Burch Creeks, which comprise an integral part of the drainage system flowing from the northwest to the Sacramento River. Jewett Creek has a drainage area of approximately 8 square miles upstream of Interstate Highway 5 (FEMA, 2011). See Figure 1-7 for location of FEMA identified flood zones. Table 1-12 provides a summary of FEMA identified 100-YR and 500-YR flood hazard areas and Table 1-13 provides further detail regarding the source/location of the City's flood plains.



Data Source: FEMA National Flood Hazard Layer

Figure 1-7: City of Corning Flood Zones

Table 1-12: Flood Hazard Area Summary

Flood Hazard Type	Sum of Acres	Sum of Square Miles
100-YR Flood	361.0	0.6
100-YR Flood, Floodway	0.5	0.0
500-YR Flood	19.2	0.0
Total	**380.7**	**0.6**

Table 1-13: Local Drainage Peak Discharge Estimates – City of Corning

	Drainage (SQ. MI.)	Discharge (cubic feet/second)			
Source/Location	**Area**	**10-Year**	**50-Year**	**100-YR**	**500-YR**
Jewett Creek					
At Interstate 5	8.1	800	1,200	2,300	3,350
Downstream of State HWY 99 (Edith Ave)	—	—	—	2,500[1]	—
Downstream of Toomes Ave	—	—	—	2,100[1]	—
Payne Creek Slough, at divergence from Sacramento River	—	11,400	24,500	31,000	*a*

[1]Jewett Creek floodwaters collect against the upstream (west) embankment of Interstate Highway 5 (I-5) and then continue to the east through the opening in I-5. However, the channel capacity downstream of I-5 is increasingly smaller as it continues through the study area, resulting in overbank losses and decreased channel flows.

Source: Table 5 Summary of Discharges from FEMA FIS Text, 2011

1.4.9.3.1 Principal Flooding Sources

In the City of Corning, during the periods of high floods, the south and southwest of the city is affected by overflows from Jewett Creek and Burch Creek downstream of Interstate Highway 5. Flooding from Jewett Creek occurs when Birch Creek overflows into the south fork of Jewett Creek west of I-5. This flooding has occurred after days of rain saturates the soil followed by sudden heavy rains in the "West Hills" bringing Birch to flood stage where it overflows in to Jewett. Flooding occurs in the south west quadrant of the City from both Jewett and Birch. Lack of regular cleaning and maintenance aggravates the problem. Because there are no gaging stations near the City of Corning to record flows, there is no flow data. Most of the flooding is a result of rainfall in the general area of the City of Corning. According to the USACE, there is no record of major flood damage in the City of Corning (FEMA, 2011).

1.4.9.3.2 Jewett and Burch Creek

The primary creeks and channels in the Corning area overtop during high runoff events causing the area to be plagued with widespread overland flooding that adversely impacts roadways and properties. These problems are attributed largely to Jewett and Burch Creeks, shown in Figure 1-8. Burch Creek overflows into Jewett Creek or west of town during localized rain events. These areas do not have active stream flow stations. Flooding is usually diverted to streets, which is acceptable. A precipitation station is located at the Corning airport. The respective areas would benefit from having access to real-time data and flood forecasting information in view of the "flashy" hydrology of the systems. It is recommended by the 2006

Tehama County Flood Mitigation Plan that both watersheds be equipped with real-time data monitoring stations and data acquisition systems for stream flow and precipitation.

Figure 1-8: Aerial Image of Jewett and Burch Creeks near Corning

Another high priority project listed in the 2006 Tehama County Flood Mitigation Plan was to formulate a Flood Management Plan for Jewett and Burch Creeks in the vicinity of Corning so that a comprehensive evaluation can be made of the constraints and opportunities for managing floodwater from the watersheds. The consideration of detention storage and other flood management facilities was first investigated in 1969 by the California Department of Conservation. Although nothing materialized from that effort, the concept could offer the opportunity to mitigate damage to public infrastructure and provide floodplain information to facilitate sound land use planning and a basis for administering the NFIP for the area. (County, 2006).

1.4.9.4 Frequency

Generally, Corning experiences flooding between December and March. Floods that can cause property damage typically occur every three to seven years. Other events occur frequently and can be classified as nuisance flooding related to drainage issues.

1.4.9.5 Severity

In developed areas, flood problems are usually intensified because new homes and other structures, and new streets, driveways, parking lots, and other paved areas decrease the amount of open land available to absorb rainfall and runoff, thus increasing the volume of water that must be carried away by waterways. However, drainage standards for new development in the City largely protect newer development.

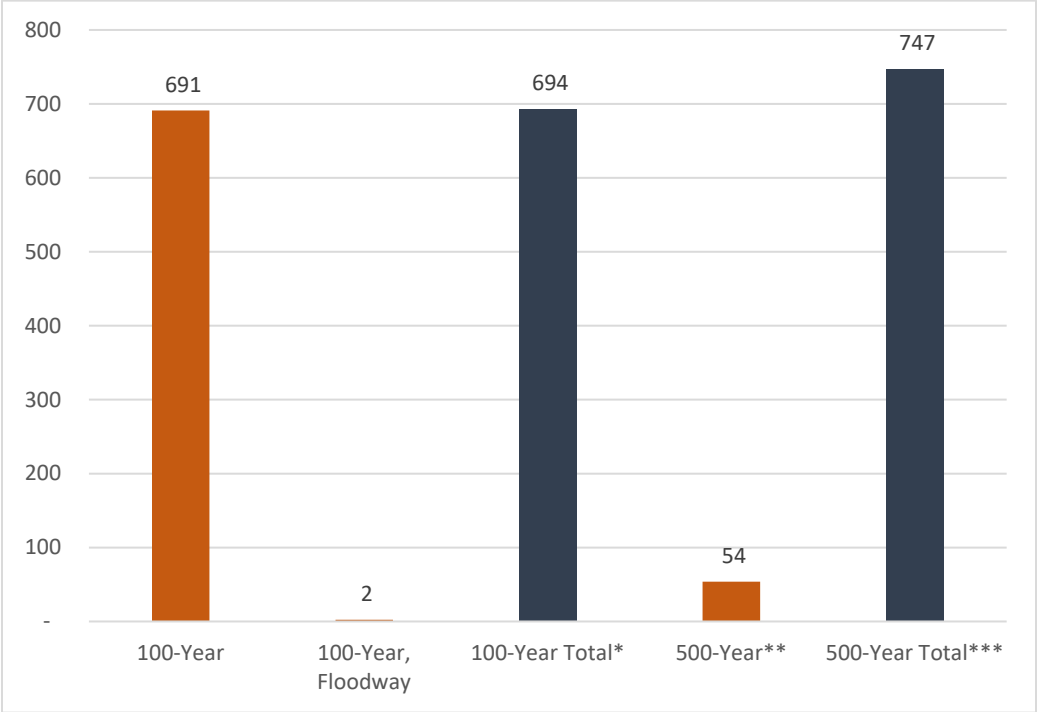
1.4.9.6 Flood Hazard Vulnerability

1.4.9.6.1 Population

Population counts of those living in the floodplain were generated by analyzing County assessor and parcel data that intersect with the 100-YR and 500-YR floodplains identified on FIRMs within the City of Corning. Using GIS, U.S. Census Bureau information was used to intersect the FEMA identified floodplains within the City limits. An estimate of population was calculated by weighting the population within each census block. The exposure results indicate the percentage of total population living within a flood risk area. Using this approach, it was estimated that a total of 694 people are exposed to flood risk from the 100-YR floodplain (9% of the total City population) and 747 people are exposed to risk from the 500-YR floodplain (9.7% of the total City Population), as shown in Figure 1-9.

Population Exposure

Population Count in the 100-Year and 500-YR Floodplains



**Total 100-year floodplain*
***Includes only additional area outside of 100-year floodplain*
****Total 500-YR floodplain, includes 100-year floodplain*

Figure 1-9: Population Exposure to Flood

One residential area most susceptible to flooding due to homes built in a low area where the railroad dams the wate is Chicago Ave. from South Street to Fig Lane The "Southern Pacific Outfall Line" at the west edge of the RR right of way carries storm water from downtown around the Chicago neighborhood but when Jewett Creek is a flood stage (twice in the last 25 years) the outfall ceases to work and Chicago floods into homes built before City building standards were implemented.

1.4.9.6.2 Property

GIS was used to determine the possible impacts of flooding within the City of Corning. The methodology described in Section 4.7.6.2 of the base plan was followed in determining structures and values at risk to the FEMA identified 1% (100-YR) and 0.2% (500-YR) annual chance flood event.

Table 1-14 summarizes the number of parcels and property value within the City of Corning's FEMA identified floodplains. GIS models determined that there are 202 parcels within the 100-YR floodplain and 24 parcels within the 500-YR floodplain. This methodology also estimated $108 million worth of building-and-contents exposure to the 100-YR flood, representing 18.4 percent of the total assessed value within the City of Corning, and $8 million worth of building-and-contents exposure to the 500-YR flood, representing 1.4 percent of the total assessed value within the City of Corning.

Table 1-14: City of Corning - Parcels Exposed to NFIP Flood Zones

	Total Parcels	Total Market Value Exposure ($)	Total Content Value Exposure ($)	Total Value ($)
Corning	2,524	$ 352,747,126	$ 238,484,505	$ 591,231,631

Flood Hazard Zone	Improved Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
100-YR Flood	202	*8.0%*	$ 60,065,935	$ 48,446,243	$ 108,512,178	*18.4%*
100-YR Flood, Floodway	-	*0.0%*	$ -	$ -	$ -	*0.0%*
100-YR Total*	**202**	**8.0%**	**$ 60,065,935**	**$ 48,446,243**	**$ 108,512,178**	**18.4%**
500-YR Flood**	24	*1.0%*	$ 4,911,453	$ 3,350,176	$ 8,261,629	*1.4%*
500-YR Total***	**226**	**9.0%**	**$ 64,977,388**	**$ 51,796,419**	**$ 116,773,807**	**19.8%**

**Total 100-year floodplain*
***Includes only additional area outside of 100-year floodplain*
****Total 500-YR floodplain, includes 100-year floodplain*

Note: The table above does not display loss estimation results; the table exhibits total value at risk based upon the hazard overlay and Tehama County Assessor data.

1.4.9.6.3 Flood Damage Estimation

FEMA's HAZUS-MH software models the possible damage of flooding within the City of Corning. The methodology described in Volume 1, Section 4.7.6.3 of the base plan was followed in determining potential damage associates with the 1% (100-YR) and 0.2% (500-YR) annual chance flood event.

The HAZUS-MH software calculates losses to structures from flooding by analyzing the depth of flooding and type of structure. Using historical flood insurance claim data, HAZUS-MH software estimates the percentage of damage to structures and their contents by applying established damage functions to an inventory. For this analysis, all non-vacant parcels with current market values were used instead of the default inventory data provided with HAZUS-MH software. The analysis for the City of Corning is summarized in Table 1-15 and Figure 1-10 for the 100-YR flood event. Hazus results for the 500-YR flood event did not result in a damage estimation greater than the 100-YR event. It is estimated that there "could" be up to $18,024,911 of flood damage loss from a 100-YR or 500-YR flood event in the City of Corning. This modeled loss is assuming all tributaries in the region collect 100-YR event precipitation levels in the watershed. The estimated loss represents 3.5% of the total value exposed to the 100-YR and 500-YR flood event.

Table 1-15: 100-YR Flood Loss Estimation (Based on Depth) in NFIP Flood Zones by Occupancy Type

Building Type	Building Damage ($)	Building Damage (% of grand total)	Content Damage ($)	Content Damage (% of grand total)	Total Damage ($)	Proportion of Loss (%)
Agricultural	$ 3,662	0.0%	$ 12,205	0.1%	$ 15,867	0%
Commercial	$ 2,940,547	16.3%	$ 9,799,601	54.4%	$ 12,740,148	71%
Education	$ -	0.0%	$ -	0.0%	$ -	0%
Governmental	$ -	0.0%	$ -	0.0%	$ -	0%
Industrial	$ 140,955	0.8%	$ 211,432	1.2%	$ 352,387	2%
Religion	$ -	0.0%	$ -	0.0%	$ -	0%
Residential	$ 3,085,043	17.1%	$ 1,831,465	10.2%	$ 4,916,509	27%
Total	**$ 6,170,207**	**34%**	**$ 11,854,703**	**66%**	**$ 18,024,911**	

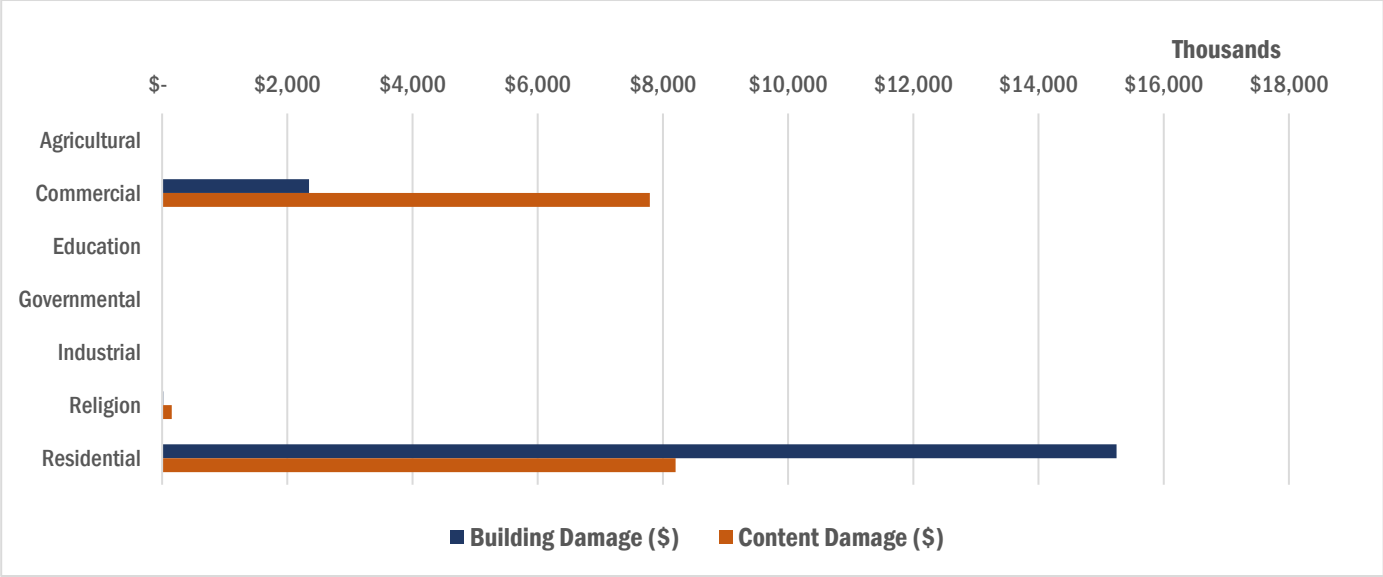


Figure 1-10: Estimated Building and Content Loss in the 100-year floodplain by Occupancy Type

1.4.9.6.4 Critical Facilities and Infrastructure

It is important to determine who may be at risk if infrastructure is damaged by flooding. Roads or railroads that are flooded or damaged can isolate residents and can prevent access throughout the City, including emergency service providers needing to get to vulnerable populations or to make repairs. Bridges washed out or blocked by floods or debris also can cause isolation. Water and sewer systems can be flooded or backed up, causing health problems. Underground utilities can be damaged. The following sections describe specific types of critical infrastructure. Table 1-16 summarizes the critical facilities and infrastructure at risk to the 100-YR, 100-YR floodway and 500-YR floodplains within the City of Corning. Details are provided in the following sections.

Table 1-16: Critical Facility Points in the Floodplain

Infrastructure Type	100-YR Flood Zone	Floodway	100-YR Total	500-YR, Outside 100-YR	500-YR Total
Essential Facility	1	0	1	0	1
EOC	0	0	0	0	0
Fire Station	0	0	0	0	0
Government Facility	1	0	1	0	1
Hospital	0	0	0	0	0
Police Station	0	0	0	0	0
School	0	0	0	0	0
High Potential Loss	2	0	2	0	2
Residential Child Care	0	0	0	0	0
Adult Residential Care	0	0	0	0	0
Child Care	1	0	1	0	1
Foster/Home Care	0	0	0	0	0
Home Care	0	0	0	0	0
Other Care Facility	0	0	0	0	0
Elder Care	0	0	0	0	0
Dam	0	0	0	0	0
Hotel	1	0	1	0	1
Transportation and Lifeline	3	0	3	1	4
Airport	0	0	0	0	0
Bridge	3	0	3	1	4
Bus Facility	0	0	0	0	0
FCC AM Tower	0	0	0	0	0
FCC Cell Tower	0	0	0	0	0
FCC FM Tower	0	0	0	0	0
Natural Gas Station	0	0	0	0	0
Power Plant	0	0	0	0	0
Substation	0	0	0	0	0
Waste Water Facility	0	0	0	0	0
Grand Total	**6**	**-**	**6**	**1**	**7**

Critical Facilities Damage Estimates

As mentioned previously, FEMA's HAZUS-MH software was used to estimate the flood loss potential to critical facilities exposed to the flood risk. Potential building and content damage has been estimated for City identified critical facilities. Using depth/damage function curves to estimate the percent of damage to the building and contents of critical facilities. Table 1-17 summarizes the results of potential damage estimates as a result of the 100-YR Flood event to city-owned essential facilities. Table 1-18 summarizes the results of potential damage estimates as a result of the 100-YR Flood event to high potential loss facilities in the city.

Table 1-17: Essential Facility Damage Estimates (100-YR Flood)

Building Site	Building Value ($1 = rental)	Content Value	Potential Building Damage ($)	Potential Content Damage ($)	Total Damage ($)
Corning Animal Shelter	$170,000	$170,000	$9,871	$64,252	$74,123

Important to note: Government Facilities may not be presented in table above, as the County Assessor does not collect valuation information on Government Owned Facilities.

Table 1-18: High Potential Loss Facility Damage Estimates (100-YR Flood)

High Potential Loss Facility	Building Value	Content Value	Potential Building Damage ($)	Potential Content Damage ($)	Total Damage ($)
High Potential Loss	**$3,726,997**	**$1,863,498**	**$111,810**	**$204,985**	**$316,795**
Hotel	**$3,726,997**	**$1,863,498**	**$111,810**	**$204,985**	**$316,795**
Holiday Inn	$3,726,997	$1,863,498	$111,810	$204,985	$316,795

Linear Utilities

It is important to determine who may be at risk if infrastructure is damaged by flooding. Roads or railroads that are blocked or damaged can isolate residents and can prevent access throughout the City, including emergency service providers needing to get to vulnerable populations or to make repairs. Bridges washed out or blocked by floods or debris also can cause isolation. Water and sewer systems can be flooded or backed up, causing health problems. Underground utilities can also be damaged. Table 1-19 shows the linear critical facilities in the floodplain.

Table 1-19: Critical Facilities (Linear) in the Floodplain – City of Corning

Infrastructure Type (Linear)	100-YR, Non-Floodway	100-YR, Floodway	500-YR	Total Mileage
Transportation and Lifeline	4.3	-	0.8	5.1
FEMA Levee	-	-	-	-
USACE Levee	-	-	-	-
Natural Gas Pipeline	-	-	-	-
Transmission Line	0.1	-	-	0.1
Railroad	0.0	-	-	0.0
Street	4.2	-	0.8	5.0
-Interstate	-	-	-	-
-Primary Highway	-	-	-	-
-State/County Highway	1.2	-	0.4	1.6
-Local Road	2.8	-	0.4	3.2
-Other Road	0.1	-	-	0.1
-4WD Road	-	-	-	-
Grand Total	4.3	-	0.8	5.1

1.4.9.6.5 Future Trends in Development

The City needs to adopt a Floodplain Overlay Zone to restrict development of 100-YR floodplains. This would become an addition to the zoning ordinance. Areas in question should be verified by a hydrological study with a qualified engineer.

Careful planning, land use regulation, grading ordinances and maintenance of waterways will result in reducing any damage that may occur from flooding. Limiting land uses in these areas and encouraging the preservation of open space or buffering of the flood plain zone will decrease flood effects to the City. A flood plain overlay district should be adopted to discourage development in flood prone areas. This would act to protect riparian corridors and reduce the potential damage that may result from flooding. The following policies are in place with regard to Flood Mitigation:

- Require the approval of drainage and erosion control plans before authorizing any initial grading and clearing activities.
- Regulate the approval of new development to ensure that new projects do not increase the potential or severity for damage from flooding.
- Regulate new development to ensure that waterways and drainage channels will not be impacted in such a manner that drainage is impeded or decreased significantly.
- Ensure that any increased runoff from projects is diverted into storm drains of adequate capacity and not be diverted as surface water runoff onto adjoining properties.
- Ensure that new development does not increase the potential or severity of the flood hazard in the City of Corning.
- The City of Corning shall regulate land use in areas that are prone to flooding and only allow those areas to be developed with proper mitigation.
- The City of Corning should promote the public's awareness of potential for and the severity of local flooding.

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1.4.10 Severe Weather

Three types of severe weather events typically impact the City: thunderstorms, damaging winds and hail storms. These types of severe weather events are described in Section 4.9 of the base plan. The severe weather events within the City of Corning are often related to high winds associated with winter storms and thunderstorms. The City can expect to experience exposure to some type of severe weather event at least annually.

1.4.10.1 Regulatory Oversight

The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. The City of Corning has adopted the International Building Code in response to California mandates. This code is equipped to deal with the impacts of severe weather events. Land use policies identified in the general plan also address many of the secondary impacts (flood and landslide) of the severe weather hazard. With these tools, the City of Corning is equipped to deal with future growth and the associated impacts of severe weather.

1.4.10.2 Past Events

The severe weather events for the City shown in Table 1-20 are often related to high winds associated with winter storms and thunderstorms. There have been three "recorded" severe weather events of significance that caused property damage in recent history near or within the City of Corning.

Table 1-20: Past Severe Storm Events in the City of Corning

Date	Type	Deaths or Injuries	Property Damage
3/23/05	Hail	0	$6,000
Description: *Several minor accidents occurred due to the slick roadways.*			
2/22/07	Thunderstorm Wind	0	$6,000
Description: *Moderately strong downdraft winds from a diminishing thunderstorm caused damage to a rural neighborhood of mobile homes. Damage to occupied homes included torn roofing and skirting material and loss of some small backyard items.*			
6/11/09	Hail	0	None reported
Description: *Hail to the size of quarters, strong gusty winds, and heavy rain was reported west of Interstate 5 near Corning.*			
1/23/16	Hail	0	$30,000
Description: *Large amounts of hail fell and accumulated, 4 to 5 inches deep on I5 and adjacent local roads. The hail was up to an inch in diameter. The hail caused very slippery conditions, causing 3 vehicles to slide into the ditch. These vehicles needed to be towed. The hail also caused long traffic delays. Snow plows were required to plow the hail off of I5.*			

1.4.10.3 Location

Generally, the entire planning area for the City of Corning can be affected by a Severe Weather Hazard. Areas with trees, power and light poles, large signs, communication towers and other structures with exposed surface areas are all vulnerable to the effects of severe weather. Severe weather events have the potential to happen anywhere in the City. Wind events are most damaging to areas that are heavily treed, such as the residential areas near the City Center.

1.4.10.4 Frequency

The planning area can expect to experience exposure to some type of severe weather event at least annually. Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century. The number of weather-related disasters during the 1990s was four times that of the 1950s, and cost 14 times as much in economic losses. Historical data shows that the probability for severe weather events increases in a warmer climate. The changing hydrograph caused by climate change could have a significant impact on the intensity, duration and frequency of storm events. All of these impacts could have significant economic consequences.

1.4.10.5 Severity

Severe windstorms can be a frequent problem in the City of Corning and have been known to cause damage to utilities. The predicted wind speed given in wind warnings issued by the National Weather Service is for a one-minute average; gusts may be 25 to 30 percent higher.

Tornadoes are potentially the most dangerous of local storms, but they are not common in the planning area. If a major tornado were to strike within the populated areas of the City, damage could be widespread. Businesses could be forced to close for an extended period or permanently, fatalities could be high, many people could be homeless for an extended period, and routine services such as telephone or power could be disrupted. Buildings may be damaged or destroyed. California ranks 32nd among states for frequency of tornadoes, 44th for the frequency of tornados per square mile, 36th for injuries, and 31st for cost of damage. The State has no reported deaths from tornadoes.

1.4.10.6 Warning Time

Meteorologists can often predict the likelihood of a severe storm within a region. This can give several days of warning time to City of Corning staff. However, meteorologists cannot predict the exact time of onset or severity of the storm. Some storms may come on more quickly and have only a few hours of warning time.

The Tehama County Sheriff's Office uses the Tehama Alert System to notify residents of a potential fire, gas leak, flood or other natural or man-caused incident in the County that would prompt an immediate evacuation or shelter in place protocols.

1.4.10.7 Severe Weather Vulnerability

The most common problems associated with severe storms are immobility and loss of utilities. Fatalities are uncommon, but can occur. Roads may become impassable due to flooding, downed trees, ice or snow, or a landslide. Power lines may be downed due to high winds or ice accumulation, and services such as water or phone may not be able to operate without power. Lightning can cause severe damage and injury.

The most significant secondary hazards associated with severe local storms are floods, falling and downed trees, landslides and downed power lines. Rapidly melting snow combined with heavy rain can overwhelm both natural and man-made drainage systems, causing overflow and property destruction. Landslides occur when the soil on slopes become oversaturated and fails.

1.4.10.7.1 Population

It can be assumed that the entire City is exposed to some extent to severe weather events. Certain areas are more exposed due to geographic location and local weather patterns. Vulnerable populations are the elderly, low income or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life threatening to those dependent on electricity for life support. Isolation of these populations is a significant concern. These populations face isolation and exposure during severe weather events and could suffer more secondary effects of the hazard.

1.4.10.7.2 Property

All property is vulnerable during severe weather events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Those that are located under or near overhead lines or near large trees may be vulnerable to falling debris (tree branches, ice, etc.) or may be damaged in the event of a collapse.

According to the Tehama County Assessor, there are 2,524 improved parcels within the City of Corning. Most of these buildings are residential. It is estimated that 29 percent of the residential structures were built without the influence of a structure building code with provisions for wind loads. These buildings are considered to be exposed to the severe weather hazard, but structures in poor condition or in particularly vulnerable locations (located on hilltops or exposed open areas) may risk the most damage. The frequency and degree of damage will depend on specific locations.

1.4.10.7.3 Critical Facilities and Infrastructure

All critical facilities are exposed to severe weather. The most common critical facilities problems associated with severe weather are loss of utilities. Downed power lines can cause blackouts, leaving large areas isolated. Phone, water and sewer systems may not function. Roads may become impassable due to ice or snow or from secondary hazards such as landslides.

Incapacity and loss of roads are the primary transportation failures resulting from severe weather, mostly associated with secondary hazards. Landslides caused by heavy prolonged rains can block roads. High winds can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, isolating population, and disrupting ingress and egress.

Severe windstorms, downed trees, and ice can create serious impacts on power and above-ground communication lines. Freezing of power and communication lines can cause them to break, disrupting electricity and communication. Loss of electricity and phone connection would leave certain populations isolated because residents would be unable to call for assistance.

1.4.10.8 Future Trends

All future development will be affected by severe storms. The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. The City of Corning has adopted the International Building Code in response to California mandates. This code is equipped to deal with the impacts of severe weather events. Land use policies identified in the general plan also address many of the secondary impacts (flood and landslide) of the severe weather hazard. With these tools, the City of Corning is equipped to deal with future growth and the associated impacts of severe weather.

1.4.11 Wildfire

Corning's periodically arid climate, combined with extensive areas of grass and brush-covered open space, create an ever-present threat of wildland fire. Extreme weather conditions, such as high temperatures, low humidity, and strong winds may cause an ordinary fire to expand into one of massive proportions. A high fuel load, resulting from years of accumulation, contributes to the problem.

Some of the land is open space, but developed ranchlands or orchards are also at risk. Like the rest of Tehama County, a significant natural hazard to most northern California communities is wild land fires. This type of hazard results from three main factors including:

- A climate characterized by dry summers, high temperatures, extremely low relative humidity
- Vegetation characterized by fire tolerant species (e. g. chaparral) with high fuel load potential
- Human settlement in areas of steep slopes, canyons and foothill areas where fire tolerant species accumulate.

The City of Corning is affected mainly by the climatic factor and is not significantly affected by the other two. Generally, the undeveloped portions of the study area do not pose a high-risk due to existing agricultural practices on the land. Most lands are actively cultivated with irrigated crops that have little fire fuel. However, grass fires can occur on uncultivated lands, particularly where there is native vegetation, such as the riparian corridors near local water courses. Fire hazards can also occur in urbanized areas of the study area. Residential and commercial structure fires can occur particularly in older neighborhoods. Additionally, some industrial processes can include the use or storage of flammable liquids. The storage of propane gas can also create a fire hazard.

1.4.11.1 Regulatory Oversight

1.4.11.1.1 Burning Regulations

Corning Code of Ordinances, Title 8- Health and Safety, Chapter 8.12 declares the following as public nuisances:

- Grass, weeds or other obstructions on sidewalks, parkways or streets;
- Weeds, rubbish or other material dangerous or injurious to neighboring property or the health or welfare of residents of the vicinity.
- Dry grass, stubble, brush, litter or other flammable material which endanger the public safety by creating a fire hazard.

The fire chief is charged with the obligation of enforcing the provisions of this chapter.

1.4.11.1.2 Weed Abatement

Where the weed abatement officer determines that nuisance conditions exist on real property located in the City, and the owner of such property is unavailable or has failed or refused to abate such nuisance and the nuisance constitutes a substantial and immediate threat to the public health or safety, the weed abatement officer, with the approval of the City Manager, may cause the nuisance to be summarily abated without a nuisance abatement order issued by the city council in the manner hereinbefore required by this chapter. In this case the weed abatement officer shall prepare a written report setting forth the justification for such summary abatement procedures and forward such report to the City Council for consideration along with the record of city abatement costs at the first regular meeting of the city council following the twentieth day after completion of abatement work.

1.4.11.1.3 California Building Code (CBC) Fire-Resistant Fire Requirements

See Section 12: Wildfire Hazard Profile of the base plan for the County/ CBC requirements for fire clearance, setbacks, residential burn permits and residential development.

1.4.11.2 Past Events

Since 2003 there have been four minor fire events that could be classified as wildfires in or around the City. These events are listed in Table 1-21. No structural damage from wildland fire events has been reported and the probability of potential structural damage is low due to enforcement of the city's weed abatement ordinance by the Fire Department.

Table 1-21: Wildfire Events in the City of Corning since 2003

Date	Event Name	Cause
6/2/13	Edith Ave	Grass Fire
6/9/09	Fig Lane	Undetermined
8/31/08	Liberal Ave	Vagrant
9/3/03	Sourgrass Road	Undetermined

Source: City of Corning 2012 All-Hazard Mitigation Plan and Cal Fire

1.4.11.3 Location

CAL FIRE adopted Fire Hazard Severity Zone maps for the Local Responsibility Area (LRA) in June 2008. Fire hazard mapping is a way to measure the physical fire behavior to predict the damage a fire is likely to cause. Fire hazard measurement includes vegetative fuels, probability of speed at which a wildfire moves the amount of heat the fire produces, and most importantly, the burning fire brands that the fire sends ahead of the flaming front.

The model used to develop the information in Table 1-22 accounts for topography, especially the steepness of the slopes (fires burn faster as they burn up-slope.). Weather (temperature, humidity, and wind) also has a significant influence on fire behavior. The areas depicted as moderate, high and very high are of particular concern and potential fire risk in these areas are constantly increasing as human development and the wildland urban interface areas expand.

Approximately 26 percent of the land area in Corning is at moderate risk from wildland fires. Table 1-22 shows the sum of acres and square miles in each wildfire hazard severity zone. Moderate Fire Hazard Severity Zones have been identified along the eastern and northeastern borders of the City as well as the foothills in the south western most region of the City. Residential uses have been constructed along these areas that back up to an area of natural vegetation that is highly susceptible to fires. Figure 1-12 illustrates the limits of the Moderate Fire Hazard Severity Zones for the City. Construction in the Moderate Fire Hazard Severity Zone will be required to meet the requirements of Chapter 7A of the California Building Code relating to fire resistant rated construction.

Table 1-22: Total Area with Wildfire Risk

Wildfire Hazard Severity Zone	Sum of Acres	Sum of Square Miles
Very High	-	-
High	-	-
Moderate	597.6	0.9
Non-Wildland/Non-Urban	377.7	0.6
Urban Unzoned	1,296.5	2.0
Total	**2,271.8**	**3.5**

1.4.11.4 Frequency

Data suggests a trend toward increasing acres burned statewide, with particular increases in conifer vegetation types. This trend is supported in part by the fact that the three largest fire years since 1950 have all occurred within the last 10 years. However, the potential of having a wild land fire affecting the City is minimal. The City of Corning Fire Department and Cal Fire respond rapidly to contain fires resulting in less damage.

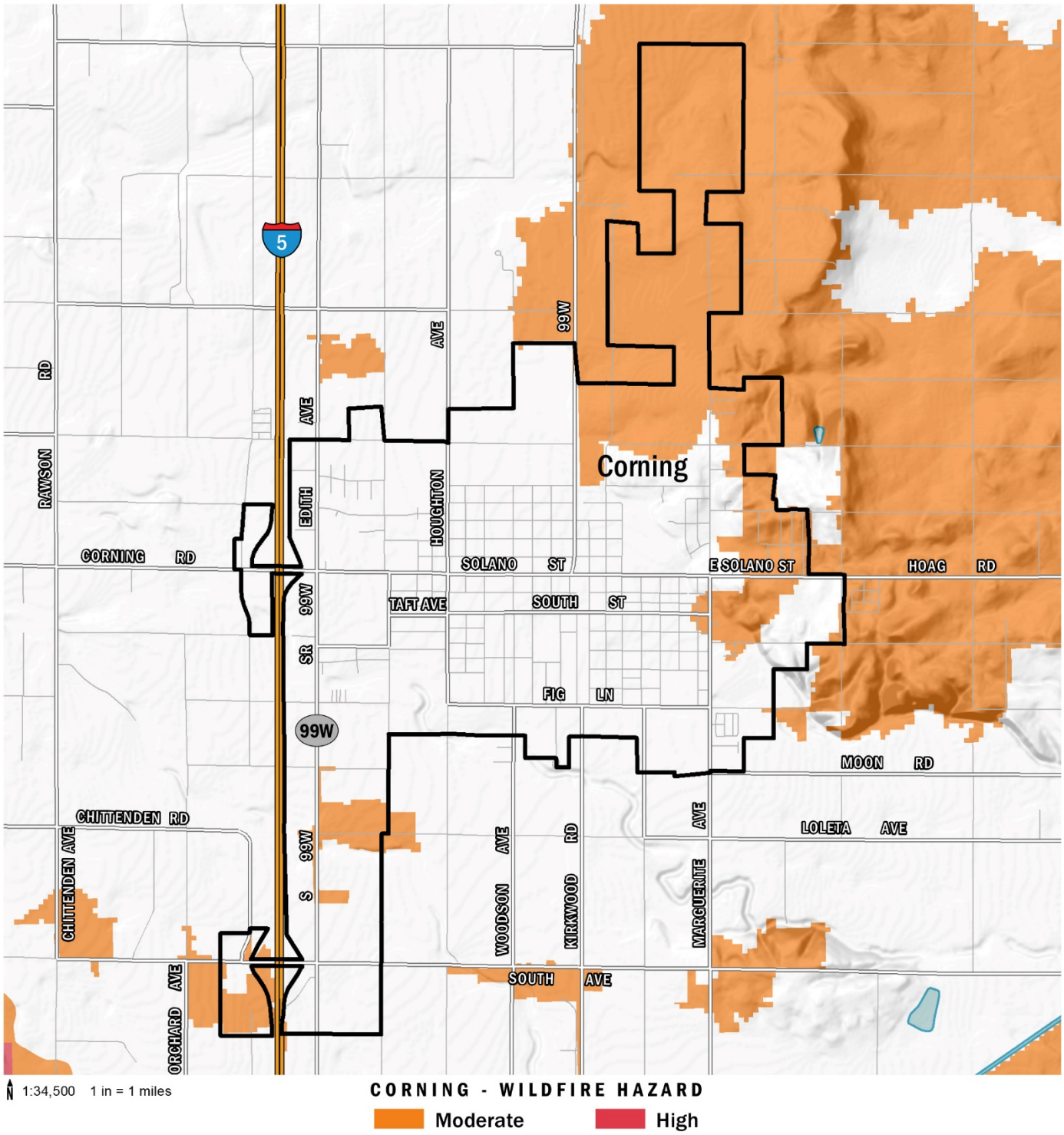
USGS LANDFIRE (Landscape Fire and Resource Management Planning Tools), is a shared program between the wildland fire management programs of the U.S. Department of Agriculture Forest Service and U.S. Department of the Interior, providing landscape scale geo-spatial products to support cross-boundary planning, management, and operations. Historical fire regimes, intervals, and vegetation conditions are mapped using the Vegetation Dynamics Development Tool (VDDT). This USGS data supports fire and landscape management planning goals in the National Cohesive Wildland Fire Management Strategy, the Federal Wildland Fire Management Policy, and the Healthy Forests Restoration Act.

As part of the USGS Landfire data sets, the Mean Fire Return Interval (MFRI) layer quantifies the average period between fires under the presumed historical fire regime. MFRI is intended to describe one component of historical fire regime characteristics in the context of the broader historical time period represented by the LANDFIRE Biophysical Settings (BPS) layer and BPS Model documentation.

MFRI is derived from the vegetation and disturbance dynamics model VDDT (Vegetation Dynamics Development Tool) (LF_1.0.0 CONUS only used the vegetation and disturbance dynamics model LANDSUM). This layer is created by linking the BpS Group attribute in the BpS layer with the Refresh Model Tracker (RMT) data and assigning the MFRI attribute. This geospatial product should display a reasonable approximation of MFRI, as documented in the RMT. See Figure 1-12 for predicted fire return interval for the City.

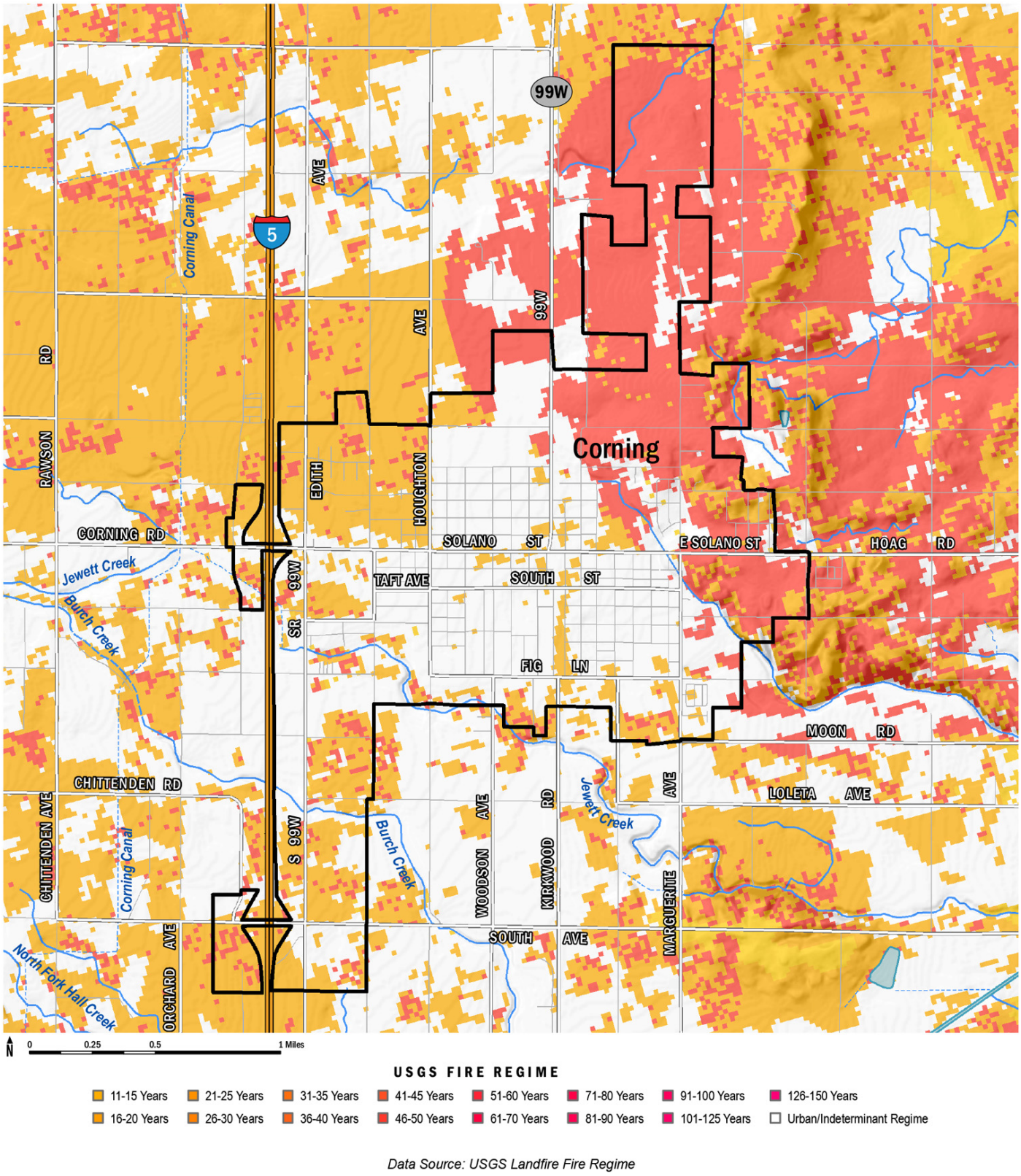
1.4.11.5 Severity

Although the City does not have a high risk of wildfire in the City itself, citizens may be affected by wildfires in the County or region. Smoke and air pollution from wildfires can be a health hazard, especially for sensitive populations including children, the elderly and those with respiratory and cardiovascular diseases. Wildfire may also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke. In addition, wildfire can lead to ancillary impacts such as landslides in steep ravine areas and flooding due to the impacts of silt in local watersheds.



Data Source: CAL FIRE, Fire Hazard Severity Zones

Figure 1-11: Wildfire Hazard Map for the City of Corning



Data Source: USGS Landfire Fire Regime

Figure 1-12: USGS Fire Regime for the City of Corning

1.4.11.6 Wildfire Hazard Vulnerability

1.4.11.6.1 Population

Wildfire is of greatest concern to populations residing in the moderate, high and very high fire hazard severity zones. U.S. Census Bureau block data was used to estimate populations within the Cal Fire identified hazard zones. As seen in Figure 1-13, 736 residents (9.6% of the total population) live in areas considered to be of moderate risk to wildfires. There are no high or very high fire hazard severity zones in the City of Corning.

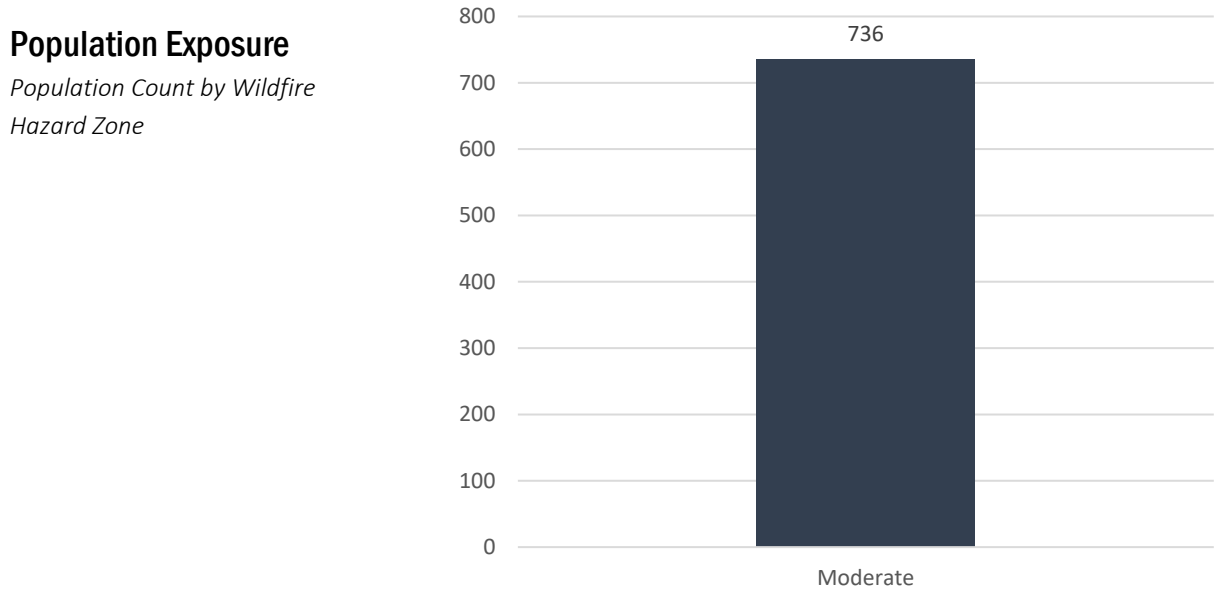


Figure 1-13: Population at risk from wildfire hazards

1.4.11.6.2 Property

The County's parcel layer was used as the basis for the inventory of improved residential parcels for the City of Corning. In some cases, a parcel will be within in multiple fire threat zones. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The centroids were then overlaid with the fire threat layer to determine the risk for each structure. The fire threat zone in which the centroid was located was assigned to the entire parcel. This methodology assumed that every parcel with a square footage value greater than zero was developed in some way. Only improved parcels were analyzed.

Table 1-23 displays the number of homes in the very high, high and moderate wildfire hazard zones within the City of Corning jurisdictional boundaries and values for each. Only 7% of the City of Corning lies within the designated "Moderate" Fire Hazard Severity Zone (FHSZ).

Table 1-23: Residential Buildings and Content within Cal Fire Wildfire Severity Zones

	Total Parcels	Total Market Value Exposure ($)	Total Content Value Exposure ($)	Total Value ($)
Corning	2,524	$ 352,747,126	$ 238,484,505	$ 591,231,631

Fire Hazard Severity Hazard Zone	Improved Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
Very High	-	*0.0%*	$ -	$ -	$ -	*0.0000%*
High	-	*0.0%*	$ -	$ -	$ -	*0.0000%*
Moderate	287	*11.4%*	$ 27,441,082	$ 15,618,738	$ 43,059,820	*7.2831%*
Total	**287**	**11%**	**$ 27,441,082**	**$ 15,618,738**	**$ 43,059,820**	**7%**

1.4.11.6.3 Critical Facilities and Infrastructure

Critical facilities data was superimposed with fire hazard severity zone data to determine the type and number of facilities within each risk classification. Table 1-24 and Table 1-25 list the critical facilities in the moderate, high and very high wildfire hazard zones for Corning. As demonstrated in the tables, a very small portion of critical facilities are within moderate wildfire risk areas.

Table 1-24: Critical Facility Exposure to Wildfire

Infrastructure Type	Moderate	High	Very High	Total Feature Count
Essential Facility	1	0	0	1
EOC	0	0	0	0
Fire Station	0	0	0	0
Government Facility	1	0	0	0
Hospital	0	0	0	0
Police Station	0	0	0	0
School	0	0	0	0
High Potential Loss	0	0	0	0
Residential Child Care	0	0	0	0
Adult Residential Care	0	0	0	0
Child Care	0	0	0	0
Foster/Home Care	0	0	0	0
Home Care	0	0	0	0
Other Care Facility	0	0	0	0
Elder Care	0	0	0	0
Dam	0	0	0	0
Hotel	0	0	0	0
Transportation and Lifeline	2	0	0	2
Airport	0	0	0	0
Bridge	2	0	0	0

Infrastructure Type	Moderate	High	Very High	Total Feature Count
Bus Facility	0	0	0	0
FCC AM Tower	0	0	0	0
FCC Cell Tower	0	0	0	0
FCC FM Tower	0	0	0	0
Natural Gas Station	0	0	0	0
Power Plant	0	0	0	0
Substation	0	0	0	0
Waste Water Facility	0	0	0	0
Grand Total	**3**	**-**	**-**	**3**

Table 1-25: Lifelines with Wildfire Risk

Infrastructure Type (Linear)	Moderate	High	Very High	Total Mileage
Transportation and Lifeline	**6.5**	**-**	**-**	**6.5**
FEMA Levee	-	-	-	-
USACE Levee	-	-	-	-
Natural Gas Pipeline	-	-	-	-
Transmission Line	-	-	-	-
Railroad	0.1	-	-	0.1
Street	6.4	-	-	6.4
-Interstate	0.0	-	-	0.0
-Primary Highway	-	-	-	-
-State/County Highway	1.4	-	-	1.4
-Local Road	4.9	-	-	4.9
-Other Road	0.1	-	-	0.1
-4WD Road	-	-	-	-
Grand Total	**6.5**	**-**	**-**	**6.5**

1.4.11.7 Future Trends

City of Corning urbanization in or near dormmate olive orchards and other dormmate tree crops can create the potential for increased exposure to wildfire issues. As Corning experiences future growth, it is anticipated that the exposure to this hazard will remain or even decrease over time due removal of dormmate orchards.

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1.4.12 Drought

The gap between water supply and demand in California is predicted to total 2.4 million-acre feet during drought years and up to 6.2 million-acre feet in drought years by 2020. It can take 20 years or longer to develop and finance a supplemental water supply for new developments. About 894 gallons of water are needed to grow the food for the daily diet of an average person. On an annual basis, an individual's water use is about 326 gallons.

The City of Corning does not rely on surface water for its supply. In an average year, approximately 30% of California's water needs are met by groundwater. In times of drought, groundwater consumption can rise to as much as 60%! The dependence on groundwater during dry years is based on the existence of hundreds of millions of acre-feet of water in California's 450 groundwater basins compared to approximately 45 million acre-feet in California's 1,200 surface water reservoirs (ACWA Groundwater Committee).

Most groundwater is a result of rain and melted snow that has soaked into the ground, making it a self-replenishing source. Some groundwater has existed for millions of years. Groundwater seeps into the ground by making its way into cracks and spaces in sand, soil, and rocks, forming an aquifer. From the aquifer, the water is brought back to the surface naturally through springs, sometimes discharging into lakes and streams, or via man-made wells.

Aquifers are replenished through a process known as recharge. Recharge can be a naturally occurring process as part of the hydrologic cycle as rainfall infiltrates the land surface and percolates into the underlying aquifers. Natural recharge occurs at different rates in different areas due to variations in properties such as soil types, plant cover, land slope, and rainfall intensity. In addition to rainfall recharge, bodies of surface water may also recharge groundwater aquifers by seeping from the sides of water bodies and percolating into the aquifer. A third source is artificial recharge where aquifers are directly replenished through the pumping or injecting of water into the wells or by spreading water over a land surface, allowing it to seep into the aquifer at a natural rate. Artificial recharge is also a useful tool to dilute contaminated groundwater supplies.

1.4.12.1 Regulatory Oversight

1.4.12.1.1 General Plan Water Resource Goals and Policies

The 2014-2034 City of Corning General Plan Update establishes the following policies to maintain, conserve and improve existing and future surface and groundwater quantity and quality.

- Promote water conservation in existing and future development.
- Support the use of reclaimed water from all sources including, but not limited to the wastewater treatment plant, detention facilities and industrial and commercial waste and water treatment facilities.

- The City shall maintain standards for erosion and sediment control plans for development potentially impacting surface waters.
- Industrial and commercial by-product discharges, waste disposal sites, and other sources of hazardous or polluting materials shall be designed to prevent contamination to rivers, creeks, streams, reservoirs, or the groundwater basin in accordance with standards accepted by or imposed by the City and the State Regional Water Quality Control Board.
- Minimize household hazardous waste disposal that could potentially contaminate soils and groundwater.

1.4.12.1.2 Tehama County Flood Control and Water Conservation District Coordinated AB 3030 Groundwater Management Plan

The primary purpose of the 2012 Tehama County Groundwater Management Plan is to sustain groundwater levels that balance long-term extraction and replenishment. Annual recovery of spring groundwater levels after the previous summer season of more intensive groundwater extraction and following each winter season will be used to assess annual groundwater recharge. Long-term trends of annual groundwater recharge shall be the primary basis for evaluating the long-term balance between extraction and replenishment.

1.4.12.2 Past Events

On January 17, 2014 California State Governor, Jerry Brown, declared a drought state of emergency. On April 17, 2017, Brown issued Executive Order B-40-17, officially ending the drought state of emergency in all California counties except Fresno, Kings, Tulare, and Tuolumne.

Section 4.5.3.1 of the Base Plan explains past drought events affecting Tehama County. These events also affected the City of Corning.

1.4.12.3 Location

The entire City is subject to drought. The City's primary source of water is provided from eight wells that are owned and operated by the City of Corning. The City relies on water mains, some of which are over 100 years old. (City of Corning All-Hazard Mitigation Plan, 2012)

1.4.12.4 Frequency

Historical data for the Tehama County region indicate numerous periods of drought, the most significant being the period from 1987 through 1994. According to the California State Hazard Mitigation Plan, Tehama County was affected by three drought incidents from 1972 to 2017.

1.4.12.5 Severity

A drought directly or indirectly impacts all people in affected areas. A drought can result in farmers not being able to plant crops or the failure of planted crops. This results in loss of work for farm workers and those in food processing jobs. Other water-dependent industries are commonly forced to shut down all or a portion of their facilities, resulting in further layoffs. A drought can harm recreational companies that use water (e.g., swimming pools, water parks, and river rafting companies) as well as landscape and nursery businesses because people will not invest in new plants if water is not available to sustain them.

1.4.12.6 Drought Vulnerability

All people, property and environments in Corning would be exposed to some degree to the impacts of moderate to extreme drought conditions. Drought produces a complex web of impacts that spans many sectors of the economy and reaches well beyond the area experiencing physical drought. This complexity exists because water is integral to the ability to produce goods and provides services. Drought can affect a wide range of economic, environmental and social activities. The vulnerability of an activity to the effects of drought usually depends on its water demand, how the demand is met, and what water supplies are available to meet the demand. California's 2013 Water Plan indicates that water demand in the state will increase through 2030. Although the Department of Water Resources predicts a modest decrease in agricultural water use, the agency anticipates that urban water use will increase by 1.5 to 5.8 million acre-feet per year.

1.4.12.6.1 Population

As in Tehama County as a whole, the planning partnership has the ability to minimize any impacts on residents and water consumers in the county should several consecutive dry years occur. No significant life or health impacts are anticipated as a result of drought within the planning area.

1.4.12.6.2 Property

As in Tehama County as a whole, no structures will be directly affected by drought conditions, though some structures may become vulnerable to wildfires, which are more likely following years of drought. Droughts can also have significant impacts on landscapes, which could cause a financial burden to property owners. However, these impacts are not considered critical in planning for impacts from the drought hazard.

1.4.12.6.3 Critical Facilities and Infrastructure

City water is provided from eight wells that are owned and operated by the City of Corning. Additionally, the City of Corning complies with Needed Fire Flow requirements with the current ground water supplies and a 100,000-gallon emergency supply storage tank.

The City's eight well locations consist of deep well turbine pumps pumping ground water from the deep-water aquifer located beneath the City. These are summarized in Table 1-25. Three additional well sites are currently off-line and not supplying water into the City system. The City has upgraded seven (7) of the eight (8) well sites by adding Variable Frequency Drive Systems that computer control and operate the pumps on a preset pressure setting. A computerized control panel remotely monitors and controls the functions of the water storage tower and these eight well sites. An auto dialer system can dial the Fire Department 24 hours a day reporting any system failures, which are then reported to the

Public Works Department. Other improvements include installation of five diesel powered standby generators to operate automatically and within minutes of a power failure. For security purposes, motion sensitive alarm systems have been installed at City Wells.

Table 1-26: Summary of Wells in the City of Corning

Source Name	Vulnerability Summary
Well 001	Well 001 is considered to be most vulnerable to contamination from the agricultural/irrigation wells located in the general vicinity around the well.
Well 002	Well 002 is considered to be most vulnerable to contamination from nearby airport activities, historic waste dumps and landfills, metal plating, finishing, or fabricating, and septic tank/leach field systems located in the general vicinity around the well.
Well 003	Well 003 is considered to be most vulnerable to contamination from the historic gas stations and metal plating, finishing, and fabricating facilities located in the general vicinity around the well.
Well 005	Well 005 is considered to be most vulnerable to contamination from the historic gas stations and metal plating, finishing, and fabricating facilities located in the general vicinity around the well.
Well 008	Well 008 is considered to be most vulnerable to contamination from injection wells or dry wells located in the general vicinity around the well.
Well 009	Well 009 is considered to be most vulnerable to contamination from the grazing activities located in the general vicinity around the well.
Well 010	Well 010 is considered to be most vulnerable to contamination from the high-density septic tank and leach field disposal systems in the vicinity around the well.
Well 019	Well 019 is considered most vulnerable to contamination from sewer collection and storm water drainage.

1.4.12.7 Future Trends

More than eight out of ten California counties will face frequent water shortages within 40 years. Climate change will exacerbate water problems in more than a third of counties across the US. In California, the outlook is worse. Forty-eight counties (83%) will be at risk by 2050, and 19 counties are on the critical list, those the report describes as under “extreme risk.” Only ten counties, mostly at the northern end of the state, were assigned to the low-risk category.

In the report Climate Change, Water, and Risk: Current Water Demands Are Not Sustainable, the authors have mapped the entire US according to drought risk, parsing data to the county level. The number of counties listed at greatest risk for water shortages is 14 times greater than in previous studies. Critical regions are the Great Plains and the Southwest. The report uses the most recent data from the US Department of Agriculture and other agencies, as well as the most recent climate models from the Intergovernmental Panel on Climate Change (IPCC) to evaluate water withdrawal.

As the climate continues to warm, there will be a tighter squeeze on water supplies. These stresses include a shriveling Sierra snowpack and earlier spring runoff, which result in reduced water storage capacity. The report also projects precipitation to decrease in some parts of California by five inches per year, by 2050. Rising surface temperatures imply greater moisture loss in vegetation and on the ground surface. The report warns that without any comprehensive climate policy, demand for freshwater will overtake available supply in this century. (Council, 2010)

1.4.13 Earthquake

According to FEMA, an earthquake is "a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface." Earthquakes can be one of the earth's most damaging hazards because the shaking of the earthquake may cause buildings and bridges to collapse; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, and structure fires as result of ruptured gas lines. For more general information on Earthquake hazards, please see Section 4.6 in Volume 1.

1.4.13.1 Regulatory Oversight

1.4.13.1.1 National Earthquake Hazard Reduction Program (NEHRP) Soil Maps

NEHRP soil types define the locations that will be significantly impacted by an earthquake. NEHRP Soils B and C typically can sustain low-magnitude ground shaking without much effect. The areas that are most commonly affected by ground shaking have NEHRP Soils D, E and F. The Corning area is made up predominately of Soils C (very dense soil and soft rock).

1.4.13.1.2 General Plan Goals and Policies

The 2014-2034 City of Corning General Plan Update establishes the following policies to minimize the risk to lives and property from seismic activity and geologic hazards.

- Comply with state seismic and building standards in the design and siting of critical facilities, including hospital facilities, police and fire stations, school facilities, hazardous material manufacture and storage facilities, bridges, and large public assembly halls. Requires all new buildings in the City be built under the seismic requirements of the currently adopted codes.
- Coordinate with county, state and federal agencies monitoring volcanic activity and hazards.
- Sedimentation and erosion from development shall be minimized through ordinances and implementation mechanisms as adopted by the City.
- When soil tests reveal the presence of expansive soils, require engineering design measures to eliminate or mitigate their impacts.

1.4.13.2 Past Events

The City of Corning does not have an extensive earthquake history. According to the California State Hazard Mitigation Plan, Tehama County had only one occurrence of earthquake activity that caused any measurable damage from 1800 to 2007. The only known seismic activity in the planning area occurred in concurrence with the volcanic eruption of Lassen Peak in 1914. There has been no declared disaster activity for earthquake within the planning area since 1950. Corning-area historical earthquake activity is near the California state average.

- On 8/1/1975 at 20:20:12, a magnitude 5.8 (5.8 MB, 5.6 MS, 5.8 MW, 5.7 ML, Class: Moderate, Intensity: VI - VII) earthquake occurred 50.9 miles away from the city center
- On 3/8/1992 at 03:43:04, a magnitude 5.5 (5.3 MB, 5.3 MS, 5.5 MW, 5.3 ML, Depth: 8.1 mi) earthquake occurred 97.6 miles away from the city center

- On 11/26/1998 at 19:49:53, a magnitude 5.4 (5.0 MB, 4.9 MS, 5.4 MW, 5.2 ML, Depth: 14.5 mi) earthquake occurred 49.7 miles away from Corning center
- On 8/10/2001 at 20:19:26, a magnitude 5.2 (4.8 MB, 4.9 MS, 5.2 MW, 5.1 MW, Depth: 11.1 mi) earthquake occurred 81.8 miles away from Corning center
- On 1/19/2008 at 23:13:05, a magnitude 4.9 (4.9 MB, 4.3 MS, 4.9 MW, 4.7 MW, Depth: 1.8 mi, Class: Light, Intensity: IV - V) earthquake occurred 32.7 miles away from the city center
- On 4/30/2008 at 03:03:06, a magnitude 5.4 (5.4 MB, 4.9 MS, 5.4 MW, Depth: 18.1 mi) earthquake occurred 93.7 miles away from the city center (California Geological Survey, 2017)

1.4.13.3 Location

As shown in Figure 1-14 and Figure 1-15, the entire City of Corning is located in the Moderate risk zone in the Battle Creek Scenario.

1.4.13.3.1 Shake Maps

A shake map is a representation of ground shaking produced by an earthquake. The information it presents is different from the earthquake magnitude and epicenter that are released after an earthquake because shake maps focus on the ground shaking resulting from the earthquake, rather than the parameters describing the earthquake source. An earthquake has only one magnitude and one epicenter, but it produces a range of ground shaking at sites throughout the region, depending on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the earth's crust. A shake map shows the extent and variation of ground shaking in a region immediately following significant earthquakes.

Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and Modified Mercalli intensity.

A probabilistic seismic hazard map shows the hazard from earthquakes that geologists and seismologists agree could occur. The maps are expressed in terms of probability of exceeding a certain ground motion, such as the 10-percent probability of exceedance in 50 years. This level of ground shaking has been used for designing buildings in high seismic areas. Figure 1-14 and Figure 1-15 show the estimated ground motion for the Battle Creek Scenario in Corning and Tehama County.

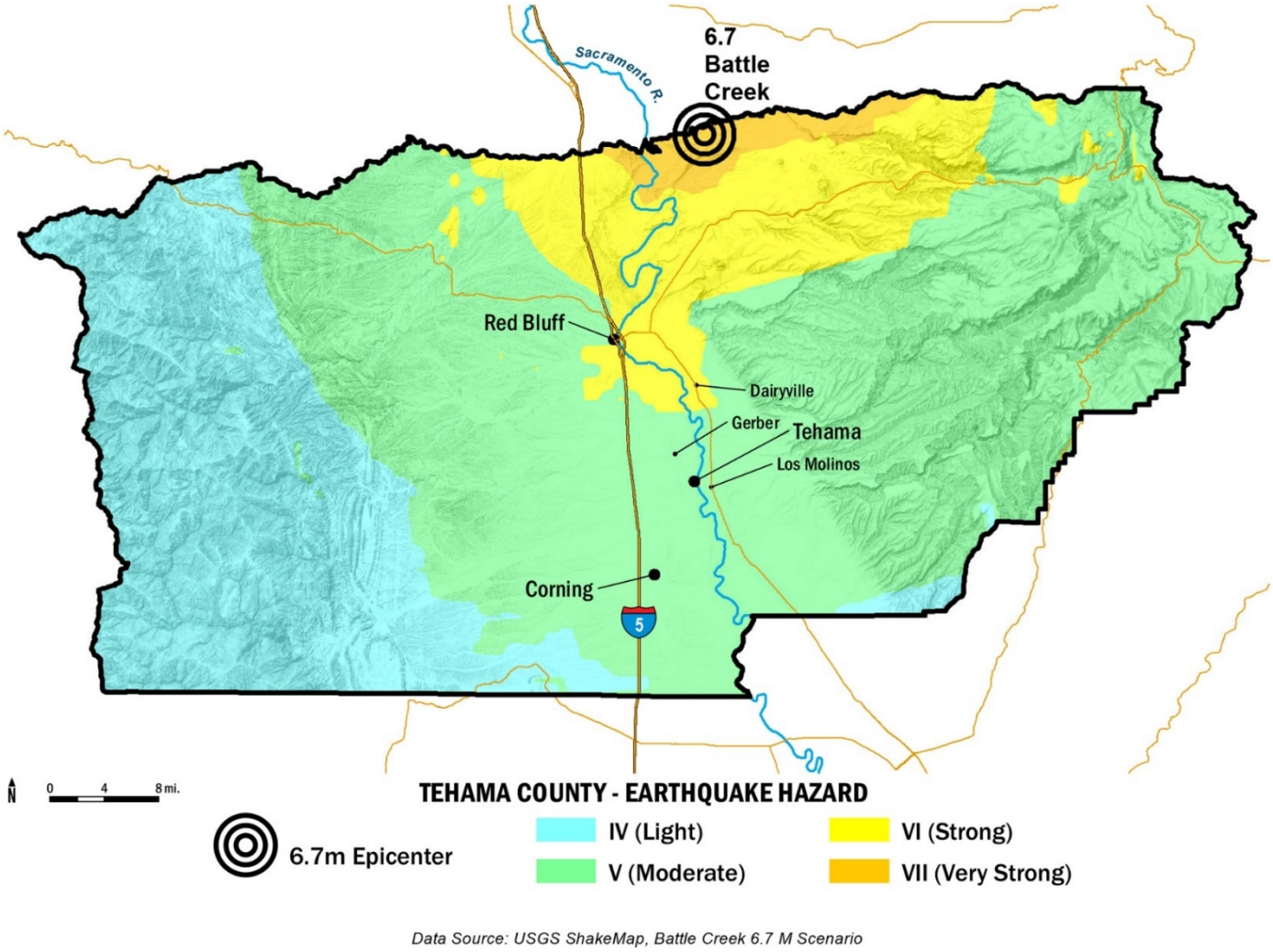
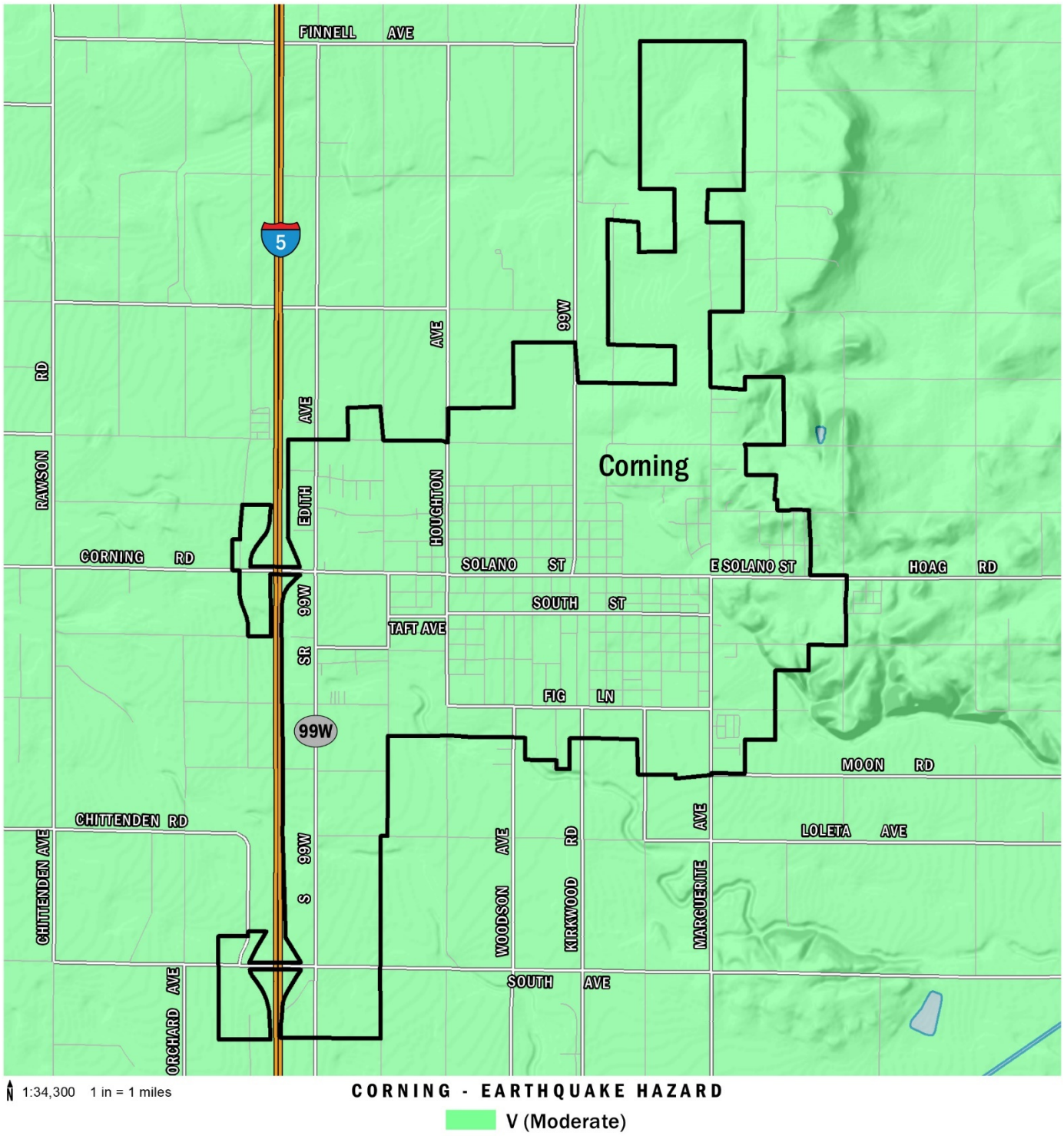


Figure 1-14: Tehama County Earthquake Shake Map



Data Source: USGS ShakeMap, Battle Creek 6.7 M Scenario

Figure 1-15: City of Corning Earthquake Hazard Map

1.4.13.4 Frequency

While earthquake activity in California is frequent, the activity in Tehama County is not. Although no active faults are mapped in the county, there exists the potential for minor, localized earth shaking events as precursors to eruptive activity of Mount Lassen. For more information on the frequency of earthquakes in Tehama County, see Section 4.6.2.3 of the Base Plan.

1.4.13.5 Severity

If a 6.7 magnitude earthquake were to occur along the Battle Creek fault, the City of Corning would experience at least moderate shaking, as shown in Figure 1-15. For more information on magnitude, see Section 4.6.2.4 in the Base Plan.

1.4.13.6 Earthquake Vulnerability

1.4.13.6.1 Population

Earthquake Exposure

As shown in Table 1-26, the entire population of the City of Corning is potentially exposed to direct and indirect impacts from earthquakes. The degree of exposure is dependent on many factors, including the age and construction type of the structures people live in, the soil type their homes are constructed on, their proximity to fault location, etc. Whether directly or indirectly impacted, the entire population will have to deal with the consequences of earthquakes to some degree. Business interruption could keep people from working, road closures could isolate populations, and loss of utilities could impact populations that suffered no direct damage from an event itself.

Table 1-27: Population Exposure to Battle Creek Earthquake Scenario

	Total Population	
Corning	7,663	
Shake Severity Zone	**Population Count**	**% of Total**
V - Moderate	7,663	100.00%
VI - Strong	-	0.00%
VII - Very Strong	-	0.00%
Total	**7,663**	**100.00%**

1.4.13.6.2 Property

Earthquake

The county Assessor's parcel data was used as the basis for the inventory of current market values and content value summaries. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The centroids were then overlaid with the shaking severity zones of the Battle Creek 6.7 magnitude earthquake severity zones to determine the at-risk structures. This methodology

assumed that every parcel with a current net value or assessed value was an improved parcel. Building exposure was calculated based on current net values or when absent, assessor's values as provided by the assessor's office. Building content exposure was calculated based on occupancy type multipliers and improvement value. Table 1-27 shows the count of at-risk parcels and their associated building and content exposure values to earthquake.

Table 1-28: City of Corning Total Parcel Value Exposure from Battle Creek Scenario

	Total Parcels	Total Market Value Exposure ($)	Total Content Value Exposure ($)	Total Value ($)
Corning	2,524	$ 352,747,126	$ 238,484,505	$ 591,231,631

Shake Severity Zone	Improved Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
V - Moderate	2,524	100.0%	$ 352,747,126	$ 238,484,505	$ 591,231,631	100.000%
VI - Strong	-	0.0%	$ -	$ -	$ -	0.000%
VII - Very Strong	-	0.0%	$ -	$ -	$ -	0.000%
Total	**2,524**	**100.0%**	**$ 352,747,126**	**$ 238,484,505**	**$ 591,231,631**	**100.0%**

Earthquake Damage Estimation

Table 1-28 demonstrates building loss estimation results from the Battle Creek 6.7 magnitude earthquake scenario. If the modeled earthquake were to occur, damages are estimated at approximately $10,650,131 or 2% percent of the total modeled value improvements within the City. FEMA's HAZUS-MH software classifies potential damage in five categories: no damage, slight damage, moderate damage, extensive damage, or complete damage. FEMA's software also predicts the possibility of exceedance for particular damage categories. As demonstrated in the table, the probability of extensive damage is minimal based upon the Battle Creek Earthquake Scenario. For further explanation of the earthquake damage estimation, please refer to Volume 1, Section 4.6.5.2.4 in the Base Plan.

Table 1-29: City of Corning EQ Damage Estimates

Building Type	Average of Potential Damage to Exceed "Slight"	Average of Potential Damage to Exceed "Moderate"	Average of Potential Damage to Exceed "Extensive"	Average Economic Loss for Each Building Category	Sum of Economic Loss	Proportion of Loss (%)
Agricultural	15%	5%	1%	$ 2,000	$ 2,000	0%
Commercial	15%	5%	1%	$ 15,296	$ 2,799,121	26%
Education	15%	5%	1%	$ 5,194	$ 10,387	0%
Governmental	0%	0%	0%	$ -	$ -	0%
Industrial	15%	5%	1%	$ 6,182	$ 86,551	1%
Religion	15%	5%	1%	$ 4,497	$ 103,427	1%
Residential	15%	5%	1%	$ 3,926	$ 7,648,644	72%
Total	**15%**	**5%**	**1%**	**$ 4,906**	**$ 10,650,131**	

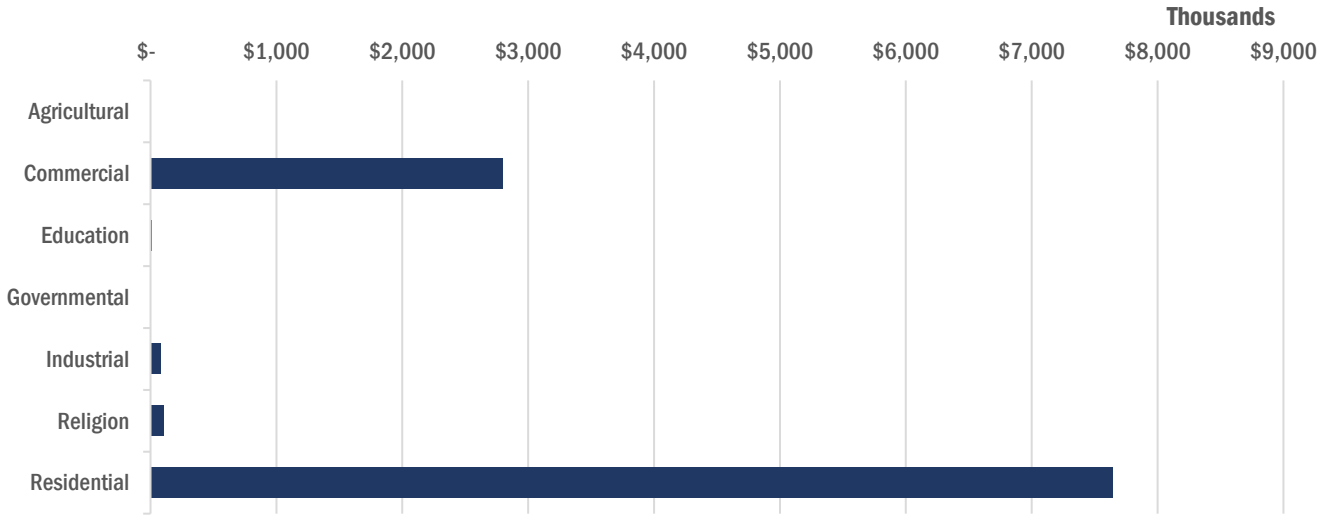


Figure 1-16: Economic Loss by Occupancy

1.4.13.6.3 Critical Facilities and Infrastructure

All critical facilities in the City of Corning are exposed to the earthquake hazard. Hazardous materials releases can occur during an earthquake from fixed facilities or transportation-related incidents. Transportation corridors can be disrupted during an earthquake, leading to the release of materials to the surrounding environment. Facilities holding hazardous materials are of particular concern because of possible isolation of neighborhoods surrounding them. During an earthquake, structures storing these materials could rupture and leak into the surrounding area or an adjacent waterway, having a disastrous effect on the environment.

Earthquake Damage Estimation

As mentioned previously, FEMA's HAZUS-MH software classifies potential damage in five categories: no damage, slight damage, moderate damage, extensive damage, or complete damage. The model was used to assign a vulnerability category to each essential and high potential loss structure. Damage functions to transportation and lifelines have not been established for this project. Table 1-30 summarizes the damage estimation results to city-owned essential facilities. Table 1-30 summarizes the damage estimation results to high potential loss facilities within the city.

Table 1-30: City of Corning Essential Facility Damage Estimation

Infrastructure Type	Average Probability of Potential Damage Exceedance			Sum of Economic Loss
	Slight	Moderate	Extensive	
Corning Animal Shelter	*15%*	*5%*	*1%*	*$ 5,853*
Corning City Hall/Police Department/Chamber of Commerce	*15%*	*5%*	*1%*	*$ 75,878*
Corning Corp Yard	*15%*	*5%*	*1%*	*$ 65,531*
Corning Library	*15%*	*5%*	*1%*	*$ 37,939*
Corning Municipal Airport	*16%*	*6%*	*1%*	*$ 69,293*
Corning Senior Center	*15%*	*5%*	*1%*	*$ 25,523*
Corning Volunteer Fire Department	*15%*	*5%*	*1%*	*$ 86,225*
Corning Wastewater Treatment Plant	*13%*	*4%*	*1%*	*$ 42,705*
Rodger's Theater	*15%*	*5%*	*1%*	*$ 86,225*
Transportation Center	*15%*	*5%*	*1%*	*$ 68,980*
Grand Total	***15%***	***5%***	***1%***	***$ 564,152***

Table 1-31: City of Corning High Potential Loss Facility Damage Estimation

Infrastructure Type	Average Probability of Potential Damage Exceedance			Sum of Economic Loss
	Slight	Moderate	Extensive	
High Potential Loss	***15%***	***5%***	***1%***	***$ 239,942***
Hotel	***15%***	***5%***	***1%***	***$ 189,047***
Best Western Plus Corning Inn	*15%*	*5%*	*1%*	*$ 73,435*
Holiday Inn	*14%*	*5%*	*1%*	*$ 115,611*
Res Elder Care Facility	***15%***	***5%***	***1%***	***$ 3,794***
OLIVE CITY CARE HOME	*15%*	*5%*	*1%*	*$ 1,649*
WANDA'S BOARDING HOUSE	*15%*	*5%*	*1%*	*$ 2,145*
Adult Res Facility	***15%***	***5%***	***1%***	***$ 12,159***
LENIHAN'S RESIDENTIAL CARE HOME #3	*15%*	*5%*	*1%*	*$ 1,994*
PATHWAYS TO SUCCESS	*15%*	*5%*	*1%*	*$ 10,165*
Child Care Centers	***15%***	***5%***	***1%***	***$ 34,943***
BUSY BEES PRESCHOOL	*15%*	*5%*	*1%*	*$ 1,870*
COLUMBIA STATE PRESCHOOL	*15%*	*5%*	*1%*	*$ 6,328*
CORNING HEAD START CENTER	*15%*	*5%*	*1%*	*$ 2,393*
LITTLE HOPPERS EHS	*15%*	*5%*	*1%*	*$ 2,393*
OLIVE VIEW STATE PRESCHOOL	*15%*	*5%*	*1%*	*$ 2,589*
SUNSHINE SCHOOLHOUSE THE	*15%*	*5%*	*1%*	*$ 9,285*
TADPOLES TO TOADS/EHS	*15%*	*5%*	*1%*	*$ 2,393*
WEST STREET HEAD START	*15%*	*5%*	*1%*	*$ 7,691*

1.4.13.7 Future Trends

Land use in Corning will be directed by the City of Corning General Plan adopted under California's General Planning Law. The safety element of the general plan establishes standards and plans for the protection of the community from hazards including seismic and geologic hazards. The information in this plan provides the City a tool to ensure that there is no increase in exposure in areas of seismic risk. Development in the Corning area will be regulated through building standards and performance measures so that the degree of risk will be reduced. The geologic hazard portions of the area are heavily regulated under California's General Planning Law. The International Building Code establishes provisions to address seismic risk.

1.4.14 Hazard Risk Ranking

The City of Corning's Planning Team used the same hazard prioritization process as the Tehama County Planning Committee. This process is described in detail in Section 13 of the base plan. Table 1-30 shows the results of the hazard risk ranking exercise.

Table 1-32: City of Corning Prioritized Hazard Assessment Matrix

		Impact			
		Catastrophic	Critical	Limited	Minor
Probability	Highly Likely		Flooding	Severe Weather	
	Likely				
	Possible			Wildfire, Drought	
	Unlikely				Earthquake

1.5 Mitigation Strategy

The intent of the mitigation strategy is to provide the County with a guidebook to future hazard mitigation administration. The mitigation strategy is intended to reduce vulnerabilities outlined in the previous section with a prescription of policies and physical projects. This will assist City staff to achieve compatibility with existing planning mechanisms, and ensures that mitigation activities provide specific roles and resources for implementation success.

The mitigation strategy represents the key outcomes of the MJHMP planning process. The hazard mitigation planning process conducted by the Planning Committee is a typical problem-solving methodology:

- **Estimate the impacts** (See Sections Vulnerability Assessment);
- **Describe the problem** (See Section Problem Statements);
- **Assess what resources exist to lessen impacts and problem** (See Capability Assessment,);
- **Develop Goals and Objectives to address the problems** (See Goals and Objectives)
- **Determine what can be done, and develop actions that are appropriate for the community** (See Mitigation Action Matrix).

1.5.1 Identifying the Problem

As part of the mitigation actions identification process, the City of Corning Planning Committee identified issues and/or weaknesses as a result of the risk assessment and vulnerability analysis. By combining common issues and weaknesses developed by the Planning Committee, the realm of resources needed for mitigating each can be understood. Community issues and weaknesses are presented by individual hazard in Table 1-31. Projects or actions have been developed to mitigate each problem identified. To the degree possible the City of Corning will support County Wide Initiatives. See Volume 1 for related County Wide mitigation actions.

Table 1-33: Problem Statements by Hazard

Hazard	Problem No.	Problem Description	Mitigation Alternative	Mitigation Action No.	County Wide	City of Corning
Drought	DR-02	Lack of recharge to stabilize the groundwater supply.	SP, PRV	TC-27-2018, TC-28-2018, CC-24-2018	x	x
Drought	DR-03	The probability of increased drought frequencies and durations due to climate change.	PRV	CoT-25-2018, RB-07-2018, TC-27-2018, TC-28-2018, CC-23-2018	x	x
Drought	DR-04	The lack of promotion of active water conservation during drought and non-drought periods.	PRV, PE&A	TC-26-2018, CoT-18-2012, RB-08-2018	x	x

Hazard	Problem No.	Problem Description	Mitigation Alternative	Mitigation Action No.	County Wide	City of Corning
Drought	DR-06	There is a lack of available resources to evaluate private wells and water quality issues and/ or dry well reporting. No mapping currently exists of dry wells or groundwater, water tables or aquifers.	PRV, NRC	CC-23-2018, TC-29-2018, TC-28-2018	x	x
Drought	DR-07	Lowering of ground water within basins in and near Corning resulting in expensive water well and waterline repairs/improvements.	NRC	CC-23-2018		x
Drought	DR-08	Water supply contingency issues during dry years for communities surrounding City of Corning i.e. Paskenta and others without consistent or reliable domestic supplies.	NRC, PRV	CC-24-2018		x
Earthquake	EQ-01	More information is needed on the exposure and performance of soft-story construction within the planning area. There are many undocumented unreinforced masonry buildings.	PPRO	CC-21-2018, CC-22-2018, CoT-16-2012, RB-04-2018, RB-05-2018		x
Flood	FL-02	Climate change impacts flood conditions in Tehama County. More severe weather events could compromise local drainage and flood control.	SP	CC-10-2012, CoT-06-2012, CoT-07-2012, CoT-08-2012, CoT-09-2012, CoT-20-2018, RB-03-2018, RB-09-2012, TC-22-2018, CC-08-2012, CC-09-2012, CC-12-2012, CC-16-2018	x	x
Flood	FL-07	More studies need to be done locally to validate the accuracy of the existing flood hazard mapping produced by FEMA reflecting the true flood risk within the planning area. This is most prevalent in areas protected by levees not accredited by the FEMA mapping process such as the Antelope/ Salt Creek area and others. Flood control structures that are not recognized by FEMA include roads, railroads and other non-certified flood control structures.	PRV	TC-08-2018, CC-17-2018	x	x

Hazard	Problem No.	Problem Description	Mitigation Alternative	Mitigation Action No.	County Wide	City of Corning
Flood	FL-08	Lack of historical damage data, such as high-water marks on structures and damage reports, to measure inundation and the cost-effectiveness of future mitigation projects.	PRV	TC-11-2018, CoT-04-2012, CC-17-2018	x	x
Flood	FL-13	A significant number of NFIP claims are outside of FEMA-designated SFHAs. The determination of the causes of flooding on existing structures and the siting of new facilities, so as not to be adversely impacted by flooding or adversely impacting adjacent or neighboring properties, is problematic due to the lack of topographic data and mapping.	PRV	CC-01-2018, CC-14-2012, CC-17-2018, TC-09-2018	x	x
Flood	FL-16	Watershed streams show rapid responses to storms, and flow levels fluctuate or flash between storm periods in a localized environment.	SP	TC-22-2018, CC-08-2012, CC-09-2012, CC-12-2012, CC-13-2012, CC-16-2018, RB-06-2012, CC-10-2012	x	x
Flood	FL-17	Multi Residential Care and Assisted Living Facilities are located within the 100 YR Flood Plain.	PPRO	CC-14-2012, RB-03-2012		x
Flood	FL-19	Burch Creek overflows in to Jewett Creek west of town during localized rain events.	SP	TC-18-2018, CC-06-2012	x	x
Flood	FL-20	Flooding / drainage when creeks are full can be a problem.	SP	CC-08-2012, CC-09-2012, CC-10-2012		x
Flood	FL-21	Flooding in Corning is typically caused by high-intensity, short-duration (1 to 3 hours) storms concentrated on a stream reach with already saturated soil.	PRV	CC-08-2012, CC-09-2012, CC-10-2012, CC-12-2012, CC-16-2018		x

Hazard	Problem No.	Problem Description	Mitigation Alternative	Mitigation Action No.	County Wide	City of Corning
Flood	FL-22	Multiple high loss potential facilities are located in the 100-YR Flood zone include a childcare facility and others.	PPRO	CC-15-2018, TC-22-2018, CoT-04-2012		x
Flood	FL-23	Dry wells citywide are failing to keep up with localized storms.	SP	CC-16-2018		x
Flood	FL-24	Limited volumes / capacity issues at Jewett Creek and South Pacific Railroad Bridge.	SP	CC-05-2018, CC-07-2012		x
Flood	FL-30	Many small tributaries in the watersheds have high levels of siltation and diminished flood-carrying capacity due to vegetation (due to Arundo and Tamarisk) overgrowth. Debris-clearing is a challenge due to environmental permitting restrictions from Fish and Game/Fish and Wildlife. The establishment of Arundo in the streams in Tehama County has seriously limited their conveyance capacity.	PRV	TC-13-2018, CC-05-2018, CoT-06-2012, RB-02-2018	x	x
Flood	FL-31	Approximately 10% of the population lives in the 100-YR or 500-YR flood plain.	PPRO	CC-11-2012		x
Flood	FL-32	Localized flooding on North Street between Edith and Toomes Avenue	SP	CC-26-2018		x
Flood	FL-33	Localized flooding on Edith Avenue between Colusa and Solano Streets	SP	CC-27-2018		x
Flood	FL-34	Localized flooding on Fig Lane & Chicago between RR tracks and West Street (including flooding from Woodson Bridge at 6th Street)	SP	CC-28-2018		x
Severe Storm	SS-01	Older building stock in the planning area do not meet code standards. These structures could be highly vulnerable to severe weather events such as windstorms.	PPRO	TC-30-2018, TC-33-2018	x	x
Severe Storm	SS-02	Risk of power supply interruption due to severe storms.	ES	TC-19-2018, CC-18-2012, CC-19-2012, CoT-23-2018	x	x

Hazard	Problem No.	Problem Description	Mitigation Alternative	Mitigation Action No.	County Wide	City of Corning
Severe Storm	SS-03	Lack of backup power generation at critical facilities.	ES	TC-20-2018, CC-18-2012, CC-19-2012, CoT-23-2018	x	x
Severe Storm	SS-05	Communication issues occur during weather events such as the phones going down. Back-Up power at communication towers is needed.	ES	TC-19-2018, TC-20-2018, CoT-23-2018	x	x
Severe Storm	SS-06	Many large trees result in damages from storms (high winds). There are currently issues with tree trimmer local capacities.	PRV	CC-20-2018, CoT-15-2012, RB-11-2018, TC-30-2018	x	x
Wildfire	WF-11	Corning's periodically arid climate, combined with extensive areas of grass and brush-covered open space and variable topography, create an ever-present threat of wild land fire. Extreme weather conditions, such as high temperatures, low humidity, and strong winds may cause an ordinary fire to expand into one of massive proportions. A high fuel load, resulting from years of accumulation, contributes to the problem. (2012 Corning Hazard Mitigation Plan)	PRV, PE&A	CC-25-2018		x
Wildfire	WF-12	Abandoned orchards within the City of Corning boundaries and surrounding area/ sphere of influence increase the risk of fires.	PPRO	CC-25-2018		x
Drought	DR-02	Lack of recharge to stabilize the groundwater supply.	SP, PRV	TC-27-2018, TC-28-2018, CC-24-2018	x	x
Drought	DR-03	The probability of increased drought frequencies and durations due to climate change.	PRV	CoT-25-2018, RB-07-2018, TC-27-2018, TC-28-2018, CC-23-2018	x	x
Drought	DR-04	The lack of promotion of active water conservation during drought and non-drought periods.	PRV, PE&A	TC-26-2018, CoT-18-2012, RB-08-2018	x	x

Hazard	Problem No.	Problem Description	Mitigation Alternative	Mitigation Action No.	County Wide	City of Corning
Drought	DR-06	There is a lack of available resources to evaluate private wells and water quality issues and/ or dry well reporting. No mapping currently exists of dry wells or groundwater, water tables or aquifers.	PRV, NRC	CC-23-2018, TC-29-2018, TC-28-2018	x	x
Drought	DR-07	Lowering of ground water within basins in and near Corning resulting in expensive water well and waterline repairs/improvements.	NRC	CC-23-2018		x
Drought	DR-08	Water supply contingency issues during dry years for communities surrounding City of Corning i.e. Paskenta and others without consistent or reliable domestic supplies.	NRC, PRV	CC-24-2018		x
Earthquake	EQ-01	More information is needed on the exposure and performance of soft-story construction within the planning area. There are many undocumented unreinforced masonry buildings.	PPRO	CC-21-2018, CC-22-2018, CoT-16-2012, RB-04-2018, RB-05-2018		x
Flood	FL-02	Climate change impacts flood conditions in Tehama County. More severe weather events could compromise local drainage and flood control.	SP	CC-10-2012, CoT-06-2012, CoT-07-2012, CoT-08-2012, CoT-09-2012, CoT-20-2018, RB-03-2018, RB-09-2012, TC-22-2018, CC-08-2012, CC-09-2012, CC-12-2012, CC-16-2018	x	x

Hazard	Problem No.	Problem Description	Mitigation Alternative	Mitigation Action No.	County Wide	City of Corning
Flood	FL-07	More studies need to be done locally to validate the accuracy of the existing flood hazard mapping produced by FEMA reflecting the true flood risk within the planning area. This is most prevalent in areas protected by levees not accredited by the FEMA mapping process such as the Antelope/ Salt Creek area and others. Flood control structures that are not recognized by FEMA include roads, railroads and other non-certified flood control structures.	PRV	TC-08-2018, CC-17-2018	x	x

1.5.2 Capability Assessment

The City of Corning identified current capabilities available for implementing hazard mitigation activities. The Capability Assessment portion of the hazard mitigation plan identifies administrative, technical, legal and fiscal capabilities. This includes a summary of departments and their responsibilities associated to hazard mitigation planning as well as codes, ordinances, and plans already in place associated to hazard mitigation planning. The second part of the assessment provides fiscal capabilities that may be applicable to providing financial resources to implement identified mitigation action items.

1.5.2.1 Existing Institutions, Plans, Policies and Ordinances

The following is (1) a summary of existing positions, their responsibilities related to hazard mitigation planning and implementation; and (2) a list of existing planning documents and regulations related to mitigation efforts within the City. The administrative and technical capabilities the City, as shown in Table 1-32, provides an identification of the staff, personnel, and department resources available to implement the actions identified in the mitigation section of the Plan. Specific resources reviewed include those involving technical personnel such as planners/engineers with knowledge of land development and land management practices, engineers trained in construction practices related to building and infrastructure, planners and engineers with an understanding of natural or human-caused hazards, floodplain managers, surveyors, personnel with GIS skills and scientists familiar with hazards in the community.

1.5.2.2 Administrative and Technical Capacity

Table 1-34: City of Corning's Administrative and Technical Ability

Staff/Personnel Resources	Available	Department/Agency Position
Planners or engineers with knowledge of land development and land management practices	Y	Planning and Public Works Departments
Engineers or professionals trained in building or infrastructure construction practices	Y	Building and Safety, Public Works Departments
Planners or engineers with an understanding of natural hazards	Y	Planning Department
Staff with training in benefit/cost analysis	N	Can contract for this service
Flood Plain Manager	Y	The Flood Damage Prevention Ordinance identifies the Building Official as the Flood Plain Administrator
Surveyors	Y	Contract for services
Personnel skilled or trained in GIS applications	Y	Planning and Public Works Departments. Can also contract for services
Scientist familiar with natural hazards in local area	N	
Emergency Manager	Y	Fire Chief. This capability could be expanded by providing training to staff to provide outreach to communities on mitigation activities people can perform on their homes and businesses.
Grant Writers	Y	Can contract for services

1.5.2.2.1 Administration

The City Manager serves as the "administrative head of the City Government, under the direction and control of the City Council". The Manager is responsible to the City Council for the day-to-day management of all City affairs and the leadership of City Department Heads.

The Manager’s principal assistant is the Secretary to the City Manager.

The City Manager also serves as the Finance Director. The Manager is directly responsible for continual review and analysis of all City administrative operations including budget preparation and control, organizational and procedural studies together with staffing. The City Manager’s responsibilities, authority and limits on authority are clearly defined in city law in City Code chapter 2.44.

1.5.2.2.2 Contract Services

The City Engineer works on a part time/per hour basis and has his primary office in Chico. Engineering services include subdivision plan checks, track map checks and related subdivision off site infrastructure. Engineering is also responsible for planning and preparing cost estimates for long range Capital Improvement Projects such as: drainage studies, street improvements, traffic safety, and sewer and water improvements.

The Corning Wastewater Treatment Plant is operated under contract with Severn Trent Services. There is a Plant Manager and four assistants that provide for laboratory testing, sewer pretreatment, plant maintenance, equipment maintenance, building maintenance and landscaping.

The City of Corning contracts with a consultant to administer airport services. There are two Fixed Base Operators (FBO) at the Corning Municipal Airport. The City also contracts for other services including ongoing janitorial, tree trimming, spraying and landscape maintenance purposes, and retains certain firms for specialized "as needed" repairs, improvements or maintenance to streets, curbs and gutters.

1.5.2.2.3 Planning Department

The Planning Director is the primary staff to the Corning Planning Commission, a five-member commission appointed by the Mayor and City Council to review development projects.

The Planning Department is responsible for implementing and updating the land use goals and policies of the City Council as detailed in the City's General Plan, Zoning Code, the Highway 99-W Specific Plan, and various development ordinances and standards. Additionally, the department is responsible for assuring compliance with numerous state statutes including the California Environmental Quality Act, The Planning and Zoning Law, and the Subdivisions Map Act

The department receives and processes development applications for land use permits including parcel maps, subdivisions, use permits, rezoning, variances, general plan amendments and annexations. Planning staff regularly meets and confers with the City's Technical Advisory Committee (including the Building, Fire, Police and Public Works Departments) to discuss development inquiries and applications, and to coordinate the efficient provisions of services to new homes and businesses.

1.5.2.2.4 Public Works Department

The Public Works Department is responsible for the management, operations and maintenance of a number of municipal facilities and services. For organizational (and budgeting) purposes, the department segregates these responsibilities into "divisions". The Public Works Department includes the following "divisions":

- Street
- Water
- Sewer
- Parks
- Airport
- Building Maintenance
- Fleet Maintenance
- Engineering
- Public Works Administration

The department, and more specifically the Director of Public Works, also serves as a liaison between the City and the following agencies: Caltrans, Regional Water Quality Control Board, Department of Health-State Drinking Water, California Transportation Commission, Tehama County Transportation Commission, the Tehama County Environmental Health Department, Air Resources Board and the Tehama County Public Works Department.

The Public Works Department currently includes a total of nine (9) full time employees. Seven (7) of those employees work out of the City Corporation Yard. The Public Works Director and the Public Works Secretary work out of offices located at City Hall.

1.5.2.2.5 Police Department

The Police Department is responsible for law enforcement services within the City Limits. The Department actively reaches out to the public through volunteer programs; youth sports activities, a full-time high school resource officer and an active cadet program to improve the quality of life. Staffing at the Police Department consists of:

- Chief of Police
- Three Patrol Sergeants
- Twelve Patrol Officers
- One Records/Communications Supervisor
- Four Dispatcher/Clerks
- Three Part-Time Dispatcher/Clerks
- One Full-Time Community Service Officer
- Three Part-Time Community Service Officers
- Administrative Secretary
- Administrative Analyst
- Three Citizen Volunteers
- Four Cadets

The Department supplies one full-time officer to the Tehama and Glenn Methamphetamine Enforcement Team (TAGMET), one School Resource Officer to Corning Union High School, and two officers to the Critical Incident Response Team (SWAT). Officers work 12-hour shifts; three one week and four the next.

1.5.2.2.6 Fire Department

The Department was founded in 1912, originally relied on hose carts and fire hydrants for fire protection. In 1920, the department purchased its first motorized fire engine: a 1920 Brockway, still in use today for parades and other community events. In 1939 a two-story, three-bay facility was built on Fifth Street, one half block off the main street. Two bays were added in 1969. In 1990 a new dispatch center was added which includes offices and living quarters. Housed at the station are three Class A pumpers, two brush engines and a rescue squad.

The Department, which has an ISO rating of four, protects an area of five square miles, including a business district, two shopping centers and three large truck stops. The Corning Volunteer Fire Department, located at 814 Fifth Street, currently has 34 members: including two Paramedics, two Emergency Medical Technicians, and nineteen first responders, of which sixteen are certified to use the heart defibrillators.

There are also five full-time employees, the Fire Chief and four fire dispatchers who are trained and certified in Emergency Medical Dispatch.

Each shift consists of twelve (12) hours, the first beginning at 7 a.m. and ending at 7 p.m. The second shift begins at 7 p.m. and ends at 7 a.m. Each dispatcher works three (3) consecutive twelve-hour shifts for a total of 36 hours, with the following four (4) day off duty. At the beginning of the fifth day each dispatcher reports to work and works four consecutive 12-hour shifts for a total 48 hours, with the following three (3) days off duty. At the end of the three days the work cycle starts over.

At the end of six months, each shift rotates, with the day shift personnel moving to the night shift and the night shift moving to the day shift.

1.5.2.3 Regulatory Tools

The legal and regulatory capabilities of local, state, and federal jurisdictions are shown in Table 1-35, which presents existing ordinances and codes that can regulate the physical or built environment of the City. Examples of legal and/or regulatory capabilities can include: building codes, zoning ordinances, subdivision ordnances, special purpose ordinances, growth management ordinances, site plan review, general plans, capital improvement plans, economic development plans, emergency response plans, and real estate disclosure plans. The City's General Plan is the constitution guiding new development and was attached as an addendum to the All-Hazard Mitigation Plan.

Table 1-35: City of Corning's Land and Regulatory Capability

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated	Comments
Codes, Ordinances & Requirements					
Building Code	Y	N	N	Y	Title 15, CMC adopts the 2007 CA Building Code, 7/13/2010
Zoning Code	Y	N	N	Y	Title 17, Chapters 17.02-17.92, CMC, adopted 1959
Subdivisions	Y	N	N	N	Title 15, Chapters 16.03-16.50, CMC adopted 1994
Post Disaster Recovery	N	N	N	N	
Real Estate Disclosure	Y	N	N	Y	CA Civil Code 1102 requires disclosure on natural hazard exposure of all real property for sale
Growth Management	Y	N	N	Y	City of Corning General Plan
Site Plan Review	Y	N	N	N	Title 15, CMC
Special Purpose (flood management, critical areas)	Y	N	N	N	Flood Damage Prevention – Title 15, Chapter 15.17, adopted 1988 Flood Plain Combining Zoning District – Title 17, Chapter 17.45, adopted 1994 Storm Water Management – Title 15, Chapter 15.28, Adopted 1991
Planning Documents					
General Plan	Y	N	N	Y	City of Corning General Plan. During the next update cycle, the approved local hazard mitigation plan will be adopted into the Safety Element of the General Plan.
Capital Improvement Plan	Y	N	N	N	5-year CIP for roads, water supply, sewer and drainage. Updated annually.
Economic Development Plan	Y	N	N	N	City has economic development department and is part of the Tehama Economic Development Corporation
Flood Plain or Basin Plan	Y	Y	N	N	
Storm Water Plan	N	N	N	N	

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated	Comments
Habitat Conservation Plan	N	N	N	N	
Shoreline Management Plan	N	N	N	N	
Emergency Response Plan	Y	N	N	Y	
Continuity of Operations Plan	N	N	N	N	
Post Disaster Recovery Plan	N	N	N	N	
Terrorism Plan	N	N	N	N	

1.5.2.3.1 Fiscal Resources

Table 1-36 shows specific financial and budgetary tools available to the City such as community development block grants; capital improvements project funding; authority to levy taxes for specific purposes; fees for water, sewer, gas, or electric services; impact fees for homebuyers or developers for new development; ability to incur debt through general obligations bonds; and withholding spending in hazard-prone areas.

Table 1-36: City of Corning's Fiscal Resources

Financial Resources	Accessible or Eligible to Use?
Community Development Block Grants	Y
Capital Improvements Project Funding	Y
Authority to Levy Taxes for Specific Purposes	Y
User Fees for Water, Sewer, Gas or Electric Service	Y
Incur Debt through General Obligations Bonds	Y
Incur Debt through Special Tax Bonds	Y
Incur Debt through Private Activity Bonds	N
Withhold Public Expenditures in Hazard-Prone Areas	N
State Sponsored Grant Programs	Y
Development Impact Fees for Homebuyers or Developers	Y
Other	N/A

1.5.2.3.2 Community Classifications

Table 1-37 summarizes classifications under various community mitigation programs.

Table 1-37: City of Corning's Community Classifications

Program	Participating	Classification	Date Classified
Community Rating System	No		
Building Code Effectiveness Grading Schedule	Yes	4/4	
Public Protection (ISO Class)	Yes	4	2001
Storm Ready	No		
Firewise	No		

1.5.3 Guiding Principle, Goals and Objectives

Hazard mitigation plans must identify goals for reducing long-term vulnerabilities to identified hazards (44 CFR Section 201.6(c)(3)(i)). Together with the County Planning Committee, the steering committee established a guiding principle, a set of goals and measurable objectives for this plan, based on data from the preliminary risk assessment and the results of the public involvement strategy. This information is located in Section 5.4 of Volume One.

1.5.4 Mitigation Action Plan

Based upon the City's planning committee priorities, risk assessment results, and mitigation alternatives, mitigation actions were developed. Most importantly, the newly developed mitigation actions acknowledge updated risk assessment information outlined in Section 1.4. Mitigation actions presented in Table 1-38 establish 26 possible mitigation actions. Some mitigation actions support ongoing City activities, while other actions are intended to be completed when funding is available. For this Plan, time frames are defined as follows:

- Short Term- 1-3 years
- Mid Term- 3-5 years
- Long Term- 5 years or more

Regardless, mitigation actions will be part of an annual review.

1.5.4.1 Benefit/ Cost Review

The City of Corning Planning Team used the same benefit/cost parameters as described in Section 5.5.1.1, Volume 1 of the Base Plan. Cost ratings were defined as follows:

- **High**—Existing funding will not cover the cost of the project; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).
- **Medium**—The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
- **Low**—The project could be funded under the existing budget. The project is part of or can be part of an ongoing existing program.

Benefit ratings were defined as follows:

- **High**—Project will provide an immediate reduction of risk exposure for life and property.
- **Medium**—Project will have a long-term impact on the reduction of risk exposure for life and property, or project will provide an immediate reduction in the risk exposure for property.
- **Low**—Long-term benefits of the project are difficult to quantify in the short term.

1.5.4.2 Mitigation Action Plan

The City of Corning Planning Team used the same mitigation action prioritization method as described in the Section 5.5.1 of the Base Plan Volume 1. Based upon the City of Corning Planning Committee consensus, **Error! Reference source not found.** lists each priority mitigation action. For Priority mitigation actions Implementation plans are made available in the Action Planner Annex. Implementation plans in Action Planner Annex identify the responsible party, time frame, potential funding source, implementation steps and resources need to implementation. The detail in the Action Planners meet the regulatory requirements of FEMA and DMA 2000.

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Table 1-38: Mitigation Action Priority Tracker

Action No.	Hazard Type	Specific Mitigation Action	Mitigation Alternatives	Responsible Party	Potential Funding Source	Time Frame	Benefit Cost Rating	Planning Mechanism	Implementation Plan / Priority
CC-01-2018	Flood	Develop the ability to document damage and high-water marks within the City of Corning. This will provide historical flooding in areas beyond the SFHA.	PRV	City of Corning Public Works	Flood Mitigation Assistance Grant Program (FMA)	Short Term	Medium / Low	Water/ Flood Management Plans	
CC-02-2012	Flood	Public Outreach Program (Develop and maintain public awareness education for protecting private property from all hazard's effects.)	PE&A	City of Corning Public Works	General Fund, Pre-Disaster Mitigation Grant Program (PDM)	Short Term	HIGH / High	Water/ Flood Management Plans	
CC-03-2012	All Hazard	Upgrade City Council Chambers Electrical and Communication systems to accommodate Emergency Response Center (EOC).	SP, PRV	City of Corning Public Works	General Fund	Short Term	Low / Low	Emergency Food and Shelter Program (EFSP) and Emergency Operations Plan (EOP)	
CC-04-2018	Flood	Inform Residents of impacts that could be caused by re-routing drainage features. I.e. No Adverse Impact concept for neighbors and other adjacent properties.	PE&A	City of Corning Public Information	General Fund	Short Term	Low / Low	Water/ Flood Management Plans	
CC-05-2018	Flood	Develop blanket maintenance and operation agreement with MOU with Cal Fish Game for maintenance. Identify stream beds and other drainage corridors for debris removal.	PRV, NRP	City of Corning Public Works	General Fund	Short Term	Low / High	Water/ Flood Management Plans	**Y**
CC-06-2012	Flood	Conduct a study of solution options and regulatory studies for increasing drain capacity under the railroad bridge at Jewett Creek and the Railroad Bridge.	SP, PRV	City of Corning Public Works	Flood Mitigation Assistance Grant Program (FMA), Hazard Mitigation Grant Program (HMGP)	Short Term	Low / High	Water/ Flood Management Plans	**Y**
CC-07-2012	Flood	Continue drainage cleaning at the Jewett Creek Bridge (Kirkwood Road).	PRV	City of Corning Public Works	General Fund	Short Term	High / High	Implementation has been occurring for several years and this is an on-going action.	
CC-08-2012	Flood	Conduct a study of solution options to fix the flooding issues at Blackburn Moon Drain.	SP, PRV	City of Corning Public Works	General Fund, Flood Mitigation Assistance Program (FMA)	Short Term	High / High	Water/ Flood Management Plans	
CC-09-2012	Flood	Redesign and replace 2 small pipes previously installed to replace a collapsed culvert on Third Street.	SP	City of Corning Public Works	Flood Mitigation Assistance Grant Program (FMA)	Short Term	High / High	Water/ Flood Management Plans	
CC-10-2012	Flood	Upgrade / Reconstruct portions of Storm Drain System to include Blackburn and Third Street Culverts.	SP	City of Corning Public Works	Flood Mitigation Assistance Grant Program (FMA)	Mid Term	High / High	Water/ Flood Management Plans	**Y**
CC-11-2012	Flood	Elevate Home Program (Develop a program to assist citizens in elevating their homes which are located in the SFHA)	PPRO, PRV	City of Corning Public Works	Flood Mitigation Assistance Grant Program (FMA)	Mid Term	Medium / High	Water/ Flood Management Plans	
CC-12-2012	Flood	Conduct a feasibility study to mitigate drainage / flood hazard at 2104 SOLANO ST. in the flood drainage area then create a retention basin.	PPRO, PRV, SP	City of Corning Public Works	General Fund	Short Term	Low / Low	Water/ Flood Management Plans	**Y**

Action No.	Hazard Type	Specific Mitigation Action	Mitigation Alternatives	Responsible Party	Potential Funding Source	Time Frame	Benefit Cost Rating	Planning Mechanism	Implementation Plan / Priority
CC-13-2012	Flood	Trash Pumps (additional 1-6 inch) (Purchase one additional 6 inch Trash Pump mounted on trailer for mobility. The Trash Pump would be used to augment an existing pump used for the removal excessive water and debris from flooded storm drains.) In addition to Trash Pump, purchase five (5) Discharge Suction Hoses (Purchase five 400 ft. discharge suction hoses for pumps used to discharge flood water.)	PRV	City of Corning Public Works	General Fund	Short Term	Low / Low	Water/ Flood Management Plans	
CC-14-2012	Flood	Property Development Program (Develop City ordinances to address future housing developments in hazard prone areas, beyond 100 YR floodplain.)	PRV, PPRO	City of Corning Planning Consultant	General Fund	Short Term	Medium / High	Water/ Flood Management Plans	
CC-15-2018	Flood	Double check site conditions and SFHA elevation vs. building first floor elevation at Centennial High School. Inform, Corning PD of flood risk at High School for emergency operations.	PRV	City of Corning Public Works	General Fund	Short Term	Medium / Medium	Water/ Flood Management Plans	
CC-16-2018	Flood	Upgrade / Replace or Construct new drainage infrastructure for undersized dry wells across the city.	SP	City of Corning Public Works	Flood Mitigation Assistance Grant Program (FMA)	Mid Term	Low / Low	Water/ Flood Management Plans	**Y**
CC-17-2018	Flood	Develop the ability to document damage and high-water marks within the City of Corning. This will provide historical flooding in areas beyond the SFHA.	PRV	City of Corning Public Works	General Fund	Short Term	Low / Low	Water/ Flood Management Plans	
CC-18-2012	Severe Storm	Public Works Corporate Yard Generator (Procure a 30KW generator to operate Public Works Maintenance Operations Yard during a loss of utility service.)	PRV	City of Corning Public Works	General Fund	Short Term	Low / Low	Emergency Food and Shelter Program (EFSP) and Emergency Operations Plan (EOP)	
CC-19-2012	Severe Storm	50KW Mobile Generator with trailer (Procure a 50KW generator mounted on a trailer would provide backup electricity for pumping gas, flood control; pump stations, storm and emergency backup power for an evacuation shelter.)	PRV	City of Corning Public Works	General Fund	Short Term	Low / Low	Emergency Food and Shelter Program (EFSP) and Emergency Operations Plan (EOP)	
CC-20-2018	Severe Storm	Develop hazard tree replacement / care program.	PRV, PPRO	City of Corning Public Works	General Fund	Short Term	Low / High	Tehama County General Plan	
CC-21-2018	Earthquake	Develop Seismic Upgrade Program for local business / gathering facilities that were built before benchmark years.	PRV	City of Corning Building and Safety	General Fund, Hazard Mitigation Grant Program (HMGP)	Short Term	Low / Low	County Building/ Development Codes and Zoning Ordinances	
CC-22-2018	Earthquake	Construct Seismic Upgrades to city owned infrastructure.	PPRO	City of Corning Public Works, City of Corning Building and Safety	General Fund, Hazard Mitigation Grant Program (HMGP)	Long Term	High / High	County Building/ Development Codes and Zoning Ordinances	

Action No.	Hazard Type	Specific Mitigation Action	Mitigation Alternatives	Responsible Party	Potential Funding Source	Time Frame	Benefit Cost Rating	Planning Mechanism	Implementation Plan / Priority
CC-23-2018	**Drought**	Construct or install groundwater monitoring wells or upgrade existing water wells to monitor aquifer levels and water quality.	**NRP, PRV**	City of Corning Public Works	General Fund	Mid Term	**High / High**	Water/ Flood Management Plans	
CC-24-2018	**Drought**	Develop alternative sources/additional wells for water supply for (Corning) residents	**PRV**	City of Corning Public Works	General Fund	Long Term	**High / High**	Water/ Flood Management Plans	
CC-25-2018	**Wildfire**	Continue to enforce the Burning Regulations and Weed Abatement (set by Chapter 8.12 and 8.14 of the City's municipal code) .	**PRV**	City of Corning Code Enforcement	General Fund	Short Term	**Low / High**	Implementation has been occurring for several years and this is an on-going action.	
CC-26-2018	**Flood**	Construct Storm drain improvements on Toomes Avenue between Blackburn Avenue to Jewitt Creek; private property	**SP**	City of Corning Public Works	Flood Mitigation Assistance Grant Program (FMA)	Mid Term	**Low / Medium**	Water/ Flood Management Plans	**Y**
CC-27-2018	**Flood**	Construct Storm drain improvements on Edith Avenue from Blackburn Avenue to Jewett Creek; private property and local businesses	**SP**	City of Corning Public Works	Flood Mitigation Assistance Grant Program (FMA)	Mid Term	**Medium / Low**	Water/ Flood Management Plans	**Y**
CC-28-2018	**Flood**	Construct Storm drain improvements to reduce localized flooding on Fig Lane & Chicago between RR tracks and West Street (including flooding from Woodson Bridge at 6th Street)	**SP**	City of Corning Public Works	Flood Mitigation Assistance Grant Program (FMA)	Mid Term	**HIGH / High**	Water/ Flood Management Plans	**Y**

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1.6 Plan Implementation and Maintenance

The City of Corning Planning Team will follow the same implementation and maintenance strategy as Tehama County. This strategy is described in detail in Section 6 of Volume 1.

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CITY OF RED BLUFF

Tehama County

MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

2018 PLAN UPDATE

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CITY OF RED BLUFF ADOPTION RECORDS

To comply with DMA 2000, the Corning City Council has officially adopted the 2018 Tehama County Multi-Jurisdictional Hazard Mitigation Plan Volume 1 and the City of Corning Volume 2 Annex. The adoption of the 2018 MJHMP in its entirety recognizes the City's commitment to reducing the impacts of natural hazards within the City and County. See below record of Adoption.

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Section 2. City of Red Bluff Annex

This Annex details the hazard mitigation planning elements specific to the City of Red Bluff, a previously participating jurisdiction to the Tehama County Hazard Mitigation Plan. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the base plan document. As such, all sections of the base plan, including the planning process and other procedural requirements apply to and were met by the City. This Annex provides additional information specific to the City of Red Bluff, with a focus on providing additional details on the planning process, risk assessment, and mitigation strategy for this community.

Hazard Mitigation Plan Point of Contact

Primary Point of Contact
R. Scott Miller, Associate Civil Engineer & Airport Manager
City of Red Bluff / Public Works, Engineering Division
555 Washington Street
Red Bluff, CA. 96080
Telephone: (530) 527-2605 x3063
e-mail Address: smiller@cityofredbluff.org

Alternate Point of Contact
Robin Kampmann, PE
Public Works Director
555 Washington Street
Red Bluff, CA. 96080
Telephone: (530) 527-2605 Ext. 3067

2.1 Introduction

The county seat of Tehama County, Red Bluff is on the northern edge of the Sacramento Valley, and is the third largest city in the Shasta Cascade region. The City of Red Bluff serves an immediate population of approx. 14,076 and an additional population of approximately 5,000 in the surrounding area. Red Bluff is located on Interstate 5 at the junction of State Highways 36/ 99.

Agriculture and tourism are the primary industries of the area along with a growing commercial base. The local economy fluctuates accordingly with the cycles of these industries. The following is a summary of key information about the jurisdiction and its history:

- **Date of Incorporation—**March 31, 1876
- **Current Population—**14,076 as of 2010 Census
- **Population Growth—**Since the City's incorporation and first census in 1880 through the 2010 Census the City's population growth rates have fluctuated, but on average has maintained a 1.46% growth rate.

2.1.1 Location and Description

Red Bluff is an incorporated city in, and the county seat of Tehama County, California. Centrally located on the Sacramento River in Northern California, Red Bluff is 30 miles (48 km) south of Redding, 40 miles (64 km) northwest of Chico, and 125 miles (201 km) north of Sacramento, 190 miles west of Reno/Tahoe, and 155 miles south of the Oregon border (see Figure 2-1). Red Bluff is a hub where Highway 36, 99, and Interstate 5 meet. Red Bluff also serves as the gateway to Lassen Volcanic National Park and is the third largest city in the Shasta Cascades.

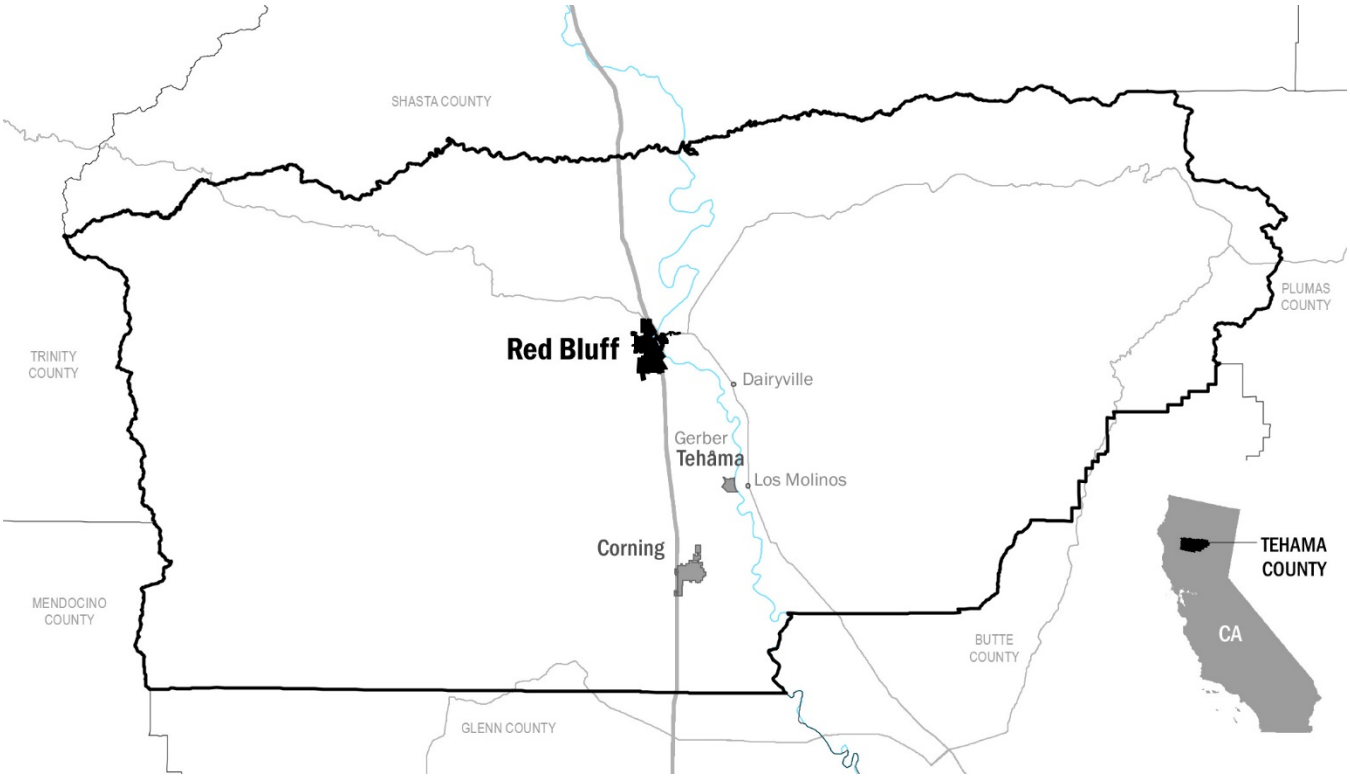


Figure 2-1: City of Red Bluff Location

2.1.2 Climate

Red Bluff has cool, wet winters and hot, dry summers. Average temperatures in January are a maximum of 54.7°F (12.6°C) and a minimum of 37.0°F (2.8°C). Average temperatures in July are a maximum of 97.9°F (36.6°C) and a minimum of 65.6°F (18.7°C). There is an average of 100.1 days annually with highs of 90°F (32°C) or higher and an average of 21.5 days with lows of 32°F (0°C) or lower. The record highest temperature was 121°F (49°C) on August 7, 1981, and the record lowest temperature was 17°F (−8°C) on January 9, 1937. Annual precipitation averages 23.21 inches (59.0 cm) with measurable precipitation falling of an average of 71 days. The wettest year was 1983 with 52.98 inches (134.6 cm) and the driest year was 1976 with 7.20 inches (18.3 cm). The most rainfall in one month was 21.47 inches (54.5 cm) in January 1995 and the most rainfall in 24 hours was 3.55 inches (9.0 cm) on January 8, 1995. Snowfall averages 2.1 inches (5.3 cm) a year. The year with the most snowfall on record was 1972 with 15.6 inches (40 cm). The most snowfall in one month was 15.0 inches (38 cm) in January 1937.

2.1.3 Historical Overview (From Chamber of Commerce Website)

Red Bluff derives its name from its location on a high vertical bank at the bend of the Sacramento River. Although never a mining camp, Red Bluff ranks with the celebrated towns of the gold rush days in age, exciting history, colorful personalities, and in present day importance.

The story of Red Bluff begins seven or eight years before the community came into existence with the comings and goings and projects of Peter Lassen, whose name was given to a county, a national park, a volcano, and a highway. At the very beginning, Red Bluff became the marketing and distributing center for a large area and its scope in that role widened steadily. By 1853 it was the chief commercial city in the northern part of the Sacramento Valley, and its streets continually thronged with pack trains operating to and from points as far away as Oregon, Nevada and Idaho.

In 1843, Lassen and two fellow pioneers were in Red Bluff tracking down horse thieves. He was so impressed by the land that he sought and received from the Mexican Government a grant of 25,000 acres, a few miles south of where the city now stands. On that tract in early 1847, he laid out a town site and named it Benton City in honor of Senator Thomas H. Benton of Missouri. Then he journeyed to Missouri to induce settlers to come out and also to obtain a charter for a Masonic Lodge which he wished to establish in his settlement.

Lassen returned to his town site in the summer of 1849 with a party of settlers and with the Masonic Charter. On reaching California, the members of the party learned about the discovery of gold, gave up their original idea, and headed or the mining area. So, the town site died suddenly and as a result, the lodge charter was transferred to Shasta. However, the publicity given to Lassen's colonization plan attracted many others to the territory, including several who helped found and build Red Bluff.

Red Bluff achieved and retained commercial importance because, for more than a century, it was the head of navigation on the Sacramento River. The initial attempt at river shipping in the area was made by Lassen in 1849 when he was still to put over Benton City. But the last trip was a losing venture and he abandoned the plan. The following year steamers commenced regular and frequent trips between San Francisco and Red Bluff and soon arrivals and departures were almost a daily occurrence. The service continued until after the turn of the century.

Another pioneer of Red Bluff was William B. Ide, commander of the group of Americans who, in the summer of 1846, revolted against Mexican rule, seized control of Sonoma, raised the Bear Flag and proclaimed the Republic of California. Ide was "President of the Republic" from June 10 to July 8, 1846, when couriers brought word that two days previously Commodore John Drake Sloat had taken over California in the name of the United States. Ide's home on the river bank about two miles north of Red Bluff in now under the State Park System.

2.1.4 Structure of Government

The City of Red Bluff operates as a general law city under the Council-Manager form of government. The Council establishes the policies for the City and appoints a trained and experienced City Manager to administer the affairs of the City. The City Council is the governing board with responsibility for the adoption and implementation of this Plan.

2.1.5 Development Trends

Red Bluff is centrally located between Redding to the north and Chico to the south, as well as, a regional recreation hub through SR 99/SR 36 and Interstate 5 that provide access to the Sacramento River, Lake Almanor, Eagle Lake, Reno, Lassen National Forest, Mount Shasta and the Shasta-Trinity National Forests.

Based on these attractive features of the region (both natural and manmade) and current development activity, the City of Red Bluff continues to experience construction for both commercial and residential development. This trend is expected to continue over the next decade as Red Bluff did not experience a massive construction boom bust, but rather a moderate uptick in development during the periods of 2004 through 2008. As a result, the development in Red Bluff, while slower paced, still remains consistent and continues to experience diversified growth in Residential (Single Family) along with Goods & Services.

2.2 What's New

The 2012 MJHMP Mitigation Actions were reviewed and have been changed, updated, and revised to reflect new priorities overtime. The sections below describe the background and planning process for changes and updates reflected in the 2018 MJHMP update.

2.2.1 Plan Consolidation and Focus

When choosing the priority hazards to be profiled for this 2018 MJHMP Update, the City of Red Bluff's planning team discussed the impact of wildfire, earthquake/slope failure, flood, severe weather and hazardous materials spills as hazards that affect the City. It was agreed that the impacts from severe weather would be minor and the planning team decided to omit severe weather in this 2018 MJHMP Update. Hazardous material spills were also omitted as the HMGP program is meant to evaluate and mitigate natural, not manmade, hazards.

Since the 2012 HMP was adopted, there were no changes to the built environment that have increased or decreased vulnerability to the City.

2.2.2 5 Year Mitigation Action Review and Update

During the 2018 MJHMP update process, each of the 2012 "County Wide" and "City of Red Bluff" specific mitigation actions were examined for relevancy, future implementation and evaluated for potential follow-on effort. Many of the City's 2012 mitigation actions were completed or are currently on-going. Upon review of the updated vulnerability assessment data, new mitigation actions were created in order to reflect changes in priorities.

The 2018 MJHMP mitigation actions located in Figure 2-1 of this annex provides a listing of 2012 mitigation actions and an explanation of why each action was completed, deleted, or deferred. Mitigation Actions previously developed under the 2012 HMP have been refreshed as a result of the newly completed risk assessment, planning process and implementation strategy.

Table 2-1: MJHMP Mitigation Action Record of Revision Review

Program/ Project	Completed, Deleted or Deferred	Explanation
Flood Hazard Mitigation		
Ensure that new development is designed to reduce or eliminate flood damage by requiring lots and rights-of-way to be laid out for the provisions of approved sewer and drainage facilities, providing on-site detention facilities as required.	Deferred, to be completed.	This project is ongoing.
Make sandbags available to residents in anticipation of severe rainstorms or flood events, deliver materials to critical infrastructure and provide public information on where these materials are stored and how to obtain them.	Deferred, to be completed.	This project is ongoing.
Clear drainage facilities of trash, debris, overgrown vegetation, dead and downed trees and shrubs prior to rainy season.	Deferred, to be completed.	This project is ongoing.
Retrofit and maintain existing storm drain system to insure full capacity is utilized	Deferred, to be completed.	This project is on-going.
Maintain compliance and good standing under the National Flood Insurance Program (NFIP)	On-Going	The City of Red Bluff is a member in good standing under NFIP.
Consider participation in the NFIP, Community Rating System (CRS)	On-Going	A CRS Cost Benefit Analysis was performed as part of this 2018 MJHMP Update.
Continue outreach program to provide information needed to increase awareness and modify actions to reduce flood damage, encourage flood insurance coverage and protect natural functions of floodplains.	New	New for 2018 mitigation plan update.
Work with Cal DFW to develop programmatic permit to remove vegetation and to conducted regular maintenance in stream channels.	New	New for 2018 mitigation plan update.
Reduce potential I & I issues in City infrastructure due to more frequent and heavy rain events.	New	New for 2018 mitigation plan update.
Earthquake Hazard Mitigation		
Construct Seismic Upgrades to city owned infrastructure not meeting current seismic standards.	New	New for 2018 mitigation plan update.

Program/ Project	Completed, Deleted or Deferred	Explanation
Develop Seismic Upgrade/ Retrofit Program for local business / gathering facilities that were built before benchmark years.	New	New for 2018 mitigation plan update.
Wildfire Hazard Mitigation		
Increase efforts to reduce hazards in existing development in Very High Fire Hazard Fire Severity Zones through improving engineering design and vegetation management standards for mitigation, appropriate code enforcement and public education on defensible space mitigation strategies.	Deleted	This mitigation action was deleted and divided into more detailed mitigation actions for Wildfire Hazards.
Clear fuels/overgrowth/dead and downed vegetation in City Parks and Open Space.	On-Going	This project is on-going.
Extend/ add domestic water fire lines to areas of known wildland fire risk.	New	New for 2018 mitigation plan update.
Construct new Fire Station near southern end of Red Bluff to decrease response times and suppress potential wildland fires in open grasslands near airport.	New	New for 2018 mitigation plan update.
Slope Failure Hazard Mitigation		
Install hillside stabilization and river bank armoring, rip-rap/gabion improvements on Red Bluff Hill and in the Sacramento River from Union Street along Rio Street north of Cedar Street to Hickory Street south of Cedar Street along Rio Street to prevent future mudslides/landslides, property slumping, road failure and infrastructure collapse.	On-Going	This project is on-going.
Hazardous Materials Spills Mitigation		
Investigate, inform and seek funding for the construction of Diamond Avenues Secondary Public Access to mitigate life, health and safety hazards of reoccurring Hazardous Materials spills, Rail road and Industrial accidents.	Delete	Not a natural Hazard event. Planning Committee chose to not profile hazardous material spill as hazard in the natural hazard mitigation plan.

Program/ Project	Completed, Deleted or Deferred	Explanation
Investigate, inform and seek funding partnerships for the construction Diamond Avenues Secondary Public Access to mitigate life, health and safety hazards of reoccurring Hazardous Materials spills, Rail road and Industrial accidents.	Delete	Not a natural Hazard event. Planning Committee chose to not profile hazardous material spill as hazard in the natural hazard mitigation plan.
All Hazard Mitigation		
Continue to participate not only in general mutual-aid agreements, but also in agreements with adjoining jurisdictions for cooperative response to all hazards and disasters	**Deleted**	**This mitigation action is vague, difficult to implement and is completed as a part of mitigation plan implementation.**
Where appropriate, support retrofitting, purchase, or relocation of structures located in hazard-prone areas to protect structures from future damage, with repetitive loss and severe repetitive loss properties as priority.	**Deleted**	**This mitigation action is vague, difficult to implement and is completed as a part of mitigation plan implementation.**
Integrate Local Hazard Mitigation Plan into the Safety Element of the General Plan	**Deleted**	**This mitigation action is vague, difficult to implement and is completed as a part of mitigation plan implementation.**
Support County-wide initiatives identified in Volume 1.	**Deleted**	**This mitigation action is vague, difficult to implement and is completed as a part of mitigation plan implementation.**
Continue to support the implementation, monitoring, maintenance, and updating of this Plan, as defined in Volume 1.	**Deleted**	**This mitigation action is vague, difficult to implement and is completed as a part of mitigation plan implementation.**

2.2.3 Implementation into Other Planning Mechanisms

The 2012 Tehama County HMP (Red Bluff Annex) has not been formally incorporated into any City planning mechanisms. This is because the City of Red Bluff has not updated any regulatory documents or ordinances during this time period.

2.2.4 Successful Mitigation Activities Since 2012

The 2012 Red Bluff HMP Annex has been implemented through various on-going projects, plans and programs. With respect to the mitigation action items and strategy developed in 2012, the City has been making improvements toward reducing natural hazard risk to life and property within the City limits. Significant risk reduction efforts have been made for floodplain management, flood damage prevention, and fire hazard abatement. These successful policies, programs, and projects are summarized below.

2.2.4.1 Red Bluff Urban Water Management Plan

Related 2012 HMP Initiative:

Ensure that new development is designed to reduce or eliminate flood damage by requiring lots and rights-of-way to be laid out for the provisions of approved sewer and drainage facilities, providing on-site detention facilities as required.

The Urban Water Management Plan (UWMP) has been prepared pursuant to the State of California's Urban Water Management Planning Act (ACT), which is contained in the California Water Code, Division 6, Part 2.6, Section 10610. The Act requires that urban water suppliers serving more than 3,000 customers or providing more than 3,000 acre-feet of water annually to develop an UWMP every fifth year ending in five and zero. Consistent with the purpose of the Act, the 2010 UWMP facilitates local and regional water planning activities and support the City of Red Bluff's long-term water resource planning goals. The UWMP also helps ensure adequate water supplies are available to meet community water needs of today and the future.

2.3 Planning Methodology

As described above, the City of Red Bluff followed the planning process detailed in Section 3 of the base plan. In addition to providing representation on the Tehama County Hazard Mitigation Planning Committee (HMPC) and Steering Committee, the City formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 2-2.

Table 2-2: 2018 MJHMP Update Stakeholder List

Planning Committee Dept. / Members	Position / Role	CRS Category
R. Scott Miller, Public Works	Planning Lead, Steering Committee Rep.	Structural Projects
Robin Kampmann, Public Works	Plan Review and Documentation, Presentation and staff reports.	Structural Projects
Scott Friend, Community Development Director and Floodplain Administrator	Document Review, Mitigation Plan Development	Preventative Measures
Kyle Sanders, Police Chief	Document Review, Mitigation Plan Development	Emergency Services

2.4 Risk Assessment

The intent of this section is to profile City of Red Bluff's hazards and assess the City's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4 (Risk Assessment) in Volume One. The hazard profiles in Volume One discuss overall impacts to the planning area and describes the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the City of Red Bluff is included in this section of the Annex. This vulnerability assessment analyzes the property, population, critical facilities, and other assets at risk to hazards specific to the City of Red Bluff. For more information about how hazards affect the County as a whole, see Section 4 Risk Assessment in the base plan.

Each hazard vulnerability assessment for the City of Red Bluff Annex includes a hazard profile/problem description as to how each medium or high significant hazard affects the City and includes information on past hazard occurrences. The intent of this section is to provide jurisdictional specific information on hazards and further describe how the hazards and risks differ across the planning area.

2.4.1 Hazard Screening Criteria

Per FEMA Guidance, the first step in developing the Risk Assessment is identifying the hazards. The City Planning Committee reviewed a number of previously prepared hazard mitigation plans and other relevant documents to determine the universe of natural hazards that have the potential to affect the County and the nearby region. Table 2-3 provides a crosswalk of hazards identified in the 2012 Tehama County HMP, 2012 City of Red Bluff HMP Annex, the City of Red Bluff General Plan and 2013 California State HMP. Thirteen different hazards were identified based on a thorough document review. The crosswalk was used to develop a preliminary hazards list providing a framework for City of Red Bluff HMP Planning Team members to evaluate which hazards were truly relevant to the City and which ones are not. For example, levee failure was considered to have no relevance to the City, while earthquake, flood and wildfire were indicated in every hazard documentation.

Table 2-3: Document Review Crosswalk

Hazards	2012 Tehama County HMP	2012 City of Red Bluff HMP Annex	City of Red Bluff General Plan	2009 Tehama County General Plan	2013 CA State HMP
Natural Hazards					
Avalanche	■				■
Climate Change	■				■
Dam Failure	■				■
Drought	■				■
Earthquake	■	■	■	■	■
Flood	■	■	■	■	■
Landslide	■	■	■		■
Levee Failure					■
Severe Weather	■	■			■
Tsunami			■		■

Hazards	2012 Tehama County HMP	2012 City of Red Bluff HMP Annex	City of Red Bluff General Plan	2009 Tehama County General Plan	2013 CA State HMP
Volcanoes			■		■
Wildfire	■	■	■	■	■
Human Caused Hazards					
Hazardous Materials		■			

2.4.2 Climate Change

Climate refers to patterns of temperature, precipitation, humidity, wind and seasons. Climate shapes natural ecosystems and the human economies and cultures that depend on them. "Climate change" refers to changes over a long period of time. It is generally perceived that climate change will have a measurable impact on the occurrence and severity of natural hazards around the world. Impacts include the following:

- Snow cover losses will continue, and declining snowpack will affect snow-dependent water supplies and stream flow levels around the world.
- Drought and the frequency, intensity, and duration of heat waves are expected to increase.
- More extreme precipitation is likely, increasing the risk of flooding.
- The world's average temperature is expected to increase.

Climate change will affect communities in a variety of ways. Impacts could include an increased risk for extreme events such as drought, storms, flooding, and forest fires; more heat-related stress; and the spread of existing or new vector-born disease into a community. In many cases, communities are already facing these problems to some degree. Climate change can affect the frequency, intensity, extent and/or magnitude of the problems.

This hazard mitigation plan addresses climate change as a secondary impact for each identified hazard of concern. Each chapter addressing one of the hazards of concern includes a section with a qualitative discussion on the probable impacts of climate change for that hazard.

2.4.3 Vulnerability Assessment and Total Assets at Risk

This section presents the vulnerability assessment for Red Bluff and identifies Red Bluff's total assets at risk, including people, values at risk, critical facilities and infrastructure. Growth and development trends are also presented for the community. This data is not hazard specific, but is representative of total assets at risk within the community.

2.4.4 Population and Asset Inventory

In order to describe vulnerability for each hazard, it is important to understand the "total" population and "total" assets at risk within the City. The exposure for each hazard described in this section will refer to the percent of total population or percent of total assets similar to Volume 1. This provides the possible significance or vulnerability to people and assets for the natural hazard event and the estimated damage and losses expected during a "worst case scenario" event for each hazard. Sections below provide a description of the total population, critical facilities, and parcel exposure inputs.

2.4.4.1 Population

In order to develop hazard-specific vulnerability assessments, populations near natural hazard risks have been determined to understand the total "at risk" population. We can understand how geographically defined hazards may affect the City by analyzing the extent of the hazard in relation to the location of population. For purposes of the vulnerability assessment approximately 14,076[2] (100%) of the City's population is exposed to one or more hazards within or near the City boundaries. Each natural hazard scenario affects the City residents differently depending on the location of the hazard and the population density of where the hazard could occur. Vulnerability assessment sections presented later in this section summarize the population exposure for each natural hazard.

2.4.4.2 Vulnerable Populations

The severity of a disaster depends on both the physical nature of the extreme event and the socioeconomic nature of the populations affected by the event. Important socioeconomic factors tend to influence disaster severity. A core concept in a vulnerability analysis is that different people, even within the same region, have a different vulnerability to natural hazards.

2.4.4.2.1 Income and Housing Condition

Income or wealth is one of the most important factors in natural hazard vulnerability. This economic factor affects vulnerability of low income populations in several ways. Lower income populations are less able to afford housing and other infrastructure that can withstand extreme events. Low income populations are less able to purchase resources needed for disaster response and are less likely to have insurance policies that can contribute to recovery efforts. Lower income elderly populations are less likely to have access to medical care due to financial hardship. Because of these and other factors, when disaster strikes, low income residences are far more likely to be injured or left without food and shelter during and after natural disasters.

Figure 2-2 shows the median household income distribution for the City of Red Bluff in 2015. The "median" is the value that divides the distribution of household income into two equal parts (e.g., the middle). The median household income in in Red Bluff in 2015 was estimated to be $31,239. In the United States during the same period, the median house household income was $53,889 (Bureau U. S., 2015). The most vulnerable residents (in terms of income and housing condition) to natural hazards are located in the downtown area of Red Bluff.

2.4.4.2.2 Age

Children and the elderly tend to be more vulnerable during an extreme natural disaster. They have less physical strength to survive disasters and are often more susceptible to certain diseases. The elderly often also have declining vision and hearing and often miss reports of upcoming natural hazard events. Children, especially young children, have the inability to provide for themselves. In many cases, both children and the elderly depend on others to care for them during day to day life.

[2] According to the 2010 U.S. Census Block pre-joined TIGER spatial data, the total population for the City in 2010 was 14,076.

Finally, both children and the elderly have fewer financial resources and are frequently dependent on others for survival. In order for these populations to remain resilient before and after a natural hazard event, it may be necessary to augment city residents with resources provided by the City, state and federal emergency management agencies and organizations.

As seen in Figure 2-3, the block groups with the highest concentration of people under 18 years old are located in the southern portion of the city as well as the northwest portion of the city along the Red Bluff border. Figure 2-4 shows that the highest concentration of people over the age of 65 is in the western portion of the City west of Monroe Street.

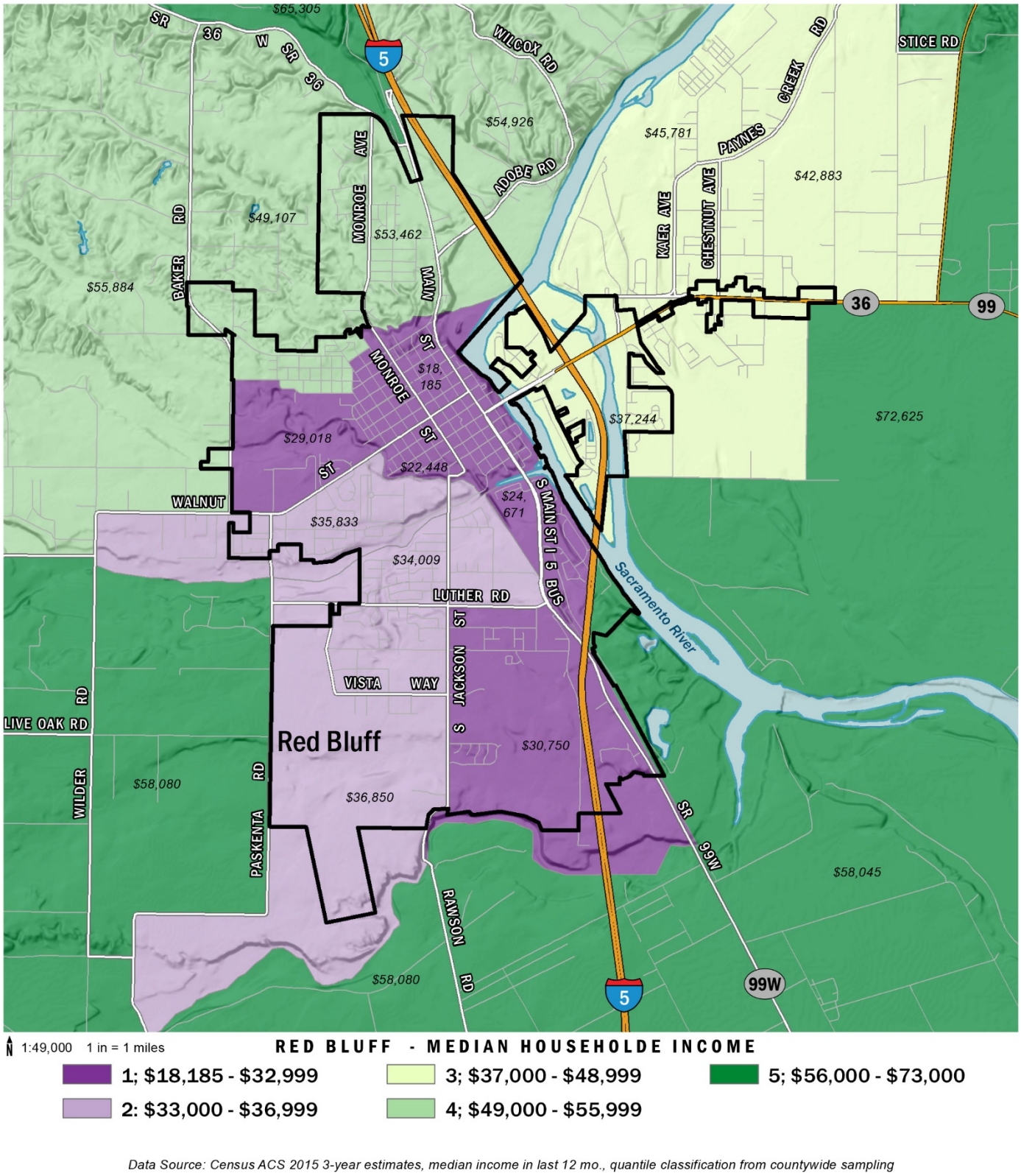
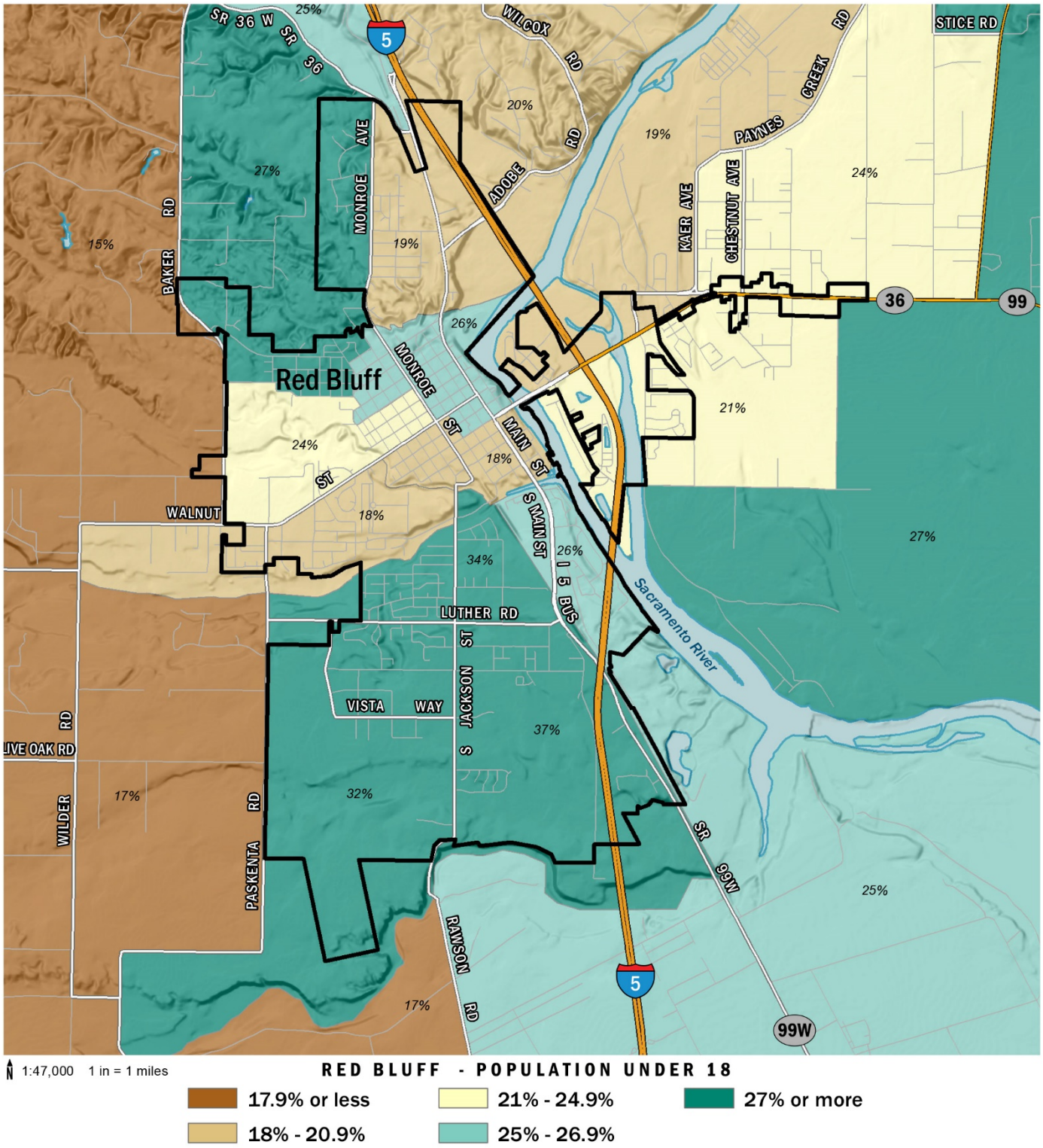
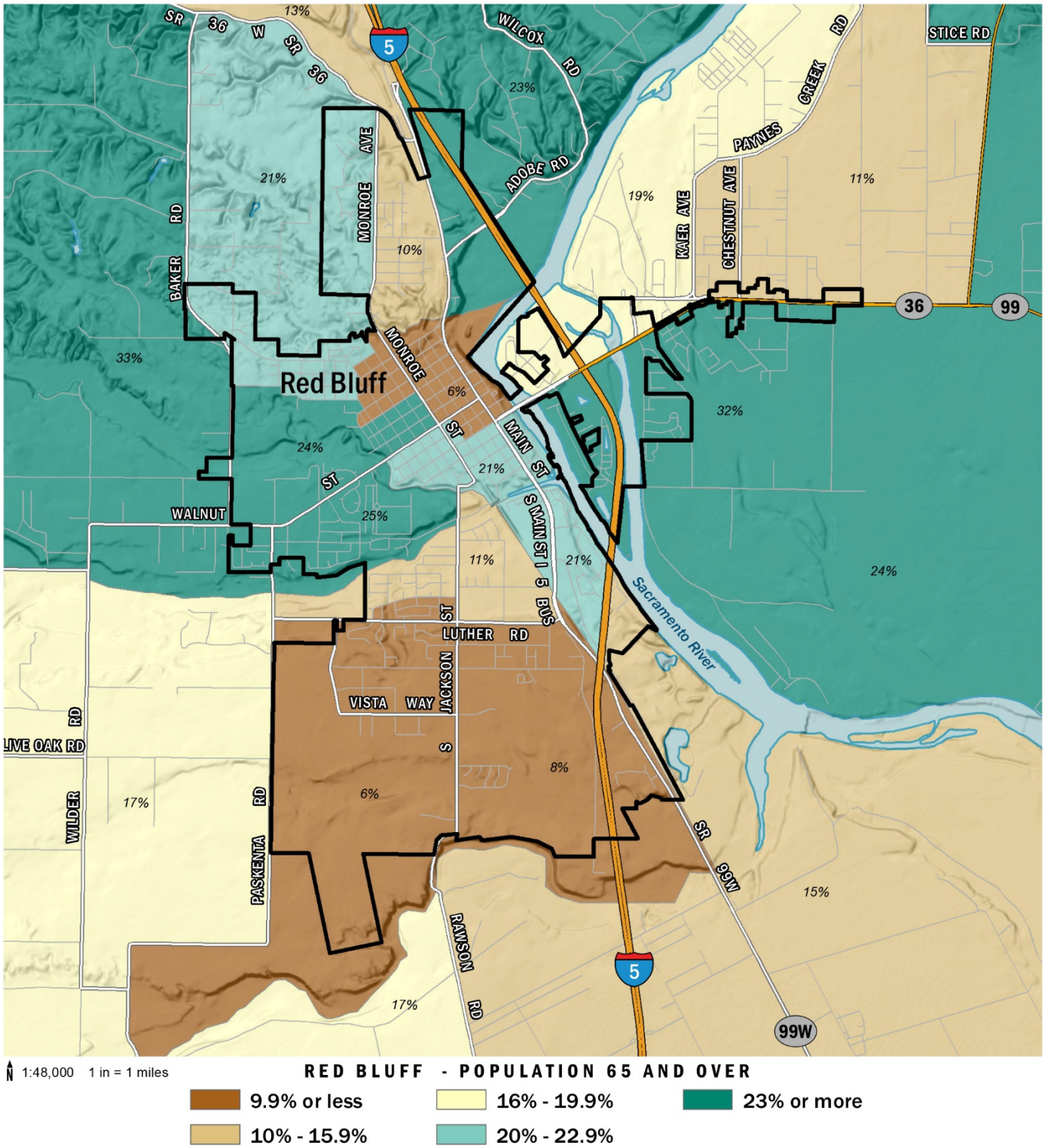


Figure 2-2: Median Household Income in Red Bluff



Data Source: Census ACS 2015 3-year estimates, percentage of total population, quantile classification from countywide sampling

Figure 2-3: Red Bluff Population Under Age 18



Data Source: Census ACS 2015 3-year estimates, percentage of total population, quantile classification from countywide sampling

Figure 2-4: City of Red Bluff Residents Over Age 65

2.4.5 Critical Facilities Inventory

Critical facilities are of particular concern when conducting hazard mitigation planning. Critical facilities are defined as essential services, and if damaged, would result in severe consequences to the health, safety, and welfare of the public.

An inventory of critical facilities based on data from the City of Red Bluff, Tehama County and other publicly sourced information were used to develop a comprehensive inventory of facility points and lifelines for the City. Critical facility points include fire stations, schools, transportation, utilities, and government buildings. Lifelines include communication, electric power, liquid fuel, natural gas, and transportation routes. A current representation of the critical facilities and lifelines in the City of Red Bluff are provided in Table 2-4 and Table 2-5. The Tehama County Public Works Department manages and maintains a complete list of critical facilities.

Table 2-4: City of Red Bluff Critical Facility Counts

Infrastructure Type	Total Feature Count
Essential Facility	44
EOC	-
Fire Station	1
Government Facility	30
Hospital	1
Police Station	1
School	11
High Potential Loss	67
Residential Child Care	1
Adult Residential Care	24
Child Care	19
Foster/Home Care	1
Home Care	1
Foster Care	3
Elder Care	6
Hotel	12
Transportation and Lifeline	28
Airport	1
Bridge	20
Bus Facility	1
FCC AM Tower	-
FCC Cell Tower	-
FCC FM Tower	3
Natural Gas Station	1
Substation	1
Waste Water Facility	1
Grand Total	**139**

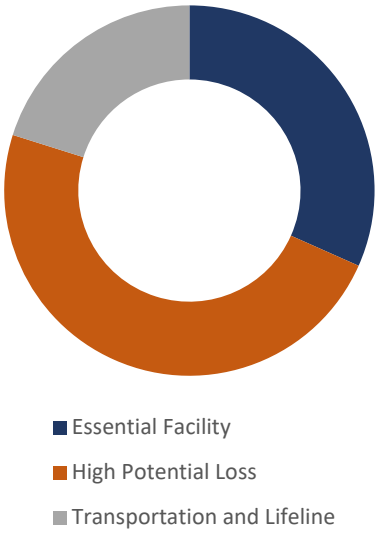


Table 2-5: City of Red Bluff Linear Utilities

Infrastructure Type (Linear)	Total Linear Mileage
Transportation and Lifeline	**101.6**
FEMA Levee	-
USACE Levee	-
Natural Gas Pipeline	2.6
Transmission Line	5.8
Railroad	5.2
Street	88.0
-Interstate	7.4
-Primary Highway	3.3
-State/County Highway	15.3
-Local Road	57.1
-Other Road	4.8
-4WD Road	-
Grand Total	**101.6**

2.4.6 Parcel Value Inventory

Total count and value of parcels within the City of Red Bluff which could be exposed to a hazard event is referred to as parcel exposure in this annex. A standardized hazard overlay was conducted to develop hazard exposure results for improved city parcels presented later in this section. For more information on this exposure method see Volume 1, Section 4. In the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a total loss and structures can be rebuilt. The Tehama County Assessor's data is pivotal to developing parcel values exposed to each hazard and includes current fair market value of assets at risk. City of Red Bluff parcel information is summed and provided in Table 2-6. Both the market value and content value are the total value in the community at risk to a particular hazard.

Table 2-6: City of Red Bluff Parcel Counts and Values

	Total Parcels	Total Market Value Exposure ($)	Total Content Value Exposure ($)	Total Value ($)
Red Bluff Parcel Totals	5,207	$ 737,733,448	$ 502,236,755	$ 1,239,970,203

2.4.7 Hazus Structure and Content Value Inventory

FEMA's loss estimation software, Hazus-MH 4.0, was used to analyze the City's building risk to flood and earthquake hazards. A Hazus level II assessment was performed leveraging county-wide assessor's data in lieu of default Hazus data aggregated to the Census Block or Tract level. Hazus software operates on structure square footage, structure replacement, and content replacement costs to estimate potential losses specific to a modeled flood or earthquake scenario. Table 2-7 and Figure 2-5 provide value data for building categories at the census block and census tract levels for the City of Red Bluff. Census block and census tracts are used to provide input information for the Hazus analysis presented in this City annex. It is important to note that the full inventory basis within the Hazus software is different than the sum of values

from the assessor's data due to a variance in replacement cost calculations. If a parcel has no market value or assessment value, Hazus calculates a default value based on construction type and year built.

Note: Data Source: Tehama County Assessor. Building values reflect fair market value where available. If no fair market value is available, this value reflects the assessed improvement value. Content replacement costs are calculated based on assessor's use codes translated to Hazus occupancy classes. Each HAZUS occupancy class prescribes a specific content cost multiplier used to calculate the content cost values shown above. Use codes including a "vacant" description have been removed along with agricultural use codes with no improvement value.

Table 2-7: Parcel-Based Hazus Input Values (City of Red Bluff)

Building Type	Building Value ($)	Building Value (% of grand total)	Content Value ($)	Content Value (% of grand total *)	Total Value ($)	Proportion of Value (%)
Agricultural	$ 47,799	0.0%	$ 47,799	0.0%	$ 95,598	0%
Commercial	$ 226,553,387	17.0%	$ 250,380,313	18.8%	$ 476,933,700	36%
Education	$ 4,277,833	0.3%	$ 4,277,833	0.3%	$ 8,555,666	1%
Governmental	$ 223,517	0.0%	$ 223,517	0.0%	$ 447,034	0%
Industrial	$ 17,953,694	1.3%	$ 22,888,214	1.7%	$ 40,841,908	3%
Religion	$ 10,663,158	0.8%	$ 10,663,158	0.8%	$ 21,326,316	2%
Residential	$ 523,669,536	39.3%	$ 261,834,807	19.6%	$ 785,504,343	59%
Total	**$ 783,388,924**	**59%**	**$ 550,315,641**	**41%**	**$ 1,333,704,565**	

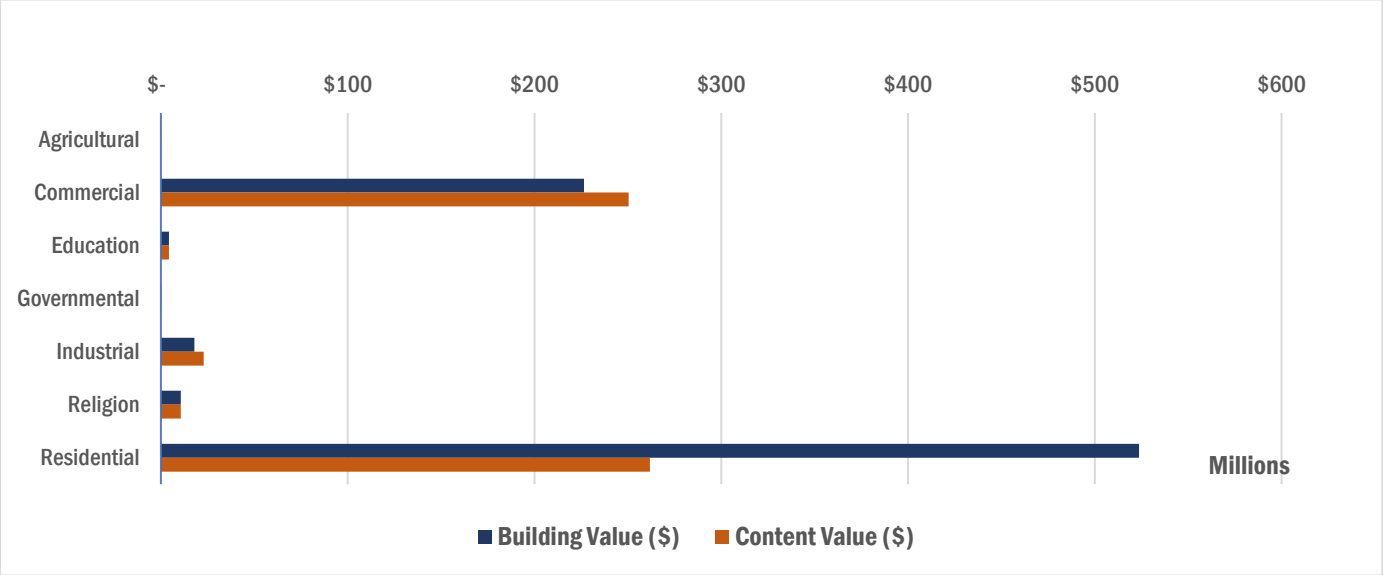


Figure 2-5: Hazus Inventory (Parcel-based) Building and Content Exposure Values

2.4.8 Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified as high or medium significance hazards within the City Limits. Impacts of past events and vulnerability of the City to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the base plan for more detailed information about these hazards and their impacts on the Tehama County planning area).

Methodologies for calculating loss estimates are the same as those described in Section 3.4 of the base plan. In general, the most vulnerable structures are those located within the flood risk areas, wildfire risk areas, and vulnerable buildings within violent earthquake shake zones. An estimate of the vulnerability of the City to each identified priority hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow.

This Annex provides an explanation of prevalent hazards within the City and how hazards may affect population and property within the jurisdiction. Most importantly the mitigation strategy presented in this plan responds to the particular vulnerabilities and provides prescriptions or actions to achieve the greatest reduction of vulnerability, which results in saved lives, reduced injuries, reduced property damage, and protection for the environment in the event of a natural hazard. This City Annex provides information for the following natural hazard threats:

Flooding
SECTION 2.4.9

Earthquake
SECTION 2.4.10

Wildfire
SECTION 2.4.11

Slope Failure
SECTION 2.4.12

Severe Weather
SECTION 2.4.13

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2.4.9 Flood Hazard

Seasonal flooding is a concern within the City of Red Bluff. The construction of Shasta Dam was part of the Central Valley Project, a flood control system which involves twenty dams and reservoirs, as well as canals, power plants, and other facilities. Shasta Dam was intended by the U.S. Bureau of Reclamation to be a major flooding control storage facility, thus lessening the threat of natural winter-spring flooding to communities downstream, such as Red Bluff. (City of Red Bluff General Plan Safety Element)

For general information regarding flooding, see the flood hazard profile located in Section 9, Volume 1 of the Base Plan.

2.4.9.1 Regulatory Oversight

2.4.9.1.1 National Flood Insurance Program (NFIP)

The City of Red Bluff has participated in the NFIP since 1982. The City of Red Bluff is currently in good standing with the provisions of the NFIP. Compliance is monitored by FEMA regional staff and by the California Department of Water Resources under a contract with FEMA. Maintaining compliance under the NFIP is an important component of flood risk reduction. See the Base Plan for general information on the NFIP.

See Table 2-8 for more information on the City's policies and historic flood insurance claims. Properties that fall within a Flood Plain are required to obtain pre- and post-construction elevation certificates and to maintain flood insurance policies and any other requirements contained in Chapter 26 "Flood Damage Prevention" of the Red Bluff City Code.

Table 2-8: NFIP Status Table (City of Red Bluff)

NFIP Status	Participating since 05/17/1982
Policies in Force	168
Policies in SFHA	138
Policies in non-SFHA	30
Total Claims Paid	37
Paid Losses	$ 370,549
Repetitive Loss Properties	N/A
Severe Repetitive Loss Properties	N/A
Repetitive Loss Payment by NFIP on Building	$ 0
Repetitive Loss Payment by NFIP on Contents	$ 0

See Volume 1, Section 9.2.1 of the Base Plan for more information on the NFIP.

2.4.9.1.2 Community Rating System (CRS)

The City of Red Bluff does not currently participate in FEMA's CRS Program.

See Volume 1, Section 9.2.2 of the Base Plan of the Base Plan for general information on CRS.

2.4.9.1.3 Flood Damage Prevention

Chapter 26 of the Red Bluff Code of Ordinances includes methods and provisions to:

- Restrict or prohibit uses which are dangerous to health, safety and property due to water or erosion hazards or which result in damaging increases in erosion or flood heights or velocities;
- Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- Control the alteration of natural floodplains, stream channels and natural protective barriers, which help accommodate or channel flood waters;
- Control filling, grading, dredging and other development which may increase flood damage; and
- Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas.

(`61 Code, § 26.1-4) (Ord. 913, passed 4-18-2000)

2.4.9.2 Past Events

Damage has been reported in the City of Red Bluff from Flood Events. During January, March, and December 1983 Reeds Creek overflowed its banks along the lower mile of its course through Red Bluff. These flood events flooded 65 homes and involved considerable emergency efforts by local agencies. Floodwaters were estimated to be between 3 – 4 feet deep inside homes in the affected areas. Table 2-29 summarizes flood events in Red Bluff since 1969.

Table 2-9: Historic Flood Events in Red Bluff

Date	Declaration #	Type of event
2/17/17		Storms brought additional rain and widespread flooding and debris flows, as well as mountain snow.
12/11/14		Heavy Rain
12/6/14		Flash Flooding caused by heavy rain.
1983		Rain
1969		Rain

Source: National Oceanic and Atmospheric Administration and 2004 City of Red Bluff LHMP

2.4.9.3 Location

The Sacramento River causes the major flood problems in Red Bluff As the water level rises, Paynes Creek Slough, Samson Slough, and East Sand Slough start flowing, causing flooding to residential areas along their lengths. Several roads that cross through these sloughs become closed during flooding. Also, homes built on the banks of the river and sloughs are subject to flooding when the Sacramento River reaches approximately 138,000 cfs, a IO-percent annual chance flood event. (FEMA, 2011)

Flooding threat in the City of Red Bluff is most notable along the following streams: Red Bank, Grasshopper, Reeds, Brickyard, Brewery, Dibble, and Blue Tent Creeks. The main stream flowing into Lake Red Bluff causes flooding of the east-side lowland areas and the City of Red Bluff parks on the western side, along with erosion of the high bluffs. Figure 2-6 shows the flood zones in Red Bluff. Local flooding problems occur in the following areas:

- Most homes on Musick Avenue and along Aloha Street from South Jackson Street to Aloha Court are located in the 100-YR plain.
- Vista School at Vista Way and South Jackson Street suffer from drainage problems.
- An area east of Airport Boulevard and north of Kimball Road suffers from runoff backup.
- A potential exists for some inundation of Forward Park.
- Mobile Home Park on Gilmore Road.

Table 2-10 provides a summary of FEMA identified 100-YR and 500-YR flood hazard areas and Table 2-11 provides further detail regarding the source/location of the City's flood plains.

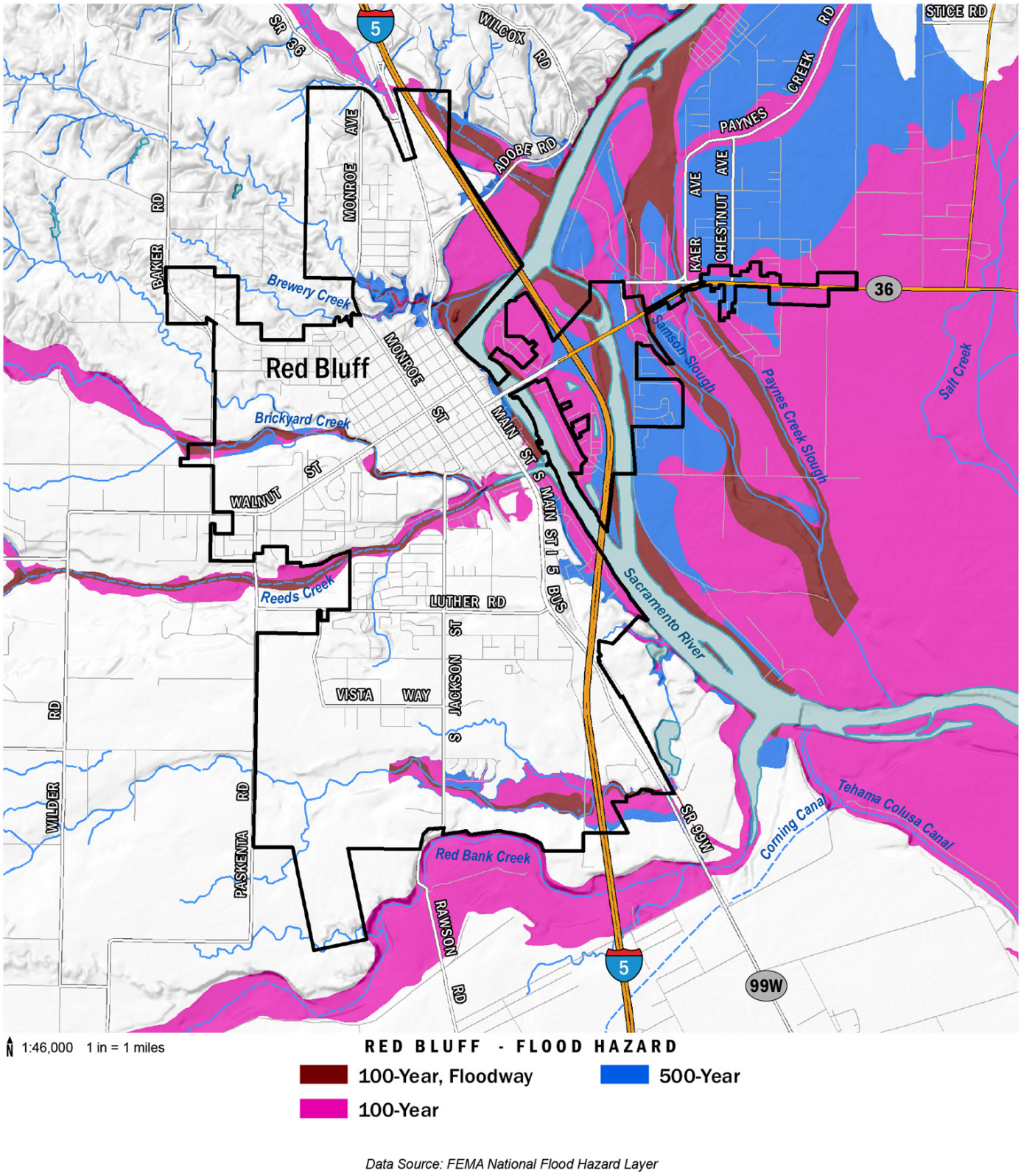


Figure 2-6: City of Red Bluff Flood Zones

Table 2-10: Flood Hazard Area Summary

Flood Hazard Type	Sum of Acres	Sum of Square Miles
100-YR Flood	429.6	0.7
100-YR Flood, Floodway	282.9	0.4
500-YR Flood	251.6	0.4
Total	**964.1**	**1.5**

Source: 09/29/2011 effective Countywide FEMA DFIRM data (5/29/2012 LOMR included)

Table 2-11: Local Drainage Peak Discharge Estimates – City of Red Bluff

	Drainage (SQ. MI)	Discharge (cubic feet/second)			
Source/Location	**Area**	**10-Year**	**50-Year**	**100-YR**	**500-YR**
Sacramento River					
At Red Bluff Diversion Dam	9,150	141,000	194,000	220,000	546,000
Downstream confluence of Reeds Creek	8,900	140,000	192,000	217,500	541,000

Source: Table 5 Summary of Discharges from FEMA FIS Text, 2011

2.4.9.4 Frequency

Natural seasonal flooding is the most common type of flooding in the City and can be expected at least annually.

2.4.9.5 Severity

Human activities in the water-shed upstream from Red Bluff play a significant role in sedimentation, peaks of water flow, and erosional capacity streams as they flow downstream across the City of Red Bluff. Since the city lies at the eastern ends of these drainages and has areas of high residential densities and paved streets, runoff from these urban surfaces represent an additional source of water for the channels. At times of peak discharge, this can lead to localized flooding and the backup of urban drainage systems. There is a partial levee system along the lower portion of Reeds Creek, which helps to protect the adjacent urban area from overbank flooding during periods of high stream flow.

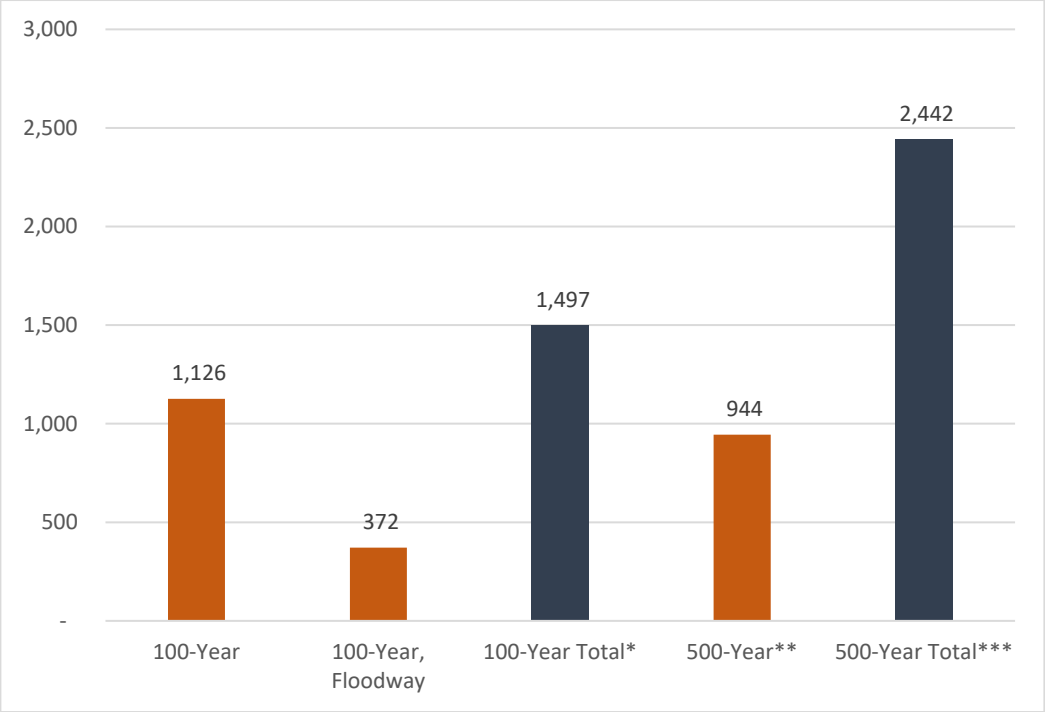
2.4.9.6 Flood Hazard Vulnerability

2.4.9.6.1 Population

Population counts of those living in the floodplain were generated by analyzing County assessor and parcel data that intersect with the 100-YR and 500-YR floodplains identified on FIRMs within the City of Red Bluff. Using GIS, U.S. Census Bureau information was used to intersect the FEMA identified floodplains within the City limits. An estimate of population was calculated by weighting the population within each census block. The exposure results indicate the percentage of total population living within a flood risk area. Using this approach, it was estimated that the total exposed population is 1,497 within the 100-YR floodplain (10.8% of total population) and 2,442 within the 500-YR floodplain (17.6% of total population), as shown in Figure 2-7.

Population Exposure

Population Count in the 100-Year and 500-YR Floodplains



**Total 100-year floodplain*
***Includes only additional area outside of 100-year floodplain*
****Total 500-YR floodplain, includes 100-year floodplain*

Figure 2-7: Population Exposure to Flood

2.4.9.6.2 Property

GIS was used to determine the possible impacts of flooding within the City of Red Bluff. The methodology described in Volume 1, Section 4.7.6.2 of the base plan was followed in determining structures and values at risk to the FEMA identified 1% (100-YR) and 0.2% (500-YR) annual chance flood event.

Table 2-12 summarizes the number of parcels and property value within the City of Red Bluff's FEMA identified floodplains. GIS models determined that there are 489 parcels within the 100-YR floodplain, 142 parcels within the 100-YR floodway and 282 parcels within the 500-YR floodplain. This methodology also estimated $154,135,468 worth of building-and-contents exposure to the 100-YR flood, representing 12.4 percent of the total assessed value within the City of Red Bluff and $8,092,164 worth of building and content exposure to the 100-YR floodway representing .7% of the total assessed value within the City. An estimated $78,054,573 worth of building-and-contents are exposed to the 500-YR flood, representing 6.3 percent of the total assessed value within the City of Red Bluff.

Table 2-12: City of Red Bluff- Parcels Exposed to NFIP Flood Zones

	Total Parcels	Total Market Value Exposure ($)	Total Content Value Exposure ($)	Total Value ($)
Red Bluff	5,207	$ 737,733,448	$ 502,236,755	$ 1,239,970,203

Flood Hazard Zone	Improved Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
100-YR Flood	489	*9.4%*	$ 88,389,643	$ 65,745,825	$ 154,135,468	*12.4%*
100-YR Flood, Floodway	142	*2.7%*	$ 4,830,409	$ 3,261,755	$ 8,092,164	*0.7%*
100-YR Total*	**631**	**12.1%**	**$ 93,220,052**	**$ 69,007,579**	**$ 162,227,631**	**13.1%**
500-YR Flood**	282	*5.4%*	$ 48,370,966	$ 29,683,607	$ 78,054,573	*6.3%*
500-YR Total***	**913**	**17.5%**	**$ 141,591,018**	**$ 98,691,186**	**$ 240,282,204**	**19.4%**

**Total 100-year floodplain*
***Includes only additional area outside of 100-year floodplain*
****Total 500-YR floodplain, includes 100-year floodplain*

Note: The table above does not display loss estimation results; the table exhibits total value at risk based upon the hazard overlay and Tehama County Assessor data.

2.4.9.6.3 Flood Damage Estimation

FEMA's HAZUS-MH software models the possible damage of flooding within the City of Red Bluff. The methodology described in Volume 1, Section 4.7.6.3 of the base plan was followed in determining potential damage associates with the 1% (100-YR) and 0.2% (500-YR) annual chance flood event.

The HAZUS-MH software calculates losses to structures from flooding by analyzing the depth of flooding and type of structure. Using historical flood insurance claim data, HAZUS-MH estimates the percentage of damage to structures and their contents by applying established damage functions to an inventory. For this analysis, all non-vacant parcels with current market values were used instead of the default inventory data provided with HAZUS-MH software. The analysis for the City of Red Bluff is summarized in Table 2-13 and Figure 2-8 for the 100-YR flood events and Table 2-14 and Figure 2-9 for 500-YR flood events. It is estimated that there "could" be up to $33,760,727 of flood loss from a 100-YR flood event in the planning area and $38,097,138 of flood loss from a 500-YR flood event. This modeled loss is assuming all tributaries in the area collect 100-YR event precipitation levels in the watershed. The estimated loss represents 20.1% of the total value exposed to the 100-YR flood and 15.9% of the total value exposed to the 500-YR event.

Table 2-13: 100-YR Flood Loss Estimation (Based on Depth) in NFIP Flood Zones by Occupancy Type

Building Type	Building Damage ($)	Building Damage (% of grand total)	Content Damage ($)	Content Damage (% of grand total)	Total Damage ($)	Proportion of Loss (%)
Agricultural	$ -	0.0%	$ -	0.0%	$ -	0%
Commercial	$ 2,348,133	6.2%	$ 7,790,872	20.5%	$ 10,139,005	30%
Education	$ -	0.0%	$ -	0.0%	$ -	0%
Governmental	$ -	0.0%	$ -	0.0%	$ -	0%
Industrial	$ -	0.0%	$ -	0.0%	$ -	0%
Religion	$ 19,592	0.1%	$ 154,759	0.4%	$ 174,351	1%
Residential	$ 15,245,515	40.0%	$ 8,201,856	21.5%	$ 23,447,371	69%
Total	**$ 17,613,240**	**52%**	**$ 16,147,487**	**48%**	**$ 33,760,727**	

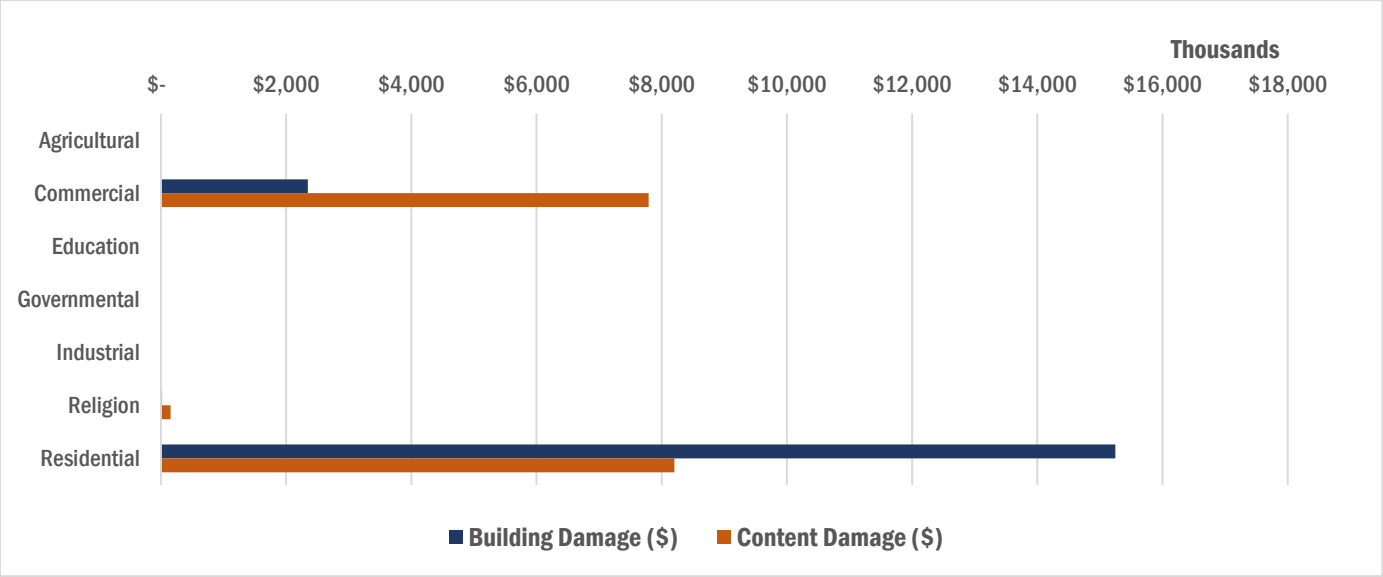


Figure 2-8: Estimated Building and Content Loss in the 100-YR floodplain by Occupancy Type

Table 2-14: 500-YR Flood Loss Estimation (Based on Depth) in NFIP Flood Zones by Occupancy Type

Building Type	Building Damage ($)	Building Damage (% of grand total)	Content Damage ($)	Content Damage (% of grand total)	Total Damage ($)	Proportion of Loss (%)
Agricultural	$ -	0.0%	$ -	0.0%	$ -	0%
Commercial	$ 2,290,935	6.0%	$ 7,522,067	19.7%	$ 9,813,002	26%
Education	$ -	0.0%	$ -	0.0%	$ -	0%
Governmental	$ -	0.0%	$ -	0.0%	$ -	0%
Industrial	$ -	0.0%	$ -	0.0%	$ -	0%
Religion	$ 19,592	0.1%	$ 154,656	0.4%	$ 174,248	0%
Residential	$ 18,248,455	47.9%	$ 9,861,433	25.9%	$ 28,109,888	74%
Total	**$ 20,558,982**	**54%**	**$ 17,538,156**	**46%**	**$ 38,097,138**	

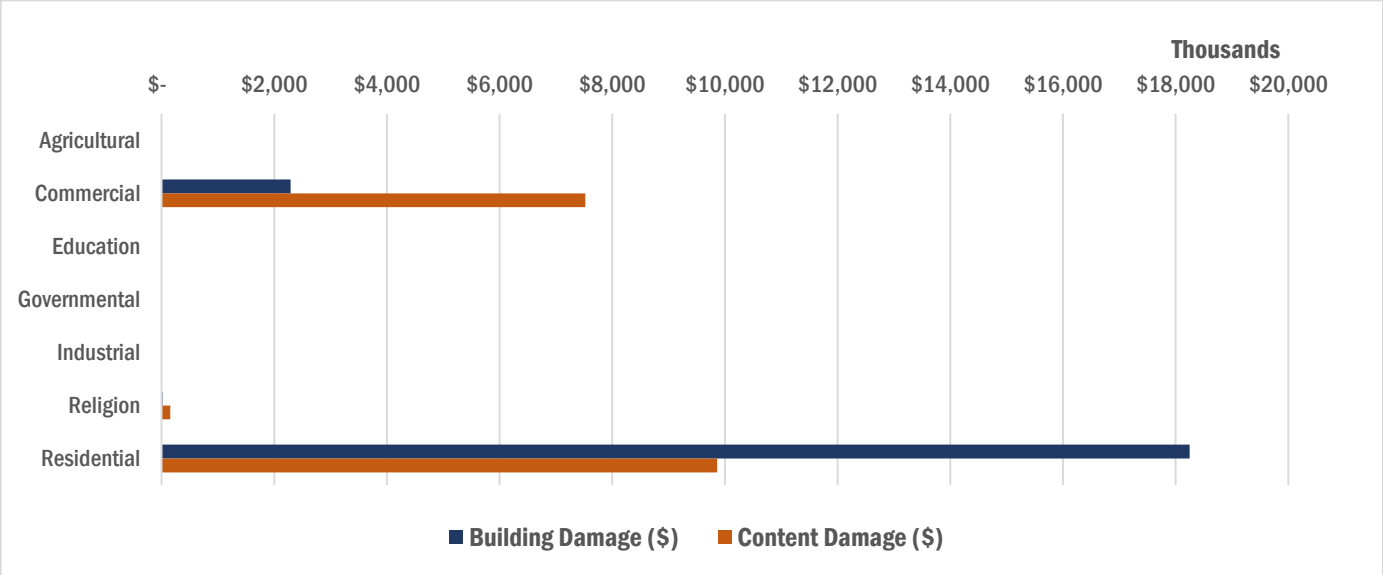


Figure 2-9: Estimated Building and Content Loss in the 500-YR floodplain by Occupancy Type

2.4.9.6.4 Critical Facilities and Infrastructure

It is important to determine who may be at risk if infrastructure is damaged by flooding. Roads or railroads that are blocked or damaged can isolate residents and can prevent access throughout the county, including for emergency service providers needing to get to vulnerable populations or to make repairs. Bridges washed out or blocked by floods or debris also can cause isolation. Water and sewer systems can be flooded or backed up, causing health problems. Underground utilities can be damaged. Dikes can fail or be overtopped, inundating the land that they protect. The following sections describe specific types of critical infrastructure.

Table 2-15 summarizes the critical facilities and infrastructure at risk to the 100-YR, 100-YR floodway and 500-YR floodplains within the City of Red Bluff.

Table 2-15: Critical Facility Points in the Floodplain – City of Red Bluff

Infrastructure Type	100-YR Flood Zone	Floodway	100-YR Total	500-YR, Outside 100-YR	500-YR Total
Essential Facility	4	0	4	1	5
EOC	0	0	0	0	0
Fire Station	0	0	0	0	0
Government Facility	4	0	4	1	5
Hospital	0	0	0	0	0
Police Station	0	0	0	0	0
School	0	0	0	0	0
High Potential Loss	8	1	9	3	12
Residential Child Care	0	0	0	0	0
Adult Residential Care	1	0	1	1	2
Child Care	2	0	2	0	2
Foster/Home Care	0	0	0	0	0
Home Care	0	0	0	0	0
Other Care Facility	0	0	0	0	0
Elder Care	2	1	3	0	3
Dam	0	0	0	0	0
Hotel	3	0	3	2	5
Transportation and Lifeline	4	4	8	3	11
Airport	0	0	0	0	0
Bridge	3	4	7	3	10
Bus Facility	0	0	0	0	0
FCC AM Tower	0	0	0	0	0
FCC Cell Tower	0	0	0	0	0
FCC FM Tower	0	0	0	0	0
Natural Gas Station	0	0	0	0	0
Power Plant	0	0	0	0	0
Substation	0	0	0	0	0
Waste Water Facility	1	0	1	0	1
Grand Total	**16**	**5**	**21**	**7**	**28**

Critical Facilities Damage Estimates

As mentioned previously, FEMA's HAZUS-MH software was used to estimate the flood loss potential to critical facilities exposed to the flood risk. The City of Red Bluff has not established building values for City Owned facilities (essential facilities) for purposes of this effort. Table 2-16 summarizes the results of potential damage estimates as a result of the 100-YR Flood event to high potential loss facilities in the city.

Table 2-16: 100-YR Flood Event High Potential Loss Facility Damage Estimation

High Potential Loss Facility	Building Value	Content Value	Potential Building Damage ($)	Potential Content Damage ($)	Total Damage ($)
High Potential Loss	**$7,819,737**	**$3,909,867**	**$458,346**	**$563,629**	**$1,021,975**
Child Care Centers	**$58,579**	**$29,290**	**$10,365**	**$6,062**	**$16,427**
RED BLUFF HEAD START CENTER	$58,579	$29,290	$10,365	$6,062	$16,427
Hotel	**$6,922,204**	**$3,461,101**	**$222,266**	**$413,815**	**$636,082**
Comfort Inn	$4,752,137	$2,376,068	$124,870	$228,928	$353,798
Motel 6 Red Bluff	$1,513,297	$756,648	$63,613	$119,660	$183,273
Riverbank Inn	$656,770	$328,385	$33,783	$65,228	$99,011
Res Elder Care Facility	**$838,954**	**$419,476**	**$225,714**	**$143,752**	**$369,466**
AQUINO SHADY OAKS REST HOME	$419,477	$209,738	$112,857	$71,876	$184,733
GILMORE PLACE	$419,477	$209,738	$112,857	$71,876	$184,733

Linear Utilities

It is important to determine who may be at risk if infrastructure is damaged by flooding. Roads or railroads that are blocked or damaged can isolate residents and can prevent access throughout the city and county, including for emergency service providers needing to get to vulnerable populations or to make repairs. Bridges washed out or blocked by floods or debris also can cause isolation. Water and sewer systems can be flooded or backed up, causing health problems. Underground utilities can be damaged. Levees can fail or be overtopped, inundating the land that they protect. Table 2-17 shows the linear critical facilities in the floodplain.

Table 2-17: Critical Facilities (Linear) in the Floodplain – City of Red Bluff

Infrastructure Type (Linear)	100-YR	100-YR, Floodway	500-YR	Total Mileage
Transportation and Lifeline	**10.8**	**2.0**	**11.0**	**23.8**
FEMA Levee	-	-	-	-
USACE Levee	-	-	-	-
Natural Gas Pipeline	0.1	-	0.1	0.2
Transmission Line	0.3	0.1	0.1	0.5
Railroad	0.1	0.0	-	0.1
Street	10.3	1.9	10.8	23.0
-Interstate	0.5	0.2	3.4	4.2
-Primary Highway	1.7	0.6	1.6	3.9
-State/County Highway	0.8	0.5	0.9	2.1
-Local Road	6.8	0.6	3.3	10.6
-Other Road	0.5	0.0	1.6	2.2
-4WD Road	-	-	-	-
Grand Total	**10.8**	**2.0**	**11.0**	**23.8**

2.4.9.7 Future Trends in Development

Limiting land uses in the floodplain to those that can sustain periodic flooding will have the greatest long-term benefits. Appropriate uses would be open space and recreation. Developments already occurring in the floodplain should be encouraged to undertake appropriate development to mitigate potential impacts, upstream and especially downstream. No development should be allowed, which would raise the level of the 100-YR flood. Surface runoff from areas that drain into streams should be controlled by measures, which prevent erosion, and soil erosion during construction should likewise be carefully monitored and controlled. Since localized flooding may occur where immediate access to stream channels is not feasible for runoff, or, if runoff is blocked by existing development project, storm drainage improvements will be required.

2.4.10 Earthquake

According to FEMA, an earthquake is "a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface." Earthquakes can be one of the earth's most damaging hazards because the shaking of the earthquake may cause buildings and bridges to collapse; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, and structure fires as result of ruptured gas lines. See Volume 1, Section 4.6: Earthquake Hazard Profile in the Base Plan for more information on earthquakes and vulnerabilities to utilities.

2.4.10.1 Regulatory Oversight

Numerous building and zoning codes exist at a state and local level to decrease the impact of an earthquake event and resulting liquefaction on residents and infrastructure. The City of Red Bluff's building codes are the same as Tehama County's. Detail about the County/ State's building codes can be found in Volume 1, Section 4.6.1 of the Base Plan.

2.4.10.2 Past Events

No events or damage has been reported in the City of Red Bluff from Earthquake Events; probability and potential occurrences are low. (City of Red Bluff General Plan Safety Element). Tehama County does not have an extensive earthquake history. For more information on past earthquake events in Tehama County, refer to Volume 1, Section 4.6 of the Base Plan.

2.4.10.3 Location

A shake map shows the extent and variation of ground shaking in a region immediately following significant earthquakes. A probabilistic seismic hazard map shows the hazard from earthquakes that geologists and seismologists agree could occur. The maps are expressed in terms of probability of exceeding a certain ground motion, such as the 10-percent probability of exceedance in 50 years. This level of ground shaking has been used for designing buildings in high seismic areas. Figure 2-10 and Figure 2-11 show the estimated ground motion for the Battle Creek Scenario in Red Bluff and Tehama County. As shown in Figure 2-11, most of the City would be in the Strong shake zone in the Battle Creek Earthquake Scenario. The northwestern most portion of the City would be in a Moderate Shake Zone. The fault nearest to the City of Red Bluff Is the Corning Fault, shown in Figure 2-12.

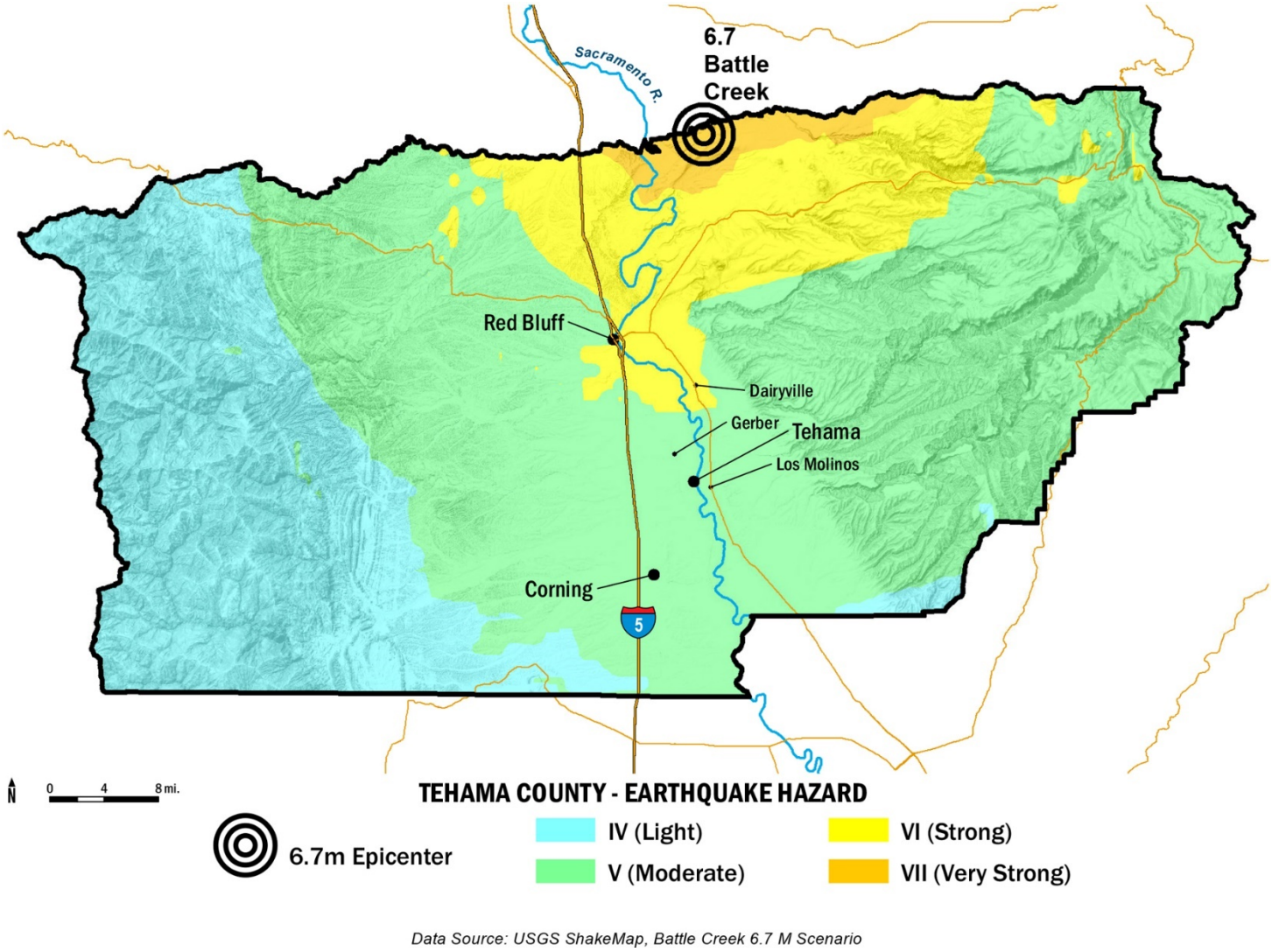
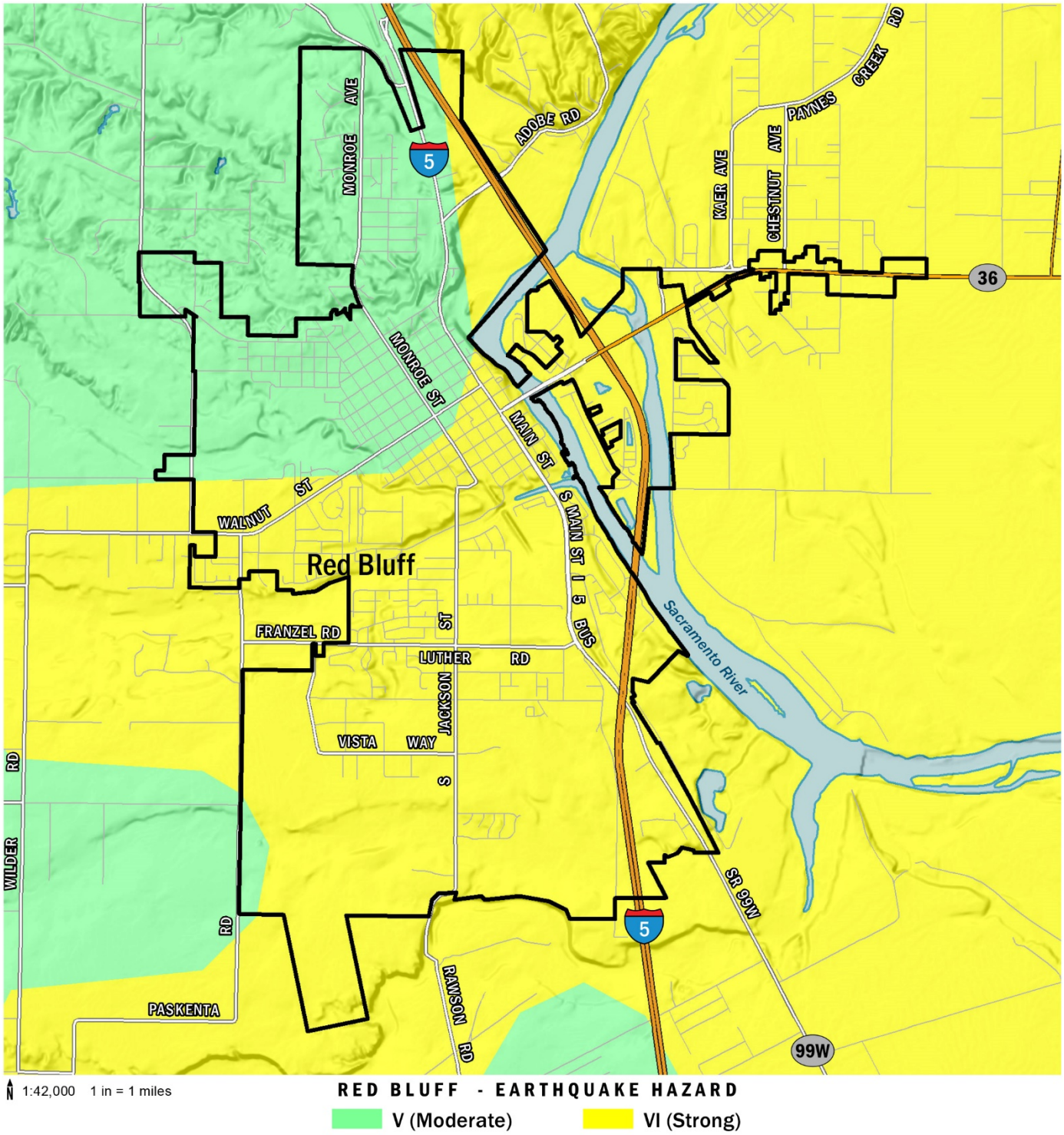


Figure 2-10: Tehama County Earthquake Shake Map



Data Source: USGS ShakeMap, Battle Creek 6.7 M Scenario

Figure 2-11: Earthquake Hazard Map for the City of Red Bluff

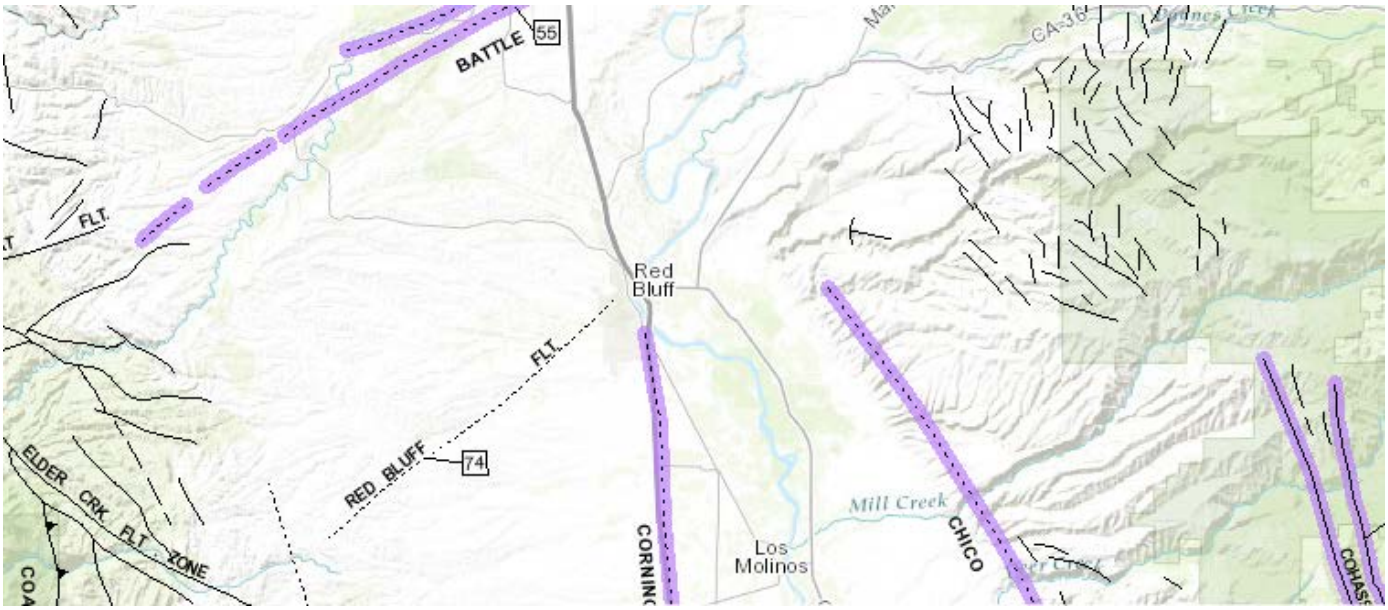


Figure 2-12: Earthquake Faults Near Red Bluff (2010)

Source: http://maps.conservation.ca.gov/cgs/fam/

2.4.10.4 Frequency

While earthquake activity in California as a whole is frequent, the activity in Tehama County is not. Although no active faults are mapped in the county, there exists the potential for minor, localized earthquake events as precursors to eruptive activity of Mount Lassen or other smaller localized faults. For more information on the frequency of earthquakes in Tehama County, see Volume 1, Section 4.6.2.3 of the Base Plan.

2.4.10.5 Severity

If a 6.7 magnitude earthquake were to occur along the Battle Creek fault, the City of Red Bluff would experience moderate to strong shaking, as shown in Figure 2-11. For more information on magnitude and severity of shaking, see Volume 1, Section 4.6.2.4 of the Base Plan.

2.4.10.6 Earthquake Vulnerability

2.4.10.6.1 Population

As shown in Table 2-18, the entire population of the City of Red Bluff is potentially exposed to direct and indirect impacts from earthquakes. The degree of exposure is dependent on many factors, including the age and construction type of the structures people live in, the soil type their homes are constructed on, their proximity to fault location, etc. Whether directly or indirectly impacted, the entire population will have to deal with the consequences of earthquakes to some degree. Business interruption could keep people from working, road closures could isolate populations, and loss of utilities could impact populations that suffered no direct damage from an event itself.

Table 2-18: Population Exposure to Battle Creek Earthquake Scenario

	Total Population
Red Bluff	13,905

Shake Severity Zone	Population Count	% of Total
V - Moderate	4,176	30.03%
VI - Strong	9,729	69.97%
VII - Very Strong	-	0.00%
Total	**13,905**	**100.00%**

2.4.10.6.2 Property

The County Assessor's parcel data was used as the basis for the inventory of current market values and content value summaries. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The centroids were then overlaid with the shaking severity zones of the Battle Creek 6.7 magnitude earthquake severity zones to determine the at-risk structures. This methodology assumed that every parcel with a current net value or assessed value was an improved parcel. Building exposure was calculated based on current net values or when absent, assessor's values as provided by the assessor's office. Building content exposure was calculated based on occupancy type multipliers and improvement value. Table 2-19 shows the count of at-risk parcels and their associated building and content exposure values to earthquake.

Table 2-19: City of Red Bluff Total Parcel Value Exposure from Battle Creek Scenario

Total Parcels	Total Market Value Exposure ($)	Total Content Value Exposure ($)	Total Value ($)
5,207	$ 737,733,448	$502,236,755	$ 1,239,970,203

Shake Severity Zone	Improved Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
V - Moderate	1,805	34.7%	$ 207,556,757	$ 126,853,450	$ 334,410,207	26.97%
VI - Strong	3,402	65.3%	$ 530,176,691	$ 375,383,305	$ 905,559,996	73.03%
VII -Very Strong	-	0.0%	$ -	$ -	$ -	0.000%
Total	**5,207**	**100.0%**	**$ 737,733,448**	**$ 502,236,755**	**$ 1,239,970,203**	**100.0%**

Earthquake Damage Estimation

Table 2-20 and Figure 2-13 demonstrates building loss estimation results from the Battle Creek 6.7 magnitude earthquake scenario. If the modeled earthquake were to occur, damages are estimated at approximately $130,427,087, or 5.31% percent of the total modeled value improvements within the City. FEMA's HAZUS-MH software classifies potential damage in five categories: no damage, slight damage, moderate damage, extensive damage, or complete damage. FEMA's software also predicts the possibility of exceedance for particular damage categories. As demonstrated in the table, the probability of extensive damage is minimal based upon the Battle Creek Earthquake Scenario. For further explanation of the earthquake damage estimation, please refer to Volume 1, Section 4.6.5.2.4 in the Base Plan.

Table 2-20: City of Red Bluff EQ Damage Estimates

Building Type	Average of Potential Damage to Exceed "Slight"	Average of Potential Damage to Exceed "Moderate"	Average of Potential Damage to Exceed "Extensive"	Average Economic Loss for Each Building Category	Sum of Economic Loss	Proportion of Loss (%)
Agricultural	29%	12%	2%	$ 3,591	$ 3,591	0%
Commercial	29%	12%	3%	$ 39,193	$ 17,127,483	29%
Education	29%	12%	2%	$ 81,077	$ 324,309	1%
Governmental	31%	13%	3%	$ 17,991	$ 17,991	0%
Industrial	28%	11%	2%	$ 36,405	$ 1,310,586	2%
Religion	28%	11%	2%	$ 28,948	$ 781,600	1%
Residential	29%	12%	2%	$ 9,899	$ 38,990,836	67%
Total	**29%**	**12%**	**2%**	**$ 13,174**	**$ 58,556,396**	

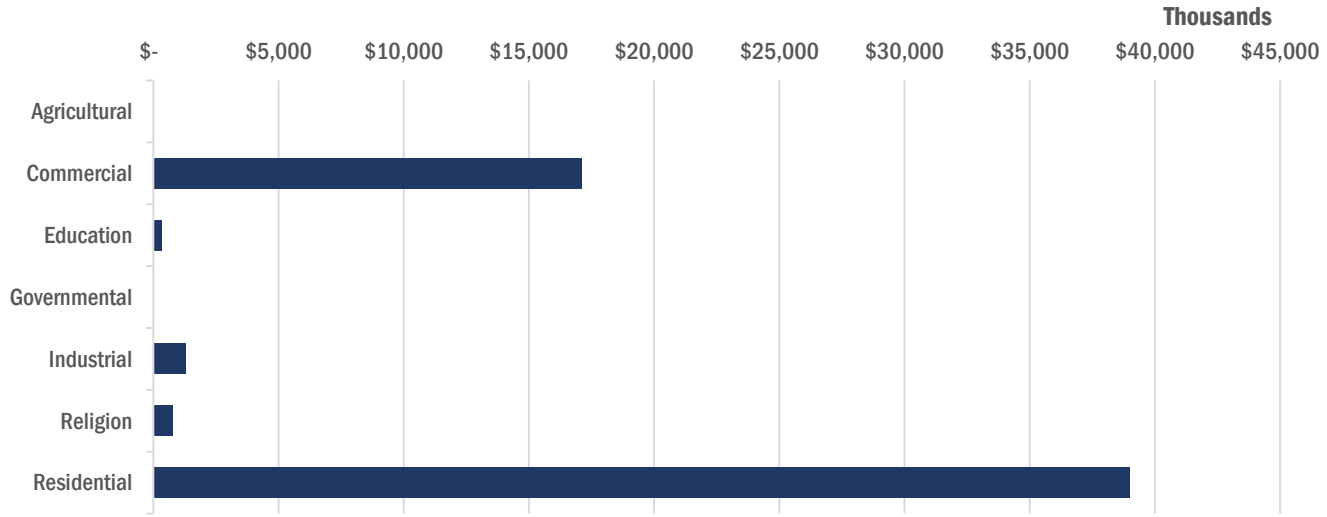


Figure 2-13: Economic Loss by Occupancy

2.4.10.6.3 Critical Facilities and Infrastructure

All critical facilities in the City of Red Bluff are exposed to the earthquake hazard. Hazardous materials releases can occur during an earthquake from fixed facilities or transportation-related incidents. Transportation corridors can be disrupted during an earthquake, leading to the release of materials to the surrounding environment. Facilities holding hazardous materials are of particular concern because of possible isolation of neighborhoods surrounding them. During an earthquake, structures storing these materials could rupture and leak into the surrounding area or an adjacent waterway, having a disastrous effect on the environment.

As mentioned previously, FEMA's HAZUS-MH software classifies potential damage in five categories: no damage, slight damage, moderate damage, extensive damage, or complete damage. The model was used to assign a vulnerability category to each essential and high potential loss structure. Damage functions to transportation and lifelines have not been established for this project. Table 2-21 summarizes the results.

Table 2-21: City of Red Bluff Critical Infrastructure Damage Estimation

	Average Probability of Potential Damage Exceedance			
Infrastructure Type	Slight	Moderate	Extensive	Sum of Economic Loss
Essential Facilities	***28%***	***12%***	***2%***	***$ 1,488,593***
Hospital	***28%***	***11%***	***2%***	***$ 1,131,107***
St Elizabeth Community Hospital	*28%*	*11%*	*2%*	*$ 1,131,107*
School	***29%***	***12%***	***2%***	***$ 357,486***
Mercy High School	*30%*	*13%*	*3%*	*$ 119,330*
Sacred Heart School	*29%*	*12%*	*2%*	*$ 186,716*
Tehama eLearning Academy	*27%*	*11%*	*2%*	*$ 51,440*
High Potential Loss	***29%***	***12%***	***2%***	***$ 3,892,414***
Hotel	***29%***	***12%***	***2%***	***$ 2,192,103***
Americas Best Value Inn - Red Bluff	*29%*	*12%*	*2%*	*$ 19,650*
BEST WESTERN Antelope Inn	*30%*	*13%*	*3%*	*$ 205,390*
Classic Inn	*27%*	*11%*	*2%*	*$ 42,839*
Comfort Inn	*30%*	*13%*	*3%*	*$ 381,169*
Crystal Motel	*29%*	*12%*	*2%*	*$ 77,917*
Gateway Inn	*29%*	*12%*	*2%*	*$ 41,679*
Hampton Inn & Suites Red Bluff	*29%*	*12%*	*2%*	*$ 677,618*
Holiday Inn Express Red Bluff - South Redding Area	*29%*	*12%*	*2%*	*$ 534,168*
Motel 6 Red Bluff	*30%*	*13%*	*3%*	*$ 120,398*
Riverbank Inn	*30%*	*13%*	*3%*	*$ 52,253*
Sky Terrace Motel	*29%*	*12%*	*2%*	*$ 38,684*
Triangle Motel	*29%*	*12%*	*2%*	*$ 338*
Res Elder Care Facility	***29%***	***12%***	***2%***	***$ 346,166***
ALL ABOUT SENIORS - WALNUT STREET	*27%*	*11%*	*2%*	*$ 38,539*
AQUINO SHADY OAKS REST HOME	*30%*	*13%*	*3%*	*$ 33,374*
BROOKDALE RED BLUFF	*29%*	*12%*	*2%*	*$ 113,181*
EMERITUS AT LASSEN HOUSE	*29%*	*12%*	*2%*	*$ 113,181*
GILMORE PLACE	*30%*	*13%*	*3%*	*$ 33,374*
PRS-SOUTHPOINTE RETREAT	*29%*	*12%*	*2%*	*$ 14,518*
Adult Res Facility	***28%***	***12%***	***2%***	***$ 198,098***
CASA SERENITY LLC 2	*27%*	*11%*	*2%*	*$ 15,443*
D & S CARE HOMES LLC	*29%*	*12%*	*2%*	*$ 9,180*
DIAMOND VIEW	*29%*	*12%*	*2%*	*$ 11,592*

Infrastructure Type	Average Probability of Potential Damage Exceedance			Sum of Economic Loss
	Slight	Moderate	Extensive	
HOLLIDAY HOMES LARKSPUR	29%	12%	2%	$ 9,108
JEWEL RESIDENTIAL - ALDER	29%	12%	2%	$ 5,687
JEWEL RESIDENTIAL - LOCUST	29%	12%	2%	$ 3,678
JEWEL RESIDENTIAL - SCOTTSDALE	29%	12%	2%	$ 6,900
JEWEL RESIDENTIAL INC. (ALDER)	29%	12%	2%	$ 5,687
JEWEL RESIDENTIAL INC. (LOCUST)	29%	12%	2%	$ 3,678
JEWEL RESIDENTIAL INC. (SCOTTSDALE)	29%	12%	2%	$ 6,900
KROGAN HOUSE RESIDENTIAL	27%	11%	2%	$ 6,370
LEGACY HOUSE II	27%	11%	2%	$ 18,704
LYFORD FAMILY HOME	29%	12%	2%	$ 10,911
MASON'S RESIDENCE	27%	11%	2%	$ 8,018
MASON'S RESIDENCE II	29%	12%	2%	$ 8,029
MASON'S RESIDENTIAL HOMES II	29%	12%	2%	$ 8,029
NORTH VALLEY SERVICES - DAYTIME ACTIVITY CENTER	28%	11%	2%	$ 15,372
PRS - SOUTHPOINTE HOUSE	29%	12%	2%	$ 12,099
PRS - WALBRIDGE HOUSE	27%	11%	2%	$ 9,924
STONYBROOK RESIDENTIAL	29%	12%	2%	$ 10,341
STONYBROOK RESIDENTIAL INC. (HOWARD)	29%	12%	2%	$ 12,446
Home Care Organization	**27%**	**11%**	**2%**	**$ 25,968**
INTERIM HEALTHCARE PERSONAL CARE & SUPPORTIVE	27%	11%	2%	$ 25,968
Other Care Facility	**29%**	**12%**	**2%**	**$ 251,209**
CHILDREN FIRST FOSTER FAMILY AGENCY	30%	13%	3%	$ 112,621
CHILDREN FIRST THPP/THP+FC	30%	13%	3%	$ 112,621
INTERIM HEALTHCARE PERSONAL CARE & SUPPORTIVE	27%	11%	2%	$ 25,968
Child Care Centers	**28%**	**12%**	**2%**	**$ 653,630**
BIDWELL STATE PRESCHOOL	27%	11%	2%	$ 6,752
BIG APPLE PRESCHOOL & CHILD CARE CENTER	29%	12%	2%	$ 186,716
DOUGLAS STREET STATE PRESCHOOL	27%	11%	2%	$ 4,290
FIRST CHURCH OF GOD PRESCHOOL	29%	12%	2%	$ 4,247
JACKSON HEIGHTS STATE PRESCHOOL	29%	12%	2%	$ 7,106
LACEY'S LIL LEARNERS CHILD CARE CENTER	30%	13%	3%	$ 15,574
LITTLE SCHOLARS PRESCHOOL	29%	12%	2%	$ 13,513
LITTLE SCHOLARS PRESCHOOL 2	29%	12%	2%	$ 186,716
METTEER STATE PRESCHOOL	29%	12%	2%	$ 9,007
OUR LITTLE HOUSE	27%	11%	2%	$ 8,580
PRESBYTERIAN CHURCH PRESCHOOL	27%	11%	2%	$ 20,049
RED BLUFF HEAD START CENTER	29%	12%	2%	$ 4,361
SACRED HEART PARISH PRESCHOOL & DAY CARE	29%	12%	2%	$ 186,716

Infrastructure Type	Average Probability of Potential Damage Exceedance			Sum of Economic Loss
	Slight	Moderate	Extensive	
24hr Res Child Care	***30%***	***13%***	***3%***	***$ 112,621***
CHILDREN FIRST THPP/THP+FC	*30%*	*13%*	*3%*	*$ 112,621*
Foster Family Agencies	***30%***	***13%***	***3%***	***$ 112,621***
CHILDREN FIRST FOSTER FAMILY AGENCY	*30%*	*13%*	*3%*	*$ 112,621*

2.4.10.7 Future Trends

Land use in the City of Red Bluff will be directed by a general plan adapted under California's General Planning Law. The Safety Element of the General Plan establishes standards and plans for the protection of the community from hazards. The information in this plan provides the participating partners a tool to ensure that there is no increase in exposure in areas of high seismic risk. Development in the planning area will be regulated through building standards and performance measures so that the degree of risk will be reduced. The geologic hazard portions of the planning area are heavily regulated under California's General Planning Law. The California Building Code establishes provisions to address seismic risk.

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2.4.11 Wildfire

Wildfires continue to pose significant threat to most Northern California communities, including Red Bluff. Wildland fires are common in open space areas with vegetation that exhibits low fuel moisture. High winds can also contribute to the severity of the fire. Generally, the undeveloped portions of the City do not pose a high-risk due to existing vegetation management practices on the land. However, grass fires can occur particularly where there is native vegetation, such as the riparian corridors near local water courses. Fire hazards can also occur in urbanized areas of the City. Residential and commercial structure fires can occur particularly in older neighborhoods. Additionally, some industrial processes can include the use or storage of flammable liquids or farming bi-products. The storage of propane gas can also create a fire hazard.

For more information on how wildfires affect Tehama County, see Volume 1, Section 4.10 in the Base Plan.

2.4.11.1 Regulatory Oversight

2.4.11.1.1 City of Red Bluff Code of Ordinances

Chapter 8 Section 8.15 establishes requirements for fire apparatus access roads.

- Fire apparatus access roads in residential areas, public or private, shall have an unobstructed minimum width of 40', curb-to-curb.
- Fire apparatus access roads within multi-family developments shall have an unobstructed minimum width of 30 feet.
- Cul-de-sac turning radius shall be 50', or 100' curb-to-curb minimum.

(Ord. 974, passed 11-20-2007; Am. Ord. 1007, passed 1-4-2011; Am. Ord. 1046, passed 12-20-2016)

Chapter 8 Section 8.17 establishes regulations on burning, including open burning/residential, land clearing, and special events.

Chapter 8 Section 8.20 sets standards for weed abatement in the City. It states “Persons owning, leasing, renting, in legal control of the property; and operating or maintaining buildings or structures in, upon or adjoining hazardous fire areas; and persons owning, leasing or controlling land adjacent to such buildings or structures, shall at all times maintain an effective firebreak, as stipulated in this code. When property lines are adjacent to roadways, the hazard shall be cleared to the center of the roadway.”

2.4.11.2 Past Events

No damage has been reported in the City of Red Bluff from Wildland Fire Events. There have been only 4 wildfire occurrences within the City since 2000. These events are summarized in Table 2-22.

Table 2-22: Wildfire Events in the City of Red Bluff since 2000

Date	Event Name	Cause
7/16/12	Cody Fire	Unknown
9/29/00	Weinstein	Unknown

Source: 2004 Red Bluff Hazard Mitigation Plan and Cal Fire*

2.4.11.3 Location

CAL FIRE adopted Fire Hazard Severity Zone maps for the Local Responsibility Area (LRA) in June 2008. Fire hazard mapping is a way to measure the physical fire behavior to predict the damage a fire is likely to cause. Fire hazard measurement includes vegetative fuels, probability of speed at which a wildfire moves the amount of heat the fire produces, and most importantly, the burning fire embers that the fire sends ahead of the flaming front.

The model used to develop the information in accounts for topography, especially the steepness of the slopes (fires burn faster as they burn up-slope.). Weather (temperature, humidity, and wind) also has a significant influence on fire behavior. The areas depicted as moderate, high and very high are of particular concern and potential fire risk in these areas are constantly increasing as human development and the wildland urban interface areas expand.

Approximately 2 percent of the land area in Red Bluff is at very high risk from wildland fires. Table 2-23 shows the sum of acres and square miles in each wildfire hazard severity zone. Table 2-14 illustrates the Fire Hazard Severity Zones for the City. Very High and High Fire Hazard Severity Zones have been identified along the northern borders of the City due to heavily forested areas such as those near Ayer Park and Forward Park. High Fire Hazard Zones have also been identified on both sides of Franzel Road. Construction in the Moderate, High and Very High Fire Hazard Severity Zone will be required to meet the requirements of Chapter 7A of the California Building Code relating to fire resistant rated construction.

Table 2-23: Total Area with Wildfire Risk (City of Red Bluff)

Wildfire Hazard Severity Zone	Sum of Acres	Sum of Square Miles
Very High	88.8	0.1
High	323.2	0.5
Moderate	1,448.1	2.3
Non-Wildland/Non-Urban	121.8	0.2
Urban Unzoned	2,361.9	3.7
Total	**4,343.7**	**6.8**

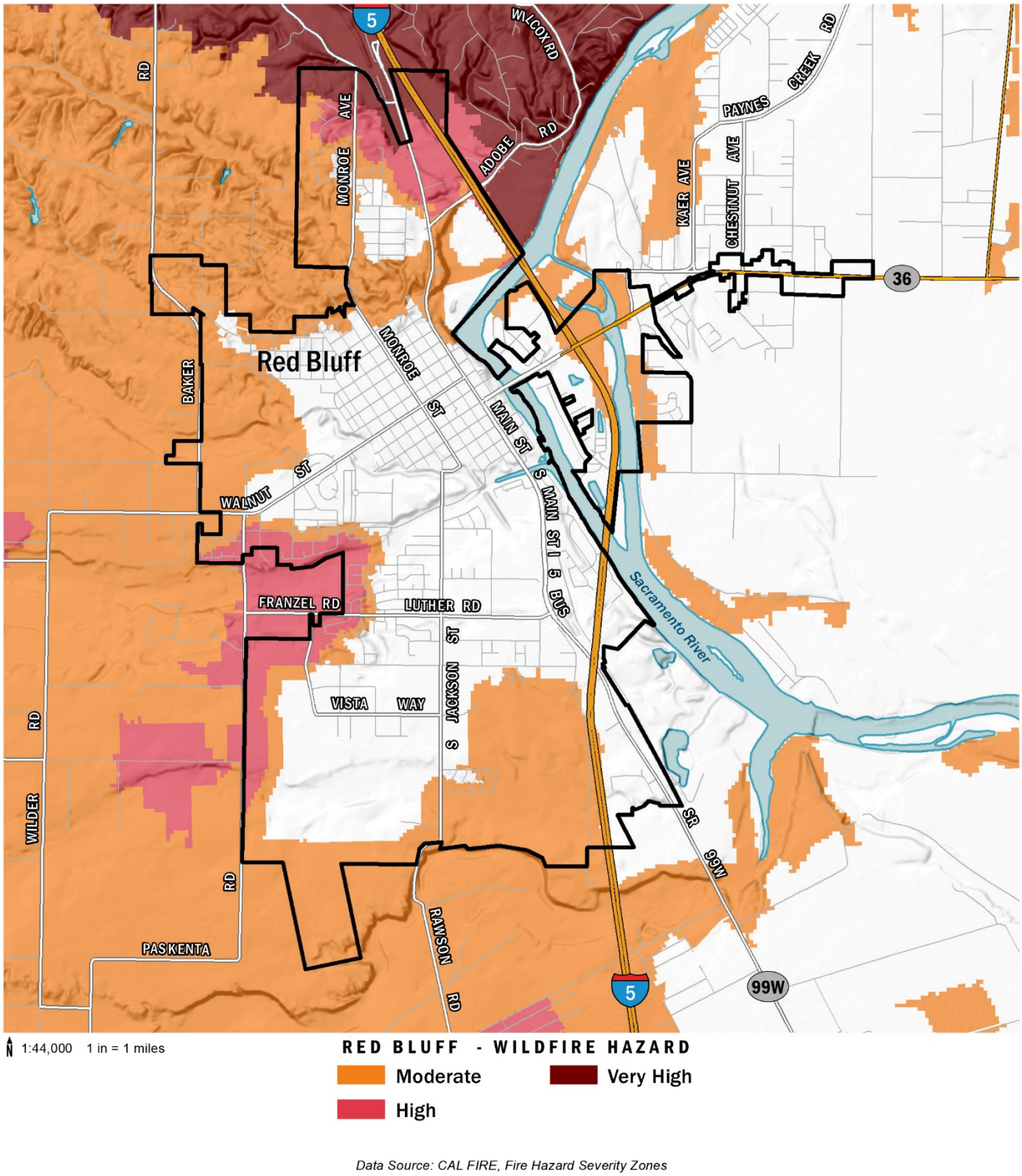


Figure 2-14: Fire Hazard Severity Zones in Red Bluff

2.4.11.4 Frequency

Data suggests a trend toward increasing acres burned statewide, with particular increases in conifer vegetation types. This trend is supported in part by the fact that the three largest fire years since 1950 have all occurred within the last 10 years. However, the potential of having a wild land fire affecting the City is minimal. The City of Red Bluff Fire Department and the Cal Fire respond rapidly to contain fires resulting in less damage.

USGS LANDFIRE (Landscape Fire and Resource Management Planning Tools), is a shared program between the wildland fire management programs of the U.S. Department of Agriculture Forest Service and U.S. Department of the Interior, providing landscape scale geo-spatial products to support cross-boundary planning, management, and operations. Historical fire regimes, intervals, and vegetation conditions are mapped using the Vegetation Dynamics Development Tool (VDDT). This USGS data supports fire and landscape management planning goals in the National Cohesive Wildland Fire Management Strategy, the Federal Wildland Fire Management Policy, and the Healthy Forests Restoration Act.

As part of the USGS Landfire data sets, the Mean Fire Return Interval (MFRI) layer quantifies the average period between fires under the presumed historical fire regime. MFRI is intended to describe one component of historical fire regime characteristics in the context of the broader historical time period represented by the LANDFIRE Biophysical Settings (BPS) layer and BPS Model documentation.

MFRI is derived from the vegetation and disturbance dynamics model VDDT (Vegetation Dynamics Development Tool) (LF_1.0.0 CONUS only used the vegetation and disturbance dynamics model LANDSUM). This layer is created by linking the BpS Group attribute in the BpS layer with the Refresh Model Tracker (RMT) data and assigning the MFRI attribute. This geospatial product should display a reasonable approximation of MFRI, as documented in the RMT. See Figure 2-15 for predicted fire return interval for the City.

2.4.11.5 Severity

Most of the City lies in the urban unzoned areas and has no direct risk to wildfire, however citizens may be affected by wildfires in the County or region. Smoke and air pollution from wildfires can be a health hazard, especially for sensitive populations including children, the elderly and those with respiratory and cardiovascular diseases. Wildfire may also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke. In addition, wildfire can lead to ancillary impacts such as landslides in steep ravine areas and flooding due to the impacts of silt in local watersheds.

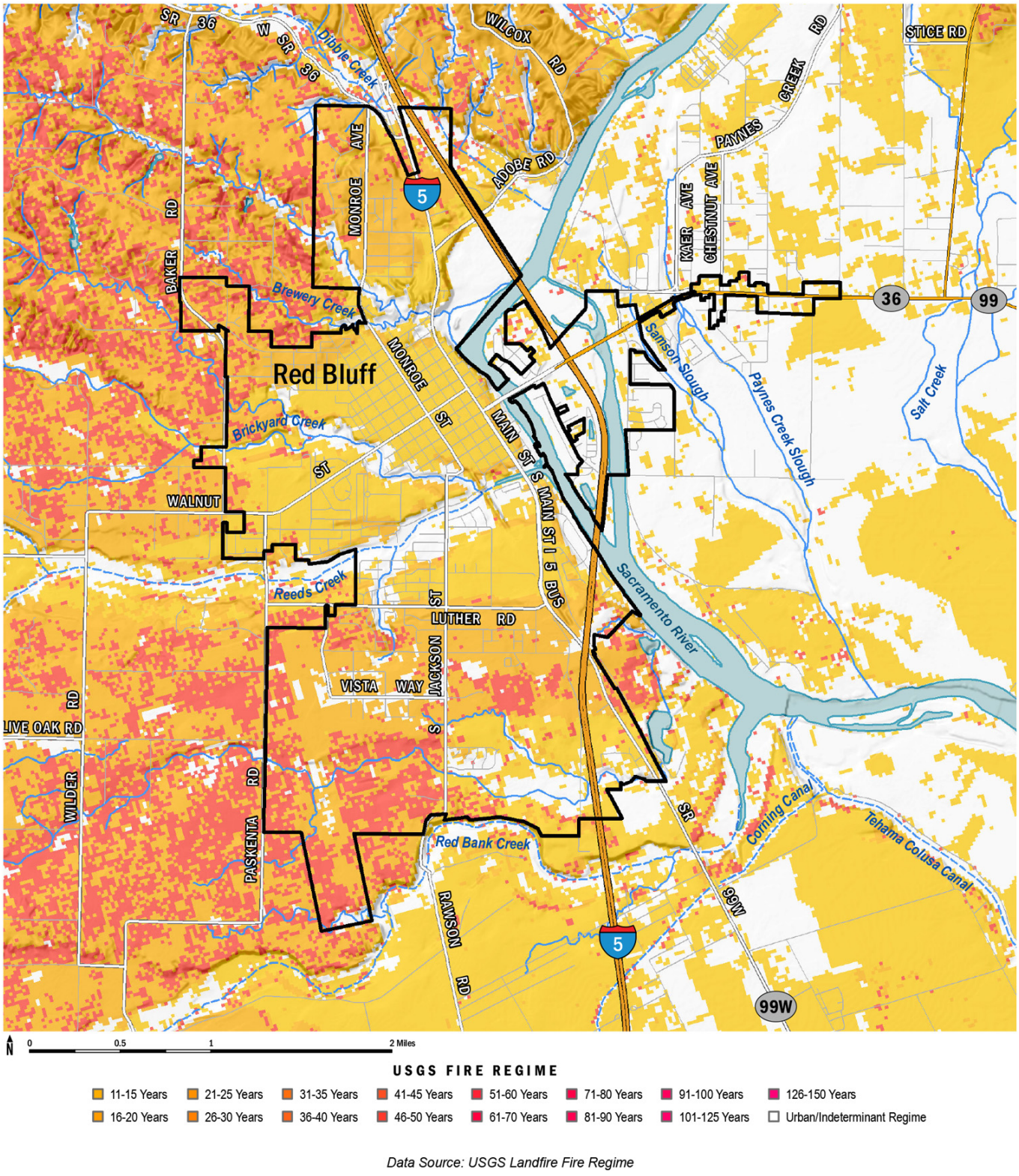


Figure 2-15: USGS Fire Regime Map for the City of Red Bluff

2.4.11.6 Wildfire Hazard Vulnerability

2.4.11.6.1 Population

Wildfire is of greatest concern to populations residing in the moderate, high and very high fire hazard severity zones. U.S. Census Bureau block data was used to estimate populations within the Cal Fire identified hazard zones. As seen in Figure 2-16, 2,886 residents (20% of the total population) live in areas considered to be of moderate risk to wildfires, 934 residents (7% of the total population) live in areas considered to have high wildfire risk and 56 residents (.4% of the total population) live in areas considered to have very high risk to wildfires.

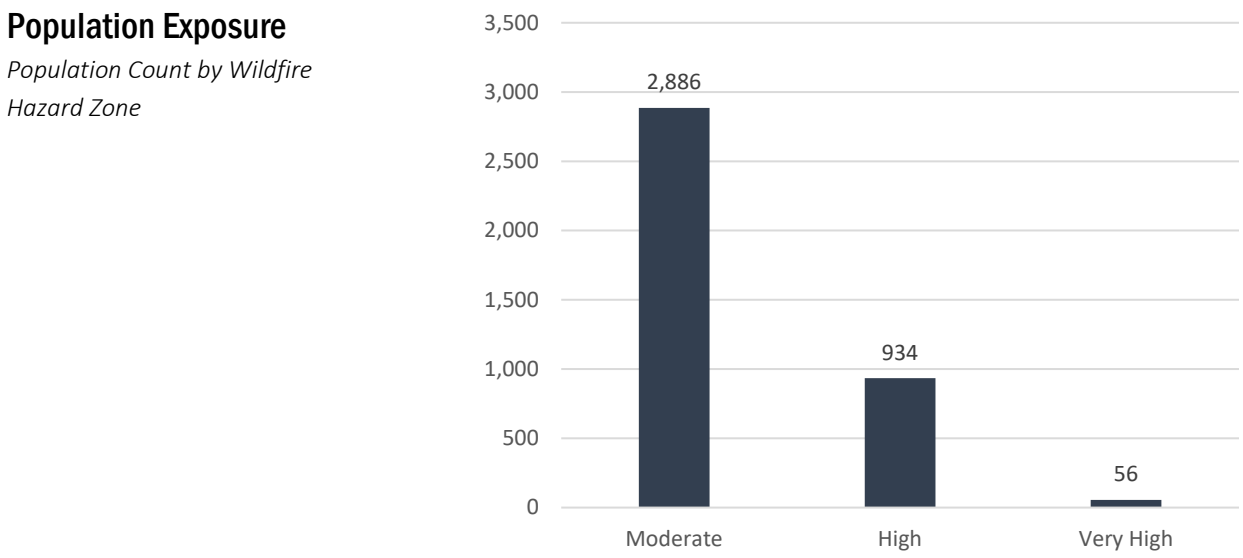


Figure 2-16: Red Bluff Population at risk from wildfire hazards

2.4.11.6.2 Property

The County's parcel layer was used as the basis for the inventory of improved residential parcels for the City of Red Bluff. In some cases, a parcel will be within in multiple fire threat zones. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The centroids were then overlaid with the fire threat layer to determine the risk for each structure. The fire threat zone in which the centroid was located was assigned to the entire parcel. This methodology assumed that every parcel with a square footage value greater than zero was developed in some way. Only improved parcels were analyzed.

Table 2-24 displays the number of homes in the very high, high and moderate wildfire hazard zones within the City of Red Bluff jurisdictional boundaries and values for each. Twenty nine percent of homes in Red Bluff lie within "Moderate" or higher Fire Hazard Severity Zones (FHSZ).

Table 2-24: Residential Buildings and Content within Cal Fire Wildfire Severity Zones

	Total Parcels	Total Market Value Exposure ($)	Total Content Value Exposure ($)	Total Value ($)
City of Red Bluff Totals	5,206	$ 675,030,475	$ 337,515,238	$ 1,012,545,713

Fire Hazard Severity Hazard Zone	Improved Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
Very High	4	*0.1%*	$ 2,448,093	$ 1,224,047	$ 3,672,140	*0.3627%*
High	392	*7.5%*	$ 68,735,772	$ 34,367,886	$ 103,103,658	*10.1826%*
Moderate	1,089	*20.9%*	$ 122,216,387	$ 61,108,194	$ 183,324,581	*18.1053%*
Total	**1,485**	**29%**	**$ 193,400,252**	**$ 96,700,126**	**$ 290,100,378**	**29%**

2.4.11.6.3 Critical Facilities and Infrastructure

Critical facilities data was superimposed with fire hazard severity zone data to determine the type and number of facilities within each risk classification. Table 2-25 and Table 2-26 list the critical facilities in the moderate, high and very high wildfire hazard zones for Red Bluff. As demonstrated in the tables, a very small portion of critical facilities are within very high wildfire risk areas.

Table 2-25: Critical Facility Exposure to Wildfire

Infrastructure Type	Moderate	High	Very High	Total Feature Count
Essential Facility	3	0	0	3
EOC	0	0	0	0
Fire Station	0	0	0	0
Government Facility	0	0	0	0
Hospital	0	0	0	0
Police Station	0	0	0	0
School	3	0	0	0
High Potential Loss	14	5	0	19
Residential Child Care	0	0	0	0
Adult Residential Care	4	4	0	0
Child Care	6	0	0	0
Foster/Home Care	0	0	0	0
Home Care	1	0	0	0
Other Care Facility	1	0	0	0
Elder Care	0	0	0	0
Dam	0	0	0	0
Hotel	2	1	0	0
Transportation and Lifeline	7	1	2	10
Airport	0	0	0	0
Bridge	5	1	2	0

Infrastructure Type	Moderate	High	Very High	Total Feature Count
Bus Facility	0	0	0	0
FCC AM Tower	0	0	0	0
FCC Cell Tower	0	0	0	0
FCC FM Tower	0	0	0	0
Natural Gas Station	1	0	0	0
Power Plant	0	0	0	0
Substation	1	0	0	0
Waste Water Facility	0	0	0	0
Grand Total	**24**	**6**	**2**	**32**

Table 2-26: Lifelines with Wildfire Risk

Infrastructure Type (Linear)	Moderate	High	Very High	Total Mileage
Transportation and Lifeline	**24.7**	**7.8**	**1.3**	**33.9**
FEMA Levee	-	-	-	-
USACE Levee	-	-	-	-
Natural Gas Pipeline	1.7	-	-	1.7
Transmission Line	3.4	0.6	0.5	4.5
Railroad	0.7	0.6	-	1.3
Street	18.9	6.6	0.9	26.4
-Interstate	2.1	1.6	0.7	4.4
-Primary Highway	0.7	-	-	0.7
-State/County Highway	3.2	1.2	0.2	4.7
-Local Road	11.1	3.1	0.0	14.2
-Other Road	1.8	0.7	-	2.5
-4WD Road	-	-	-	-
Grand Total	**24.7**	**7.8**	**1.3**	**33.9**

2.4.11.7 Future Trends

Fire Department concerns relative to land use planning and future development projects within the urban area are addressed in the City of Red Bluff General Plan. (City of Red Bluff General Plan Safety Element) Urbanization tends to alter the natural fire regime and can create the potential for the expansion of urbanized areas into wildland areas. The expansion of the wildland urban interface can be managed with strong land use and building codes. The planning area is well equipped with these tools and this planning process has asked each planning partner to assess its capabilities with regards to the tools. As Red Bluff experiences future growth, it is anticipated that the exposure to this hazard will remain as assessed or decrease over time due to these capabilities.

2.4.12 Slope Failure (Slumping / Erosion)

FEMA describes a landslide as the downward movement of a slope and the materials under the force of gravity. A wide variety of ground movement can be categorized as a landslide, including; rock falls, deep failure of slopes and shallow debris flows. Landslides can be caused by human activities and natural geological factors, such as precipitation and topography. For more general information on slope failure, see Section 4.8 in the Base Plan. For purposes of this Annex, the City will focus on Slumping and bank erosion near in certain portions of the City especially along the Sacramento River Corridor.

2.4.12.1 Regulatory Oversight

2.4.12.1.1 California Building Code

The City of Red Bluff has adopted California Building Code (CBC) 2016 Edition which establishes the minimum requirements to safeguard the public health, safety and general welfare through structural strength, means of egress facilities, stability, access to persons with disabilities, sanitation, safety to life and property from fire and other hazards attributed to the built environment, and to provide safety to fire fighters and emergency responders during emergency operations. For information on the CBC, erosion control measures and grading plans and inspections, see Section 4.8.1.1.1 of the Base Plan.

2.4.12.1.2 City of Red Bluff General Plan

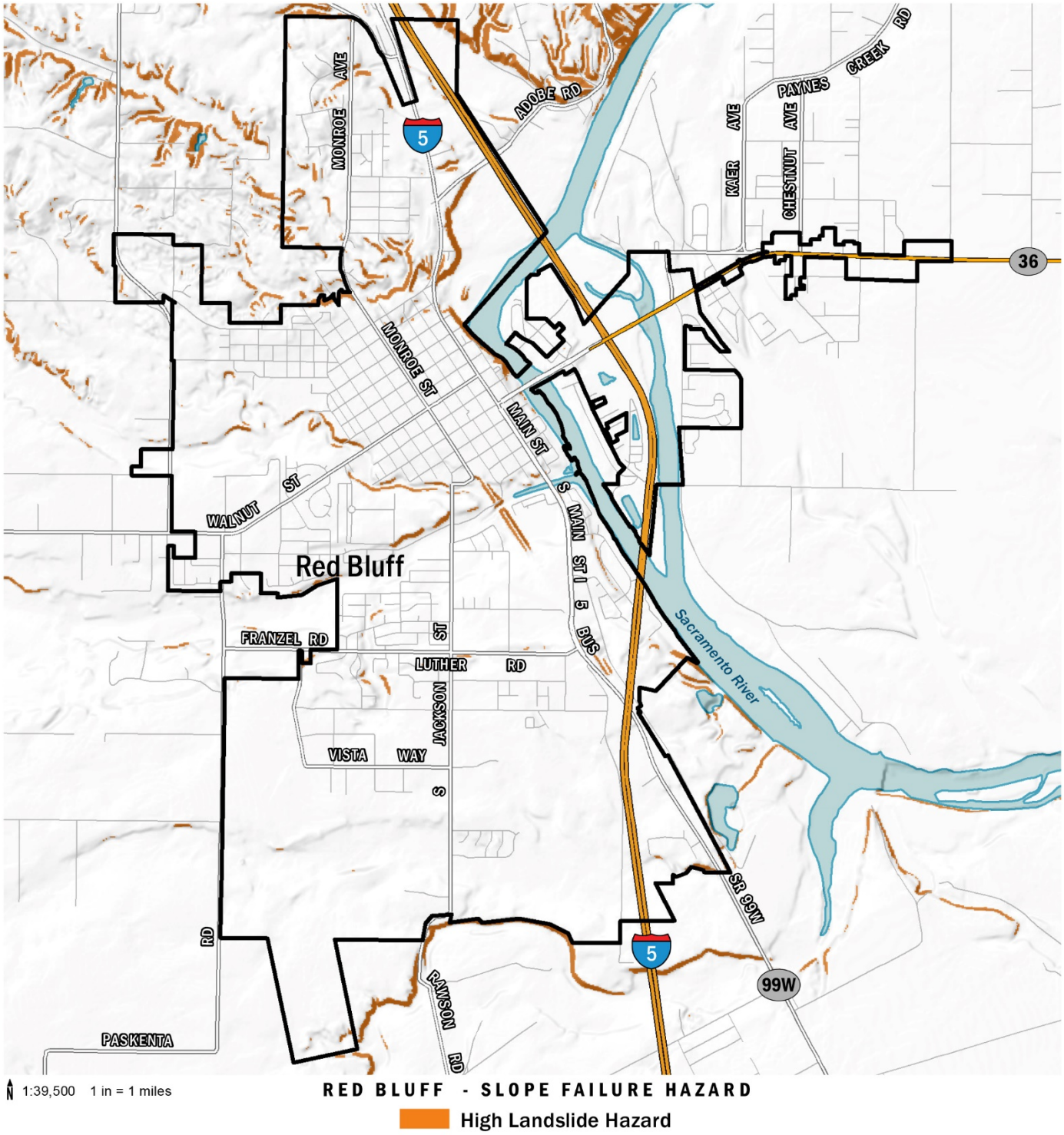
The City of Red Bluff's General Plan Land Use Element establishes policies to promote site development practices that will preserve the natural physical site characteristics of development sites in especially sensitive areas of the City of Red Bluff. These include hillsides, greenways, wooded areas, streams and drainage-ways. These policies address issues including maintenance of natural topography, vegetation, erosion control and the off-site environmental impacts of development. Grading policies are established in the Land Use Element as well as policies pertaining to drainage and vegetation preservation, replacement and new species introduction.

2.4.12.2 Past Events

Slope failure occasionally occurs along the banks of the Sacramento River as well as along the north side of Brickyard Creek. (City of Red Bluff General Plan Safety Element).

2.4.12.3 Location

Figure 2-17 shows the high slope failure areas within the City of Red Bluff. Areas of concern for slope failure include the areas surrounding the Sacramento River, Reeds Creek and Brickyard Creek. Aerial photographic surveys reveal that large-scale landslides are rare in the 75 square miles of the Reeds Creek drainage basin; however, several large earthflows occur outside the city limits along the north side of Brickyard Creek. (City of Red Bluff General Plan Safety Element)



Data Source: California Geological Survey, Deep-Seated Landslide Susceptibility, DP+S slope & elevation calculations - USGS 10m NED

Figure 2-17: Red Bluff High Slope Failure Risk Areas

2.4.12.4 Frequency

The majority of steep slopes shown in Figure 2-18 are heavily vegetated and have a smaller chance of failing than if they were to be exposed.

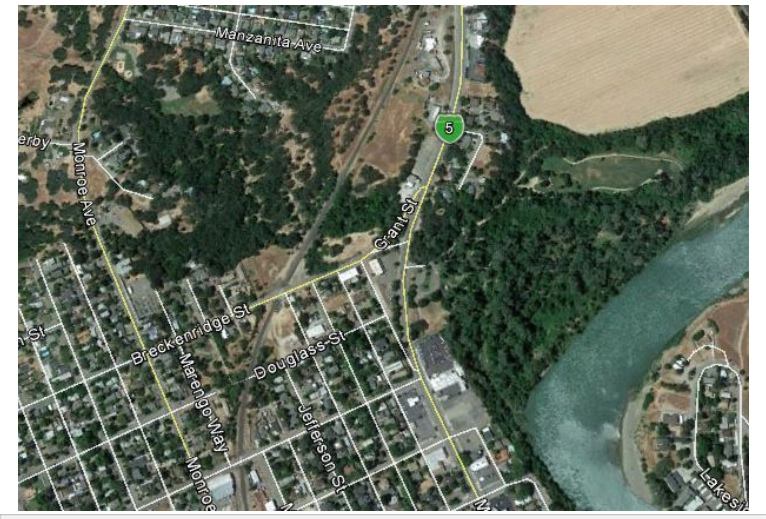


Figure 2-18: High landslide areas in Red Bluff are covered with dense vegetation.

2.4.12.5 Severity

Slope failure along the Sacramento River or Aloha Street (Brickyard Creek) may result in erosion and sediment buildup in the waterways but would likely not have a direct impact on residents or parcels. If slope failure were to occur along Main Street (5), it would have minimal impact on the road and would not likely impact travel. Slope failure bordering the residential neighborhood south of Walnut Street and west of Monroe Street would also not impact residents or parcels.

2.4.12.6 Slope Failure Vulnerability

2.4.12.6.1 Population

As shown in Table 2-27, 1.48% of Red Bluff's population (205 residents) could be exposed to some type of slope failure issues or erosion control problems.

Table 2-27: City of Red Bluff Population Exposure to Slope Failure

Risk Type	Population Count	% of Total
Landslide	205	1.48%
Avalanche	-	0.00%
Total	**205**	**1.48%**

2.4.12.6.2 Property

As shown in Table 2-28, 2.4% of the total parcels in Red Bluff could be exposed to some type of slope failure issues or erosion control problems equating to $14,199,774 in total exposure (1.4% of the total value of improved parcels).

Table 2-28: City of Red Bluff Total Parcel Exposure to Slope Failure

Total Parcels	Total Market Value Exposure ($)	Total Content Value Exposure ($)	Total Value ($)
5,206	$ 675,030,475	$ 337,515,238	$ 1,012,545,713

Risk Type	Improved Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
Landslide	123	2.4%	$ 9,466,516	$ 4,733,258	$ 14,199,774	1.402%
Avalanche	-	0.0%	$ -	$ -	$ -	0.000%
Total	**123**	**2.4%**	**$ 9,466,516**	**$ 4,733,258**	**$ 14,199,774**	**1.4%**

2.4.12.6.3 Critical Facilities and Infrastructure

Three critical facilities and .7% of the total linear mileage of critical facilities were identified as being exposed to the landslide hazard to some degree. A more in-depth analysis of mitigation measures taken by these facilities to prevent damage from mass movements should be done to determine if they are exposed to erosion issues or ground mass movements.

At this time all infrastructure and transportation corridors identified as exposed to the landslide hazard are considered vulnerable until more information becomes available. Table 2-29 and Table 2-30 summarize the critical facilities exposed to the slope failure hazard.

Table 2-29: Critical Facility Points with Slope Failure Hazard Risk

Infrastructure Type	Landslide	Avalanche	Total Feature Count
Essential Facility	0	0	0
EOC	0	0	0
Fire Station	0	0	0
Government Facility	0	0	0
Hospital	0	0	0
Police Station	0	0	0
School	0	0	0
High Potential Loss	0	0	0
Residential Child Care	0	0	0
Adult Residential Care	0	0	0
Child Care	0	0	0
Foster/Home Care	0	0	0
Home Care	0	0	0
Other Care Facility	0	0	0
Elder Care	0	0	0
Dam	0	0	0
Hotel	0	0	0
Transportation and Lifeline	3	0	3
Airport	0	0	0
Bridge	1	0	0
Bus Facility	0	0	0
FCC AM Tower	0	0	0
FCC Cell Tower	0	0	0
FCC FM Tower	1	0	0
Natural Gas Station	0	0	0
Power Plant	0	0	0
Substation	0	0	0
Waste Water Facility	1	0	0
Grand Total	**3**	**-**	**3**

Table 2-30: Critical Facilities (Linear) with Slope Failure Hazard Risk

Infrastructure Type (Linear)	Landslide Hazard	Avalanche Hazard	Total Mileage
Transportation and Lifeline	**0.7**	**-**	**0.7**
FEMA Levee	-	-	-
USACE Levee	-	-	-
Natural Gas Pipeline	0.1	-	0.1
Transmission Line	0.2	-	0.2
Railroad	0.1	-	0.1
Street	0.3	-	0.3
-Interstate	-	-	-
-Primary Highway	0.0	-	0.0
-State/County Highway	0.1	-	0.1
-Local Road	0.1	-	0.1
-Other Road	0.0	-	0.0
-4WD Road	-	-	-
Grand Total	**0.7**	**-**	**0.7**

2.4.12.7 Future Trends

The City of Red Bluff continues to experience construction for both commercial and residential above both the statewide and county wide average. This trend is expected to continue over the next decade as Red Bluff did not experience a massive construction boom bust, but rather a moderate uptick in development during the periods of 2004 through 2008. (Tehama County Hazard Mitigation Plan, 2012) For all existing and future development in especially sensitive areas of the City (hillsides, greenways, wooded areas, streams and drainage-ways), policies set forth by the City of Red Bluff General Plan Land Use Element will be followed. These policies and corresponding suggested implementation measures will mitigate the risk of slope failure and erosion to the built environment.

In addition, the City of Red Bluff has adopted the California Building Code (CBC) 2016 Edition. The State of California has adopted the 2016 International Building Code (IBC) by reference in its California Building Standards Code. The IBC includes provisions for geotechnical analyses in steep slope areas that have soil types considered susceptible to landslide hazards. These provisions assure that new construction is built to standards that reduce the vulnerability to landslide risk.

2.4.13 Severe Weather

In the past, severe weather events having an effect on Red Bluff have included tornadoes, heavy rain and hail. For more information on severe weather events, see Section 4.9 in the Base Plan.

2.4.13.1 Regulatory Oversight

The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. The City of Red Bluff has adopted the International Building Code in response to California mandates. This code is equipped to deal with the impacts of severe weather events. Land use policies identified in the General Plan also address many of the secondary impacts (flood and landslide) of the severe weather hazard. With these tools, the City of Red Bluff is equipped to deal with future growth and the associated impacts of severe weather.

2.4.13.2 Past Events

Past severe weather events in the City of Red Bluff are summarized in Table 2-31. No injuries or property damage has occurred as a result of a severe weather event in the City. Heavy rain is the most common type of severe weather event.

Table 2-31: Past Severe Weather Events in the City of Red Bluff

Date	Type	Deaths or Injuries	Property Damage
1/23/16	Funnel Cloud	0	0
Description: *Funnel cloud spotted moving east at 10 mph toward Richfield.*			
10/18/15	Heavy Rain	0	0
Description: *Locally heavy rain from a thunderstorm, with 1.25 inches measured in about 30 minutes.*			
4/4/13	Tornado	0	0
Description: *Public reported a brief tornado with visible debris cloud in an empty field south of Shasta College. Tornado duration was approximately 2 minutes. This tornado was rated an EF0 with no known damage.*			
10/13/09	Heavy Rain	0	0
Description: *Red Bluff Airport recorded 1.95 inches of rainfall on the 13th. Strong, gusty winds peaking at 53 mph brought down numerous trees, large branches, and power lines which resulted in power outages in Tehama County.*			
1/25/08	Heavy Rain	0	0
Description: *Rainfall at Red Bluff airport totaled 2.14 inches on January 25th, which broke the previous record for the date of 1.38 inches set in 1997.*			
7/18/07	Heavy Rain	0	0
Description: *A new daily and monthly rainfall record of 0.86 inches was set at Red Bluff Airport. The old daily record was only a trace of rain, which last occurred in 2004. The old monthly record was 0.70 inches set in 2000.*			

Date	Type	Deaths or Injuries	Property Damage
8/6/06	Heavy Rain	0	0
Description: *A late night shower produced a rare rainfall event for early August in Red Bluff when 0.01 inches of rain fell at the airport. This breaks the old daily record of a trace set in 1945.*			
2/22/01	Hail	0	0
Description: *One-inch hail was reported in Red Bluff.*			
7/4/00	Hail	0	0
Description: *A line of thunderstorms developed rapidly off the Trinity Mountains and moved across northern Tehama and southern Shasta counties. Many reports were received of widespread large hail and several minor car accidents were reported on I-5 and local highways. Localized street flooding was reported in the town of Cottonwood.*			
5/15/00	Funnel Cloud	0	0
Description: *A funnel cloud developed 10 miles west of Red Bluff. It dissipated after 2-3 minutes.*			

Source: noaa.gov

2.4.13.3 Location

Generally, the entire planning area for the City of Red Bluff can be affected by a Severe Weather Hazard. Areas with trees, power and light poles, large signs, communications towers and other structures with exposed surface areas are all vulnerable to the effects of severe weather. Severe weather events have the potential to happen anywhere in the City. Wind events such as funnel clouds or tornados are most damaging to areas that are heavily treed.

2.4.13.4 Frequency

The planning area can expect to experience exposure to some type of severe weather event at least annually. Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century. The number of weather-related disasters during the 1990s was four times that of the 1950s, and cost 14 times as much in economic losses. Historical data shows that the probability for severe weather events increases in a warmer climate. The changing hydrograph caused by climate change could have a significant impact on the intensity, duration and frequency of storm events. All of these impacts could have significant economic consequences.

2.4.13.5 Severity

The most common severe weather event in the City is heavy rain which has not caused any injuries, fatalities or property damage in recent history. Tornadoes are potentially the most dangerous of local storms, but they are not common in the planning area. If a major tornado were to strike within the populated areas of the City, damage could be widespread. Businesses could be forced to close for an extended period or permanently, fatalities could be high, many people could be homeless for an extended period, and routine services such as telephone or power could be disrupted. Buildings may be damaged or destroyed. California ranks 32nd among states for frequency of tornadoes, 44th for the frequency of tornados per square mile, 36th for injuries, and 31st for cost of damage. The state has no reported deaths from tornadoes.

2.4.13.6 Warning Time

Meteorologists can often predict the likelihood of a severe storm within a region. This can give several days of warning time to City of Red Bluff staff. However, meteorologists cannot predict the exact time of onset or severity of the storm. Some storms may come on more quickly and have only a few hours of warning time.

The Tehama County Sheriff's Office uses the Tehama Alert system to notify residents of a potential fire, gas leak, flood or other natural or man-caused incident in the County that would prompt an immediate evacuation or shelter in place protocols.

2.4.13.7 Severe Weather Vulnerability

The most common problems associated with severe storms are immobility and loss of utilities. Fatalities are uncommon, but can occur. Roads may become impassable due to flooding, downed trees, ice or snow, or a landslide. Power lines may be downed due to high winds or ice accumulation, and services such as water or phone may not be able to operate without power. Lightning can cause severe damage and injury.

The most significant secondary hazards associated with severe local storms are floods, falling and downed trees, landslides and downed power lines. Rapidly melting snow combined with heavy rain can overwhelm both natural and man-made drainage systems, causing overflow and property destruction. Landslides occur when the soil on slopes becomes oversaturated and fails.

2.4.13.7.1 Population

It can be assumed that the entire City is exposed to some extent to severe weather events. Certain areas are more exposed due to geographic location and local weather patterns. Vulnerable populations are the elderly, low income or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life threatening to those dependent on electricity for life support. Isolation of these populations is a significant concern. These populations face isolation and exposure during severe weather events and could suffer more secondary effects of the hazard.

2.4.13.7.2 Property

All property is vulnerable during severe weather events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Those that are located under or near overhead lines or near large trees may be vulnerable to falling ice or may be damaged in the event of a collapse.

Structures built without the influence of a structure building code with provisions for wind loads are considered to be exposed to the severe weather hazard, but structures in poor condition or in particularly vulnerable locations (located on hilltops or exposed open areas) may risk the most damage. The frequency and degree of damage will depend on specific locations.

2.4.13.7.3 Critical Facilities and Infrastructure

All critical facilities are exposed to severe weather. The most common critical facilities problems associated with severe weather are loss of utilities. Downed power lines can cause blackouts, leaving large areas isolated. Phone, water and sewer systems may not function. Roads may become impassable due to ice or snow or from secondary hazards such as landslides.

Incapacity and loss of roads are the primary transportation failures resulting from severe weather, mostly associated with secondary hazards. Landslides caused by heavy prolonged rains can block roads. High winds can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, isolating population, and disrupting ingress and egress.

Severe windstorms, downed trees, and ice can create serious impacts on power and above-ground communication lines. Freezing of power and communication lines can cause them to break, disrupting electricity and communication. Loss of electricity and phone connection would leave certain populations isolated because residents would be unable to call for assistance.

2.4.13.8 Future Trends

All future development will be affected by severe storms. The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. The City of Red Bluff has adopted the International Building Code in response to California mandates. This code is equipped to deal with the impacts of severe weather events. Land use policies identified in the general plan also address many of the secondary impacts (flood and landslide) of the severe weather hazard. With these tools, the City of Red Bluff is equipped to deal with future growth and the associated impacts of severe weather.

2.4.14 Drought

Drought hazards in the City of Red Bluff are the same as Tehama County as a whole. For a complete hazard profile and vulnerability assessment for drought, refer to Section 4.5 of Volume 1.

2.4.15 Hazard Risk Ranking

The City of Red Bluff's Planning Team used the same hazard prioritization process as the Tehama County Planning Committee. This process is described in detail in Section 13 of the base plan. Table 2-32 shows the results of the hazard risk ranking exercise.

Table 2-32: City of Red Bluff Prioritized Hazard Assessment Matrix

		Impact			
		Catastrophic	Critical	Limited	Minor
Probability	Highly Likely				
	Likely				Severe Weather
	Possible				Flood, Wildfire, Slope Failure
	Unlikely				Earthquake

2.5 Mitigation Strategy

The intent of the mitigation strategy is to provide the City with a guidebook to future hazard mitigation administration. The mitigation strategy is intended to reduce vulnerabilities outlined in the previous section with a prescription of policies and physical projects. This will assist County staff to achieve compatibility with existing planning mechanisms, and ensures that mitigation activities provide specific roles and resources for implementation success.

The City of Red Bluff followed the same mitigation strategy as Tehama County for this 2018 MJHMP Update. The mitigation strategy is explained in detail in Section 5 of the Base Plan.

2.5.1 Identifying the Problem

As part of the mitigation actions identification process, the Red Bluff Planning Committee identified issues and/or weaknesses as a result of the risk assessment and vulnerability analysis. By combining common issues and weaknesses developed by the Planning Committee, the realm of resources needed for mitigating each can be understood. Community issues and weaknesses are presented by individual hazard in Table 2-33. Projects or actions have been developed to mitigate each problem identified.

Table 2-33: City of Red Bluff Problem Statements by Hazard

Hazard	Problem No.	Problem Description	Mitigation Alternative	Mitigation Action No.	County Wide	City of Red Bluff
Dam Failure	DF-01	There is often limited warning time for dam failure. These events are frequently associated with construction methodology and or severe weather, which limits predictability of dam failure and compounds flood risk. Protocol for notification of downstream citizens of imminent failure needs to be tied to local emergency response planning.	ES, PE&A	TC-23-2018, RB-06-2018, CoT-24-2018	x	x
Dam Failure	DF-02	Mapping that estimates inundation depths for federally regulated dams is already required and available; however, mapping for non-federal-regulated dams is needed to better assess the risk associated with failure of these facilities. Also, access to inundation zones is not readily available to residents area wide.	ES	TC-24-2018, TC-23-2018, RB-06-2018	x	x
Drought	DR-03	The probability of increased drought frequencies and durations due to climate change.	PRV	CoT-25-2018, RB-07-2018, TC-27-2018, TC-28-2018, CC-23-2018	x	x

Hazard	Problem No.	Problem Description	Mitigation Alternative	Mitigation Action No.	County Wide	City of Red Bluff
Drought	DR-04	The lack of promotion of active water conservation during drought and non-drought periods.	PRV, PE&A	TC-26-2018, CoT-18-2012, RB-08-2018	x	x
Earthquake	EQ-01	More information is needed on the exposure and performance of soft-story construction within the planning area. There are many undocumented unreinforced masonry buildings.	PPRO	CC-21-2018, CC-22-2018, CoT-16-2012, RB-04-2018, RB-05-2018		x
Flood	FL-02	Climate change impacts flood conditions in Tehama County. More severe weather events could compromise local drainage and flood control.	SP	CC-10-2012, CoT-06-2012, CoT-07-2012, CoT-08-2012, CoT-09-2012, CoT-20-2018, RB-03-2018, RB-09-2012, TC-22-2018, CC-08-2012, CC-09-2012, CC-12-2012, CC-16-2018	x	x
Flood	FL-16	Watershed streams show rapid responses to storms, and flow levels fluctuate or flash between storm periods in a localized environment.	SP	TC-22-2018, CC-08-2012, CC-09-2012, CC-12-2012, CC-13-2012, CC-16-2018, RB-06-2012, CC-10-2012	x	x
Flood	FL-17	Multi Residential Care and Assisted Living Facilities are located within the 100 YR Flood Plain.	PPRO	CC-14-2012, RB-03-2012		x
Flood	FL-03	Residents need more education about flood preparedness, flood insurance and the resources available during and after floods on a continual basis.	PEA	TC-06-2018, CC-02-2012, CoT-03-2012, CoT-04-2012, CoT-11-2012, CoT-12-2012, CoT-14-2012, RB-03-2012	x	x

Hazard	Problem No.	Problem Description	Mitigation Alternative	Mitigation Action No.	County Wide	City of Red Bluff
Flood	FL-30	Many small tributaries in the watersheds have high levels of siltation and diminished flood-carrying capacity due to vegetation (due to Arundo and Tamarisk) overgrowth. Debris-clearing is a challenge due to environmental permitting restrictions from Fish and Game/Fish and Wildlife. The establishment of Arundo in the streams in Tehama County has seriously limited their conveyance capacity.	PRV	TC-13-2018, CC-05-2018, CoT-06-2012, RB-02-2018	x	x
Severe Storm	SS-01	Older building stock in the planning area do not meet code standards. These structures could be highly vulnerable to severe weather events such as windstorms.	PPRO	TC-30-2018, TC-33-2018	x	x
Severe Storm	SS-06	Many large trees result in damages from storms (high winds). There are currently limitations due to local tree trimmer capacities..	PRV	CC-20-2018, CoT-15-2012, RB-11-2018, TC-30-2018	x	x
Slope Failure	SF-01	There are existing homes and businesses along the west bank of the Sacramento River that are at risk to erosion and landslides due to river channel migration.	PPRO	CoT-26-2018, RB-02-2012		x
Slope Failure	SF-02	Slope stability issues are present along Rio Street and the river bend as well as Antelope Bridge and other areas along the Sacramento River.	SP	RB-02-2012		x
Wildfire	WF-13	Portions WUI areas are not covered by Fire Hydrants or have exposure due fire department response times.	ES	RB-09-2018, RB-10-2018		x

Hazard	Problem No.	Problem Description	Mitigation Alternative	Mitigation Action No.	County Wide	City of Red Bluff
Wildfire	WF-14	High wildfire risk within the Reeds Creek CWPP Planning Unit. This includes populations and structures at risk near the wildland urban interface near Red Bluff. Red Bluff areas of concern including areas near S. Jackson Street, Monroe Ave @ Walton Ave, and Monroe Ave @ HWY 36.	PPRO	RB-08-2012		x

2.5.2 Capability Assessment

The City of Red Bluff identified current capabilities available for implementing hazard mitigation activities. The Capability Assessment portion of the hazard mitigation plan identifies administrative, technical, legal and fiscal capabilities. This includes a summary of departments and their responsibilities associated to hazard mitigation planning as well as codes, ordinances, and plans already in place associated to hazard mitigation planning. The second part of the assessment provides fiscal capabilities that may be applicable to providing financial resources to implement identified mitigation action items.

2.5.2.1 Existing Institutions, Plans, Policies and Ordinances

The following is (1) a summary of existing positions their responsibilities related to hazard mitigation planning and implementation; and (2) a list of existing planning documents and regulations related to mitigation efforts within the City. The administrative and technical capabilities the City, as shown in Table 2-34, provides an identification of the staff, personnel, and department resources available to implement the actions identified in the mitigation section of the Plan. Specific resources reviewed include those involving technical personnel such as planners/engineers with knowledge of land development and land management practices, engineers trained in construction practices related to building and infrastructure, planners and engineers with an understanding of natural or human-caused hazards, floodplain managers, surveyors, personnel with GIS skills and scientists familiar with hazards in the community.

2.5.2.2 Administrative and Technical Capacity

Table 2-34: Red Bluff's Administrative and Technical Ability

Staff/Personnel Resources	Available	Department/Agency Position
Planners or engineers with knowledge of land development and land management practices	Y	Planning and Public Works Departments
Engineers or professionals trained in building or infrastructure construction practices	Y	Building and Safety, Public Works Departments
Planners or engineers with an understanding of natural hazards	Y	Planning Department and Public Works Department
Staff with training in benefit/cost analysis	Y	Can contract for this service
Flood Plain Manager	Y	The Flood Damage Prevention Ordinance identifies the Community Development Director as the Flood Plain Administrator
Surveyors	Y	Contract for services
Personnel skilled or trained in GIS applications	Y	Planning and Public Works Departments. Can also contract for services
Scientist familiar with natural hazards in local area	Y	Contract for services
Emergency Manager	Y	Fire Chief, Police Chief and Public Works Department. This capability could be expanded by providing training to staff to provide outreach to communities on mitigation activities people can perform on their homes and businesses.
Grant Writers	Y	City contracts for services

2.5.2.2.1 Administration

The City Manager serves as the "administrative head of the City Government, under the direction and control of the City Council". The Manager is responsible to the City Council for the day-to-day management of all City affairs and the leadership of City Department Heads.

The City Manager also serves as the Finance Director. The Manager is directly responsible for continual review and analysis of all City administrative operations including budget preparation and control, organizational and procedural studies together with staffing. The City Manager’s responsibilities, authority and limits on authority are clearly defined in city law in City Code chapter 2.44.

2.5.2.2.2 Engineering Design

Led by the Public Works Director, staff provide engineering design services, provides plans, develops and constructs public facilities, roadways, and capital improvement projects. The staff prepares plans, specifications, and cost estimates for many projects within City boundaries such as:

- Airport Facilities
- Sewer Design
- Street Realignment
- Traffic Signal Installation
- Storm Drains
- Other Public Facilities

2.5.2.2.3 Planning Department

The Planning Director is the primary staff to the Red Bluff Planning Commission, a five-member commission appointed by the Mayor and City Council to review development projects.

The Planning Department is responsible for implementing and updating the land use goals and policies of the City Council as detailed in the City's General Plan, Zoning Code, Specific Plans, and various development ordinances and standards. Additionally, the department is responsible for assuring compliance with numerous state statutes including the California Environmental Quality Act, The Planning and Zoning Law, and the Subdivisions Map Act

The department receives and processes development applications for land use permits including parcel maps, subdivisions, use permits, rezoning, variances, general plan amendments and annexations. Planning staff regularly meets and confers with the City's Technical Advisory Committee (including the Building, Fire, Police and Public Works Departments) to discuss development inquiries and applications, and to coordinate the efficient provisions of services to new homes and businesses.

2.5.2.2.4 Public Works Department

Public Works includes Airport Management, Land Development, Design, and Construction Management. The City of Red Bluff Street Department, Waste Water Treatment Facilities and Water Department are under the direction of the Public Works Director.

Public Works secures funding for projects from outside agencies, State and Federal sources and prepares all required project documentation and regulatory agency reports.

Public Works Responsibilities:

- Airport Management
- Conducts land development project review and inspections
- Advertises projects, reviews bids and awards projects
- Initiates State Transportation Improvement Program (STIP) projects and administers contracts
- Responds to public inquiries
- Develops technical reports
- Maintains the City's Design Standards Manual
- Maintains improvement records and maps
- Street Banners--look under Public Notices for the banner application

2.5.2.2.5 Police Department

The Operations Division is comprised of the Patrol Unit and Dispatch Unit whose primary function is to deliver initial police services to the community 24 hours a day, 365 days a year. The Operations Division consists of uniformed police officers and public safety dispatchers who work together to provide police response to calls for service as well as the initial response to an emergency or report of a crime. This division accounts for most of the Department's measurable workload and is the most visible as they are usually the first point of contact for persons seeking police services.

The Operations Division is currently commanded by one Captain and staffed with four sergeants, nine police officers, one dispatch supervisor and four dispatchers. These personnel work diligently every day to make the City of Red Bluff a great place to live.

2.5.2.2.6 Fire Department

The Red Bluff Fire Department currently has 1 station and consists of 12 career personnel, 18 reserve personnel and 3 administrative staff personnel. The Fire Department has 3 engines, 1 ladder truck, 2 rescue/squads and 1 OES engine. Typical daily staffing includes 3 personnel for the Engine and 2 personnel for the truck.

2.5.2.3 Regulatory Tools

The legal and regulatory capabilities of local, state, and federal jurisdictions are shown in Table 2-35, which presents existing ordinances and codes that can regulate the physical or built environment of the City. Examples of legal and/or regulatory capabilities can include: building codes, zoning ordinances, subdivision ordnances, special purpose ordinances, growth management ordinances, site plan review, general plans, capital improvement plans, economic development plans, emergency response plans, and real estate disclosure plans. The City's General Plan is the constitution guiding new development.

Table 2-35: City of Red Bluff's Land and Regulatory Capability

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated	Comments
Codes, Ordinances & Requirements					
Building Code	Y	N	N	Y	Section 5.20-1 adopts the 2016 Edition of the California Building Code
Zoning Code	Y	N	N	Y	Chapter 25 Article 1 adopts the zoning ordinance
Subdivisions	Y	N	N	N	Chapter 20
Post Disaster Recovery	Y	N	N	N	SEP Section 11
Real Estate Disclosure	N	N	N	Y	
Growth Management	Y	N	N	Y	City of Red Bluff General Plan Land Use/ Circulation Elements
Site Plan Review	Y	N	N	N	Chapter 5 Section 5.45
Special Purpose (flood management, critical areas)	Y	N	N	N	Chapter 26: Flood Damage Prevention Floodplain Protection, City of Red Bluff General Plan Land Use Element
Planning Documents					
General Plan	Y	N	N	Y	City of Red Bluff General Plan. During the next update cycle, the approved local hazard mitigation plan will be adopted into the Safety Element of the General Plan.
Capital Improvement Plan	Y	N	N	N	2011 DRAFT Capital Improvement Plan
Economic Development Plan	Y	N	N	N	City of Red Bluff General Plan Economic Development Element, Approved 4/2/02
Flood Plain or Basin Plan	Y	Y	N	N	2015 Urban Water Management Plan Update, City of Red Bluff, California
Storm Water Plan	N	N	N	N	
Habitat Conservation Plan	Y	N	N	N	City of Red Bluff General Plan Natural Resource Conservation Element

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated	Comments
Shoreline Management Plan	N	N	N	N	
Emergency Response Plan	Y	Y	Y	Y	City of Red Bluff Emergency/Disaster Response Plan
Continuity of Operations Plan	N	N	N	N	
Post Disaster Recovery Plan	N	N	N	N	
Terrorism Plan	N	N	N	N	

2.5.2.3.1 Fiscal Resources

Table 2-36 shows specific financial and budgetary tools available to the City such as community development block grants; capital improvements project funding; authority to levy taxes for specific purposes; fees for water, sewer, gas, or electric services; impact fees for homebuyers or developers for new development; ability to incur debt through general obligations bonds; and withholding spending in hazard-prone areas.

Table 2-36: City of Red Bluff's Fiscal Resources

Financial Resources	Accessible or Eligible to Use?
Community Development Block Grants	Y
Capital Improvements Project Funding	Y
Authority to Levy Taxes for Specific Purposes	Y (voter approval, prop 218 regulated)
User Fees for Water, Sewer, Gas or Electric Service	Y
Incur Debt through General Obligations Bonds	N
Incur Debt through Special Tax Bonds	N
Incur Debt through Private Activity Bonds	Unknown
Withhold Public Expenditures in Hazard-Prone Areas	N
State Sponsored Grant Programs	Y
Development Impact Fees for Homebuyers or Developers	Y
Other	YES: HMGP, PDM, FMA, RFC, SRL

2.5.2.3.2 Community Classifications

Table 2-37 summarizes classifications under various community mitigation programs.

Table 2-37: City of Red Bluff's Community Classifications

Program	Participating	Classification	Date Classified
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	Yes	N/A	N/A
Public Protection (ISO Class)	Yes	3	2004
Storm Ready	No	N/A	N/A
Firewise	Yes	3	2006

2.5.3 Guiding Principle, Goals and Objectives

Hazard mitigation plans must identify goals for reducing long-term vulnerabilities to identified hazards (44 CFR Section 201.6(c)(3)(i)). Together with the County Planning Committee, the steering committee established a guiding principle, a set of goals and measurable objectives for this plan, based on data from the preliminary risk assessment and the results of the public involvement strategy. This information is located in Section 5.4 of Volume One.

2.5.4 Mitigation Action Plan

Based upon planning committee priorities, risk assessment results, and mitigation alternatives, mitigation actions were developed. Most importantly, the newly developed mitigation actions acknowledge updated risk assessment information outlined in Section 2.4. Mitigation actions presented in Table 2-38 establish 16 possible mitigation actions. Some mitigation actions support ongoing City activities, while other actions are intended to be completed when funding is available. For this Plan, time frames are defined as follows:

- Short Term- 1-3 years
- Mid Term- 3-5 years
- Long Term- 5 years or more

Regardless, mitigation actions will be part of an annual review.

2.5.4.1 Benefit/Cost Review

The City of Red Bluff Planning Team used the same benefit/cost parameters as Tehama County. This exercise is described in detail in Section 16.3 of the Base Plan.

Cost ratings were defined as follows:

- **High**—Existing funding will not cover the cost of the project; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).
- **Medium**—The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
- **Low**—The project could be funded under the existing budget. The project is part of or can be part of an ongoing existing program.

Benefit ratings were defined as follows:

- **High**—Project will provide an immediate reduction of risk exposure for life and property.
- **Medium**—Project will have a long-term impact on the reduction of risk exposure for life and property, or project will provide an immediate reduction in the risk exposure for property.
- **Low**—Long-term benefits of the project are difficult to quantify in the short term.

2.5.4.2 Mitigation Action Plan

The City of Red Bluff's Planning Team used the same mitigation action prioritization method as described in the Section 5.8.3 of the Base Plan Volume 1. Based upon the City of Red Bluff Planning Committee consensus, Table 2-38 lists each priority mitigation action. For Priority mitigation actions Implementation plans are made available in the Action Planner Annex. Implementation plans in Action Planner Annex identify the responsible party, time frame, potential funding source, implementation steps and resources need to implementation. The detail in the Action Planners Annex meet the regulatory requirements of FEMA and DMA 2000.

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Table 2-38: Mitigation Action Abbreviated List

Action No.	Hazard Type	Specific Mitigation Action	Mitigation Alternatives	Responsible Party	Potential Funding Source	Time Frame	Benefit Cost Rating	Planning Mechanism	Implementation Plan / Priority
RB-01-2018	Flood	Continue outreach program to provide information needed to increase awareness and modify actions to reduce flood damage, encourage flood insurance coverage and protect natural functions of floodplains.	PE&A	City of Red Bluff Public Works	General Fund, Pre-Disaster Mitigation Grant Program (PDM)	Short Term	LOW/LOW	Implementation has been occurring for several years and this is an on-going action.	1
RB-02-2012	Slope Failure	Install hillside stabilization and river bank armoring, rip-rap or gabion improvements on Red Bluff Hill and in the Sacramento River from Union Street along Rio Street north of Cedar Street to Hickory Street south of Cedar Street along Rio Street to prevent future mudslides/landslides, property slumping, road failure and infrastructure collapse.	SP	City of Red Bluff Public Works	Hazard Mitigation Grant Program (HMGP)	Mid Term	HIGH/LOW		
RB-02-2018	Flood	Work with Cal DFW to develop programmatic permit to remove vegetation and to conducted regular maintenance in stream channels.	PRV	City of Red Bluff Public Works	General Fund	Short Term	LOW/HIGH	Water/ Flood Management Plans	7
RB-03-2012	Flood	Ensure that new development is designed to reduce or eliminate flood damage by requiring lots and rights-of-way to be laid out for the provisions of approved sewer and drainage facilities, providing on-site detention facilities as required.	PRV, PPRO	City of Red Bluff Planning Department	General Fund	Mid Term	LOW/LOW	Building/ Development Codes and Zoning Ordinances	
RB-03-2018	Flood	Reduce potential inflow & infiltration issues in City infrastructure due to more frequent and heavy rain events as a result of Climate Change.	SP, PRV	City of Red Bluff Public Works	Flood Mitigation Assistance Program (FMA)	Mid Term	MEDIUM/MEDIUM	Water/ Flood Management Plans	5
RB-04-2012	Flood	Make sandbags available to residents in anticipation of severe rainstorms or known flood events, deliver materials to critical infrastructure and provide public information on where these materials are stored and how to obtain them.	PRV	City of Red Bluff Public Works	General Fund, Pre-Disaster Mitigation Grant Program (PDM)	Short Term	LOW/LOW	Water/ Flood Management Plans	6
RB-04-2018	Earthquake	Construct Seismic Upgrades to city owned infrastructure not meeting current seismic standards.	SP, PRV	City of Red Bluff Public Works	Hazard Mitigation Grant Program (HMGP)	Long Term	HIGH/LOW	Building/ Development Codes and Zoning Ordinances	9
RB-05-2018	Earthquake	Develop Seismic Upgrade Program for local business / gathering facilities that were built before benchmark years.	PRV	City of Red Bluff Building Department	General Fund	Mid Term	MEDIUM/LOW	Building/ Development Codes and Zoning Ordinances	4
RB-06-2012	Flood	Clear drainage facilities of trash, debris, overgrown vegetation, dead and downed trees and shrubs prior to rainy season.	PRV	City of Red Bluff Public Works	General Fund	Short Term	LOW/MEDIUM	Water/ Flood Management Plans	2
RB-06-2018	Dam Failure	Educate public on evacuation procedures for dam failure and other hazards.	PE&A	City of Red Bluff Public Works	General Fund, Pre-Disaster Mitigation Grant Program (PDM)	Short Term	LOW / MEDIUM	General Plan Update	

Action No.	Hazard Type	Specific Mitigation Action	Mitigation Alternatives	Responsible Party	Potential Funding Source	Time Frame	Benefit Cost Rating	Planning Mechanism	Implementation Plan / Priority
RB-07-2018	Drought	Construct new ground water recharge facilities / drainage facilities to offset drought years and to recharge ground water aquifers.	SP, PRV	City of Red Bluff Public Works	General Fund	Long Term	HIGH/MEDIUM	Water/ Flood Management Plans	
RB-08-2012	Wildfire	Clear fuels/overgrowth/dead and downed vegetation in City / school district owned properties.	PRV	City of Red Bluff Fire Department	General Fund	Short Term	LOW/LOW	Community Wildfire Protection Plans (CWPPs).	**8**
RB-08-2018	Drought	Develop and promote water conservation programs.	NRP, PRV	City of Red Bluff Public Works- Water Department	General Fund	Short Term	LOW/MEDIUM	Water/ Flood Management Plans	**9**
RB-09-2012	Flood	Retrofit and maintain existing storm drain system to insure full capacity is utilized.	SP	City of Red Bluff Public Works	General Fund	Short Term	MEDIUM/ MEDIUM	Water/ Flood Management Plans	
RB-09-2018	Wildfire	Extend/ add domestic water fire lines to areas of known wildland fire risk.	SP, ES	City of Red Bluff Fire Department, City of Red Bluff Public Works	General Fund, Hazard Mitigation Grant Program (HMGP)	Mid Term	HIGH/LOW	Community Wildfire Protection Plans (CWPPs).	**2**
RB-10-2018	Wildfire	Construct new Fire Station near southern end of Red Bluff to decrease response times and suppress potential wildland fires in open grasslands near airport.	SP	City of Red Bluff Fire Department	Hazard Mitigation Grant Program (HMGP)	Long Term	HIGH/ LOW	Community Wildfire Protection Plans (CWPPs).	
RB-11-2018	Severe Storm	Create a hazard tree maintenance and replacement program for aging street trees.	PRV	City of Red Bluff Public Works	General Fund, Pre-Disaster Mitigation Grant Program (PDM)	Short Term	LOW/ MEDIUM	General Plan Update	

2.6 Plan Implementation and Maintenance Strategy

The City of Red Bluff Planning Team will follow the same implementation and maintenance strategy as Tehama County. This strategy is described in detail in Section 6 of the Base Plan.

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CITY OF TEHAMA

Tehama County

MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

2018 PLAN UPDATE

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CITY OF TEHAMA ADOPTION RECORDS

To comply with DMA 2000, the Tehama City Council has officially adopted the 2018 Tehama County Multi-Jurisdictional Hazard Mitigation Plan Volume 1 and the City of Tehama Volume 2 Annex. The adoption of the 2018 MJHMP in its entirety recognizes the City's commitment to reducing the impacts of natural hazards within the City and County. See below record of Adoption.

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Section 3. City of Tehama

This Annex details the hazard mitigation planning elements specific to the City of Tehama, a previously participating jurisdiction to the Tehama County Hazard Mitigation Plan. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the base plan document. As such, all sections of the base plan, including the planning process and other procedural requirements apply to and were met by the City. This Annex provides additional information specific to the City of Tehama, with a focus on providing additional details on the planning process, risk assessment, and mitigation strategy for this community.

Hazard Mitigation Plan Point of Contact

Primary Point of Contact
Carolyn Steffan, City Clerk
250 Cavalier Dr.
Tehama, CA 96060
Telephone: (530) 384-1501
e-mail Address: cdsteffan@sbcglobal.net

Alternate Point of Contact
Robert Mitchell, Mayor
PO Box 207
Tehama, CA 96090
Telephone: 530-384-2505
e-mail Address: Tehamavice@yahoo.com

3.1 Introduction

The City of Tehama is one of three incorporated areas within Tehama County and is the smallest in population and area. Tehama's eastern boundary is skirted by the Sacramento River. McClure Creek (to the north) and Rodeo Creek (to the south) run parallel from the west to the east and meet in a confluence at the northwest corner of the city limits of Tehama. From there, they empty into a drainage area that flows southeast into the Sacramento River. Other small drainages and seasonal creeks lie within very close proximity to Tehama. The following is a summary of key information about the jurisdiction and its history:

- **Date of Incorporation—July 2, 1906**
- **Current Population—**416 (population estimate as of July 1st, 2016)
- **Population Growth—**The population has remained fairly constant throughout the past few decades, gaining or losing a few residents each year.

3.1.1 Location and Description

The City of Tehama is near the geographical center of Tehama County located at 40 degrees 1 minute 28 seconds North Latitude/ 122 degrees 7 minutes 26 seconds West Longitude, approximately 6 miles east of Interstate Highway 5 and 1 mile west of U. S. Highway 99. The corporate limits of Tehama is 0.8 square miles. Elevation above sea level for the City of Tehama Is 210 feet (64 m). Tehama's location within Tehama County and the State of California are shown in Figure 3-1.

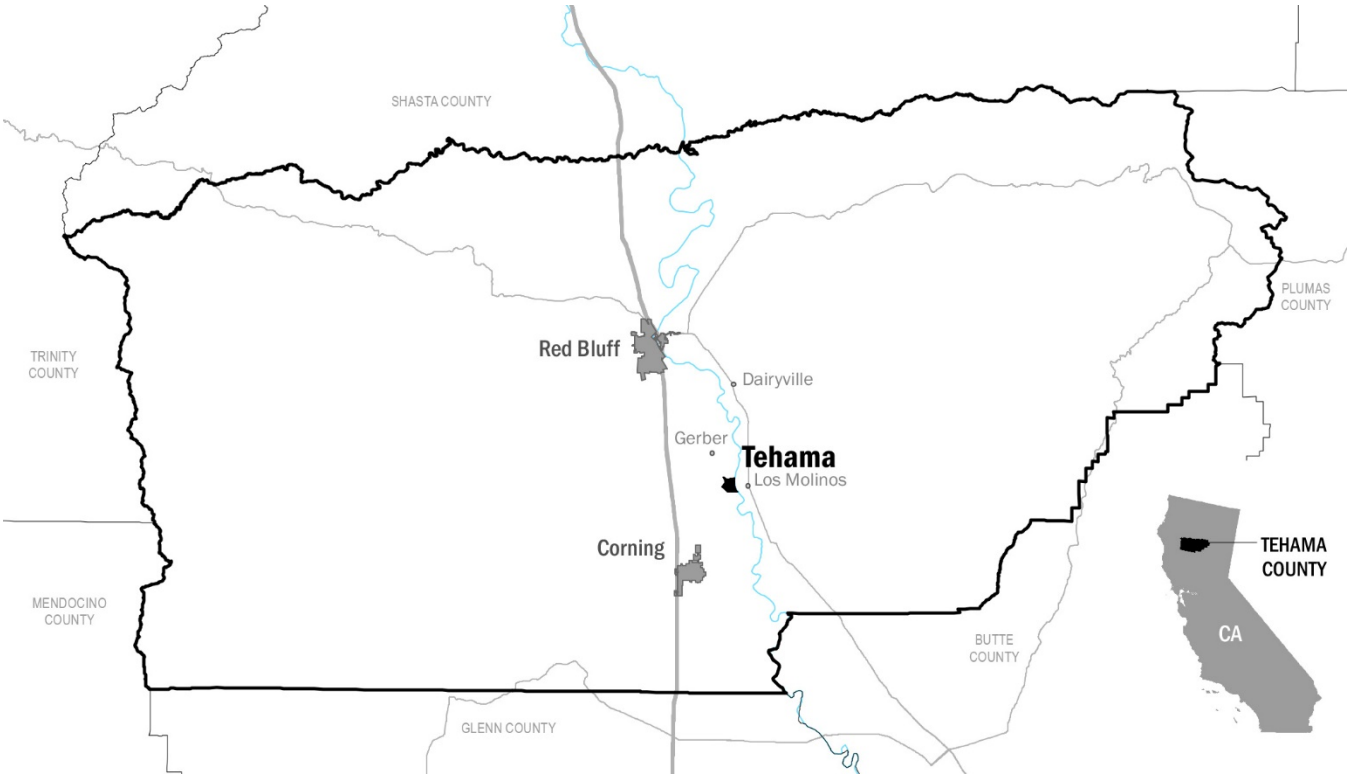


Figure 3-1: City of Tehama Location

3.1.2 Climate

The climate in Tehama is typical of that found in the Central Valley, with summers being very warm and dry, with mild, wet winters.

3.1.3 Historical Overview (From Tehama County 2012 Hazard Mitigation Plan)

Tehama was founded by Robert Hasty Thomes, who arrived in the area that is now Tehama County in the company of Albert G. Toomes, William Chard, and Jake F. Dye. The four men travelled northward from San Francisco, and were each given land grants from the government of Mexico in 1844, with Thomes' portion being named Rancho de la Saucos.

"Tehama" is believed to be an Indian word, but authorities disagree on the meaning, which has variously been reported as "high water", "low land", "salmon" or "shallow"—any of which would be an accurate description of a location where the river is normally shallow enough to ford, where fishermen are a common sight during the salmon run, and winter floods are a regular occurrence. A Nomlaki village once stood on the site of modern-day Tehama on the western bank of the Sacramento River.

Thomas mapped out the city in 1850, with First through Fifth Streets running north-south, and B through I Streets running east-west. First Street no longer exists; it was eroded away by the river. Tehama was one of the earliest California settlements north of Sacramento. The town initially thrived on the riverboat traffic.

When Tehama County was formed in 1856, Tehama was established as the County Seat. However, the seat was moved to Red Bluff, by county-wide election, the very next year, although various local stories have circulated about how Red Bluff "stole" it's county seat status from Tehama. Tehama had a reputation of being somewhat more liberal and freewheeling than the rest of the county, being the last town to go "dry" before Prohibition, and a center for bootleggers and gamblers.

Tehama's population peaked in the 1890s, at about 2000 residents, including a sizeable Chinese quarter. The city was incorporated in 1906 when plans were being made for an electric railway through the Sacramento Valley; the railway was never built, but Tehama remains as one of the smallest incorporated cities in California with the smallest general fund. A disastrous fire in 1908 combined with the decline of the riverboat traffic, caused the city to gradually lose prominence and population. Tehama has a mini-mart, an insurance office, a bar, and a post office, leaving Tehama almost entirely a residential neighborhood and farming area.

3.1.4 Structure of Government

Tehama has a council form of government. The 5-member council elects one of its members to serve as mayor. The council also serves as the planning commission. This body will assume responsibility for adoption and implementation of this plan. The city clerk and treasurer are also elected.

Because of its small size and only part time employees, office hours are by appointment only. The city clerk/administrator is always available by phone. The city clerk is responsible for day-to day operations within the city and is also certified as the water operator and floodplain administrator. In addition, there is a part time maintenance person who performs all maintenance work and assists with the water system. The city contracts for a city engineer, a planner with the County building department for issuing building permits and the Tehama County Sheriff for law enforcement.

3.2 What's New

This section of annex includes background information on the City of Tehama 2011 FHMP, the 2012 MJHMP and the 2018 MJHMP Updates. The MJHMP 2012 Mitigation Actions were reviewed and have been changed, updated, and revised to reflect new priorities overtime. The sections below describe the background and planning process for changes and updates.

3.2.1 Plan Assessment and Focus

When choosing the priority hazards to be profiled for this 2018 MJHMP Update, the City of Tehama's planning team discussed the impact of flood, severe weather, earthquake, drought and wildfire as hazards that affect the City. It was agreed that these hazards remain relevant and should be profiled in this 2018 Update.

In addition, the Planning Committee decided to also profile Dam Failure to reflect changes in priorities based on updated risk assessment data.

Since the 2012 HMP was adopted, there were no changes to the built environment, except for the additional freeboard to decrease vulnerability of houses. The Gyle Road Project decreased flooding of local roads for resident safety with drainage improvements.

3.2.2 5 Year Mitigation Action Review and Update

During the 2018 MJHMP update process, each of the 2012 "County Wide" and "City of Tehama" specific mitigation actions were examined for relevancy, future implementation and evaluated for potential follow-on effort. Many of the City's 2012 mitigation actions are on-going and will continue to progress. It was determined that many of the other mitigation actions were vague and part of the mitigation plan implementation, and were thus deleted. New mitigation actions were added in order to reflect changes in priorities.

The 2018 MJHMP mitigation actions located in Table 3-1 of this annex provides a listing of 2012 mitigation actions and an explanation of why each action was completed, deleted, or deferred. Mitigation Actions previously developed under the 2012 HMP have been refreshed as a result of the newly completed risk assessment, planning process and implementation strategy.

Table 3-1: MJHMP Mitigation Action Record of Revision Review

Program/ Project	Completed, Deleted or Deferred	Explanation
Flood hazard mitigation		
Designate floodplain areas; preserve open space; ensure consistency of floodplain regulations with General Plan.	**Delete**	**Make sure that we leave the concept of open space preservation in floodplains specifically.**
Refer development proposals that impact flood protection to other agencies as applicable, including Army Corps, FEMA. Require drainage plans.	**Edit.**	**Drainage plans for improvements. This is beyond CRS and NFIP.**
Continue participation in NFIP and CRS; seek CRS classification improvements. Promote purchase of flood insurance.	**Delete**	**Part of Implementation of a Mitigation Plan. This is a requirement to describe continued participation in the plan.**
Continue outreach program to provide information needed to increase awareness and modify actions to reduce flood damage, encourage flood insurance coverage and protect natural functions of floodplains. Seek CRS classification improvements i.e. better and more often outreach, Promotion of flood insurance to local residents and alert and warning of possible flood depths.	**On-going**	**Keep this. We will take care of this during 2018 SOW.**
Continue to pursue regional approach to flood issues by remaining involved in County Multi-Hazard Mitigation Plan.	**Delete.**	**Part of Implementation of a HMP.**

Program/ Project	Completed, Deleted or Deferred	Explanation
Continue to develop, implement, and expand the Flood Alert and Early Warning Program systems.	Ongoing	We can expand this as 2018 Mitigation Action. How, what resources etc…..
Implement a plan to keep brush & debris clear from Tehama Simpson Slough.	Ongoing	Private property is an issue. See map.
Continue annual inspection and maintenance of City's storm drain systems.	Ongoing	Contracted with County to
Analyze solutions to Gyle Rd flooding & funding sources. Improve barricading of Gyle Rd during flooding.	Ongoing / to be completed	Improved with Cal Trans funding. Ongoing due to discovery of additional flooding / drainage issues.
Repair culvert on Gyle Rd for drainage of McClure Creek.	To be completed	Part County / Part City. Need joint study for drainage improvements.
Continue to promote programs to elevate and retrofit structures to protect from future damage, with repetitive loss properties as priority.	On-going	More to be done!!!
Perform a dam failure analysis to determine probably impact of flooding within Tehama if Shasta Dam fails & create a dam failure element for City's emergency response plan.	To be completed	We will have dam inundation zones available as a result of 2018 HMP process.
Make readings readily available on water levels and educate public on readings i.e. what does gauge elevations mean in a localized area.	On-going / to be completed	Provide methods (technology, web maps, gauge links etc….on City Website and other places Post Office, City Hall, Phone notification). Part of CRS 600 series activity.
Analyze cost and benefit of flood protection measures for City Hall and School facility to lower risk of damage from flooding.	To be completed	Applied for NOI in 2018 under DR ???
Continue to maintain compliance and god standing under the national Flood Insurance program (NFIP)	Delete	Native to HMP regulations and processes Part C of CFR.
Improve south shoulder of East Gyle Rd. to prevent continual damage during flooding events.	New	NOI submitted under DR???

Program/ Project	Completed, Deleted or Deferred	Explanation
Educate public on evacuation procedures for dam failure and other hazards.	New	Related mostly to dam failure but could be linked to other hazards.
Severe Storm hazard		
Continue hazard tree maintenance and replacement program foraging street trees.	On-going	Need additional funding / mixed funding. JPA has provided safety money for existing program.
Construct back-up power generation / communication for City Hall or other community service infrastructure / essential facilities.	New	This could be under EMPG or other DHS grants.
Earthquake		
Undertake Earthquake Study for all critical facilities and non-reinforced masonry buildings. Seismic retrofit of identified buildings.	To be completed	Old Store, Museum, and early residence (completed).
Implement an automatic gas shut off valve install program.	To be completed.	Need assistance from Gas purveyor(s).
Wildfire		
Continue weed abatement program.	On-going	Successful program.
Conduct fuel reduction efforts on Railroad property.	New	This will require coordination between City and Railroad facilities staff.
Drought		
Develop and promote water conservation programs.	Completed	Went above and beyond state regulations.
Wellhead protection plans for active and abandoned wells within city.	New	Need to examine wells on south 2nd street and north of B street. Work with Rural Water (national water org) on source water protection plan.

Program/ Project	Completed, Deleted or Deferred	Explanation
Developed water supply contingency planning.	New	Addressed in Water Emergency Response plan. This will identify alternative sources.
All hazards		
Identify special needs residents and stay-at-home children that may require special assistance in hazard situations.	Ongoing	We can expand this as 2018 Mitigation Action. Use neighborhood watch as part of implementation.
Monitor and regularly update City hazard studies whenever information becomes available that would significantly modify previous data. Update GIS data as it relates to HMP documentation.	Ongoing	What layers? This will be successful after 2018
Integrate, where appropriate, goals, objectives and initiatives of Tehama Hazard Mitigation Plan into City General Plan, regulations and programs where appropriate	Delete	
Collect information and participate in programs which address emergency preparedness.	Delete	Belongs in preparedness or response documentation. i.e. EOP,
Continue to participate in agreement with County for cooperative response to all hazards and disasters.	Delete	Belongs in preparedness or response documentation. i.e. EOP,
Continue to support the implementation, monitoring, maintenance, and updating of this Plan, as defined in Volume 1.	Delete	
Continue to participate in mutual-aid agreements, such as in WARN –Water Assistance Resource Network- to get assistance in disaster situations.	Delete	Belongs in preparedness or response documentation. i.e. EOP,
Consider appropriate higher regulatory standards that prevent or reduce risk to the built environment from the known hazards of concern.	Completed / ongoing	NOI… Now require building 3 feet about the 100-YR flood levels.

3.2.3 Implementation into Other Planning Mechanisms

The 2012 Tehama County HMP (Tehama Annex) initiatives and mitigation actions have been implemented through various on-going projects and programs. Based upon new vulnerability data from the 2012 HMP, the City of Tehama updated the flood ordinance to require 3 feet of freeboard rather than 2 feet. The 2012 mitigation action of seeking CRS classification improvements was implemented by establishing higher regulatory standards, maintaining flood data for resident use and updating the City's flood warning and response.

With respect to the mitigation action items and strategies developed in 2012, the City of Tehama has been making improvements toward reducing natural hazard risks to life and property within the City. Significant risk reduction efforts have been made for floodplain management, flood damage prevention, and public education and awareness. These successful policies, programs, and projects are summarized in the following section.

3.2.4 Successful Mitigation Activities Since 2012

3.2.4.1 City Storm Drain Systems Maintenance

Related 2012 HMP Initiative:
Continue annual inspection and maintenance of City's storm drain systems.

Maintenance of City storm drains includes such work as necessary to maintain proper drainage adjacent to the roadway and through culverts. This work includes the cleaning and shaping of roadside ditches in conjunction with blading roadside shoulders, cleaning gutters, mechanical sweeping of areas with curb and gutter, cleaning, repairing and replacing culverts.

Figure 3-2: A new culvert and drainage during a storm event

3.2.4.2 Gyle Rd Flood Mitigation Project

Related 2012 HMP Initiative:

Analyze solutions to Gyle Rd flooding & funding sources. Improve barricading of Gyle Rd during flooding.

Roadway reconstruction and drainage improvements were completed on 5th Street from E Street south to Gyle Road and west to the Tehama City limits.

This street was constructed in the 60's and is now a heavily traveled connection between I 5, 99W and 99E. During heavy rains, the curve where 5th St. meets Gyle Rd. would become flooded and be impassible. Cars would go around the barricades and end up stranded or in the drainage ditch. This project was funded by the State of California Department of Transportation.

3.2.4.3 New Website

Related 2012 HMP Initiative:

Inform and educate public on hazard mitigation; develop web site; annual dissemination of information.

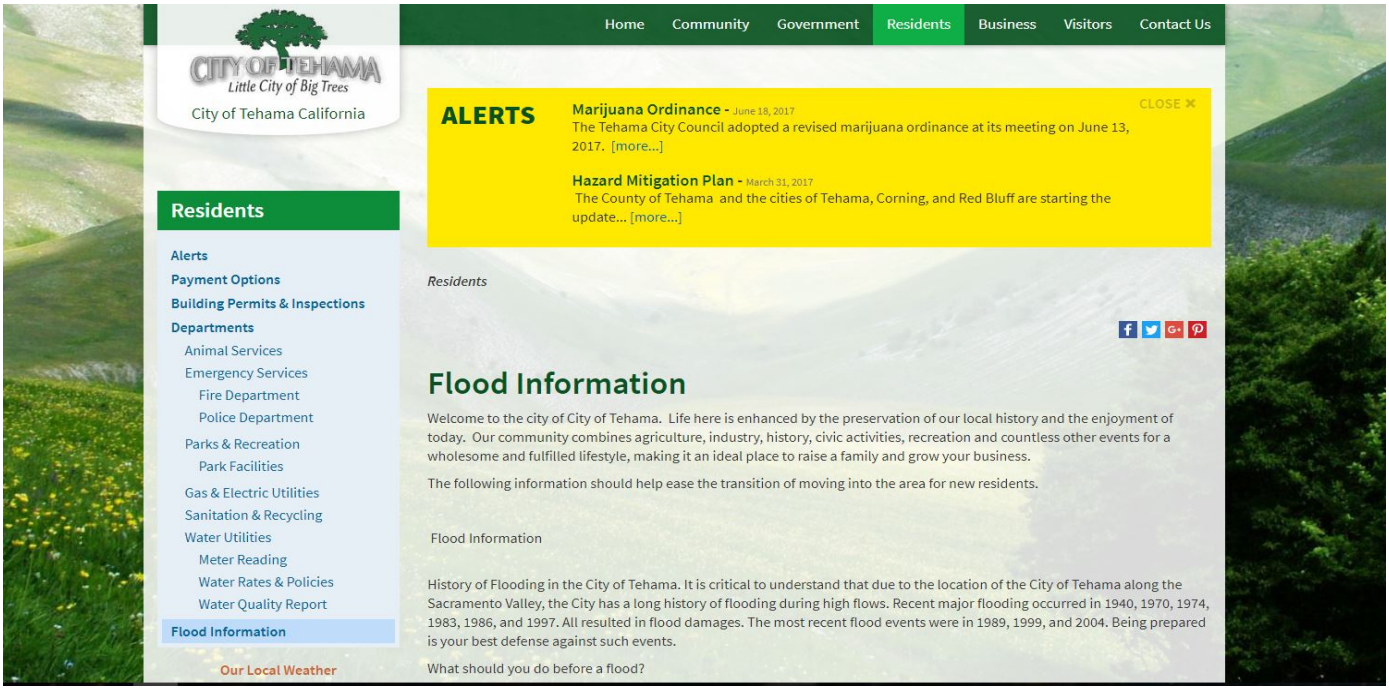


Figure 3-3: Screenshot from the new Flood Information page cityoftehama.us/flood-information

The City of Tehama has developed a new website to share Flood Information with residents. The website, as shown in Figure 3-3, provides information regarding what to do before, during and after a flood, explains the importance of purchasing flood insurance, provides resources for homeowners to retrofit their homes, and encourages residents to sign up for the City of Tehama Flood Warning System notifications.

3.2.4.4 Tree Trimming / Replacement Program

Related 2012 HMP Initiative:

Continue tree trimming program of 140-year old black walnut trees

Figure 3-4: Removal of a 150-year-old tree that was in bad condition

Trees are very important to the residents of Tehama (a book was even written about the city's history called, "Tehama, Little City of Big Trees"). Tree trimming is one of the City's highest expenditures because many of the street trees (oak and black walnut) were planted in the 1870's. In 2016-17, the City experienced several incidents of large limbs falling on cars, fences, etc. For the last several years the City has hired an arborist to prioritize the trees that need to be trimmed or removed. New trees are planted every several years. In 2016-17, the City planted 10 black walnuts of a variety that produces very few nuts as there no longer is a market for black walnuts in this area. Figure 3-4 shows one of the trees that were recently removed.

3.2.4.5 Road Closure Signs for Flooding

Related 2012 HMP Initiative:

Continue outreach program to provide information needed to increase awareness and modify actions to reduce flood damage, encourage flood insurance coverage and protect natural functions of floodplains.

The City of Tehama has permanently installed "flooded" signs for Gyle Road and Tehama Avenue – the two roads that flood frequently. These signs only need to be unlocked and turned to be used. The City has coordinated with the County and the County has installed the same type of signs on the county side of the City's roads.

3.2.4.6 Water Conservation Program

Related 2012 HMP Initiative:

Develop and promote water conservation programs

Figure 3-5: A City Water Meter

The City of Tehama has adopted all the state mandated drought regulations established by the California Water Action Plan. Chapter 13.04 Article XI: Water Conservation in the City of Tehama Code of Ordinances establishes normal water operations and regulations to be implemented during times of declared water shortages or declared water shortage emergencies. It establishes three levels of drought response actions to be implemented in times of shortage, with increasing restrictions on water use in response to worsening drought conditions and decreasing available supplies.

The City has also added penalties for residents using what the council considered to be excessive water. The penalties were very effective and mandates plus penalties resulted in a 40% reduction in water use. The penalties have been removed in 2017 but many of the other regulations have been retained.

3.2.4.7 Freeboard inclusions to floodplain regulation

Related 2012 HMP Initiative:

Consider appropriate higher regulatory standards that prevent or reduce risk to the built environment from the known hazards of concern.

The City of Tehama, a participating CRS community, updated the floodplain regulations to include three feet of freeboard. Freeboard is a factor of safety usually expressed in feet above a flood level for purposes of floodplain management. "Freeboard" tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, bridge openings, and the hydrological effect of urbanization of the watershed. Freeboard is not required by NFIP standards, but communities are encouraged to adopt at least a one-foot freeboard to account for the one-foot rise built into the concept of designating a floodway and the encroachment requirements where floodways have not been designated. Freeboard results in significantly lower flood insurance rates due to lower flood risk.

3.3 Planning Methodology

The City of Tehama followed the planning process detailed in Section 3 of the base plan. In addition to providing representation on the Tehama County Hazard Mitigation Planning Committee (HMPC) and Steering Committee, the City formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 3-2.

Table 3-2: 2018 MJHMP Update Stakeholder List

Planning Committee Dept. / Members	Position / Role	CRS Category
Plan Development and Review		
Carolyn Steffan, City Clerk/ Administrator	Planning Lead, Steering Committee Rep.	Public Information
Citizen Advisory		
Stan Johnson, Appraiser	Citizen Advisory	Property Protection
George Sigalas, Insurance Agent	Citizen Advisory	Property Protection

3.4 Risk Assessment

The intent of this section is to profile the City of Tehama's hazards and assess the City's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4 (Risk Assessment) Volume One. The hazard profiles in Volume One discuss overall impacts to the planning area and describes the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the City of Tehama is included in this section of the Annex. This vulnerability assessment analyzes the property, population, critical facilities, and other assets at risk to hazards specific to the City of Tehama. For more information about how hazards affect the County as a whole, see Section 4 Risk Assessment in the base plan.

Each hazard vulnerability assessment for the City of Tehama Annex includes a hazard profile/problem description as to how each medium or high significant hazard affects the City and includes information on past hazard occurrences. The intent of this section is to provide jurisdictional specific information on hazards and further describe how the hazards and risks differ across the planning area.

3.4.1 Hazard Screening Criteria

Per FEMA Guidance, the first step in developing the Risk Assessment is identifying the hazards. The City Planning Committee reviewed a number of previously prepared hazard mitigation plans and other relevant documents to determine the universe of natural hazards that have the potential to affect the County and the nearby region. Table 3-3 provides a crosswalk of hazards identified in the 2012 Tehama County HMP, 2009 Tehama County General Plan and 2013 California State HMP. Twelve different hazards were identified based on a thorough document review. The crosswalk was used to develop a preliminary hazards list providing a framework for City of Tehama HMP Planning Team members to evaluate which hazards were truly relevant to the City and which ones are not. For example, volcanic activity was considered to have no relevance to Tehama County, while earthquake, flood and wildfire were indicated in every hazard documentation.

Table 3-3: Document Review Crosswalk

Hazards	2012 Tehama County HMP	2004 City of Tehama General Plan	2009 Tehama County General Plan	2013 CA State HMP
Avalanche	■			■
Climate Change	■			■
Dam Failure	■			■
Drought	■			■
Earthquake	■	■	■	■
Flood	■	■	■	■
Landslide	■	■		■
Levee Failure				■
Severe Weather	■			■
Tsunami				■
Volcanoes				■
Wildfire	■	■	■	■

3.4.2 Climate Change

Climate refers to patterns of temperature, precipitation, humidity, wind and seasons. Climate shapes natural ecosystems and the human economies and cultures that depend on them. “Climate change” refers to changes over a long period of time. It is generally perceived that climate change will have a measurable impact on the occurrence and severity of natural hazards around the world. Impacts include the following:

- Snow cover losses will continue, and declining snowpack will affect snow-dependent water supplies and stream flow levels around the world.
- Drought and the frequency, intensity, and duration of heat waves are expected to increase.
- More extreme precipitation is likely, increasing the risk of flooding.
- The world’s average temperature is expected to increase.

Climate change will affect communities in a variety of ways. Impacts could include an increased risk for extreme events such as drought, storms, flooding, and forest fires; more heat-related stress; and the spread of existing or new vector-born disease into a community. In many cases, communities are already facing these problems to some degree. Climate change can affect the frequency, intensity, extent and/or magnitude of the problems.

This hazard mitigation plan addresses climate change as a secondary impact for each identified hazard of concern. Each chapter addressing one of the hazards of concern includes a section with a qualitative discussion on the probable impacts of climate change for that hazard.

3.4.3 Vulnerability Assessment and Total Assets at Risk

This section presents the vulnerability assessment for Tehama and identifies Tehama's total assets at risk, including people, values at risk, critical facilities and infrastructure. Growth and development trends are also presented for the community. This data is not hazard specific, but is representative of total assets at risk within the community.

3.4.4 Population and Asset Inventory

In order to describe vulnerability for each hazard, it is important to understand the "total" population and "total" assets at risk within the City. The exposure for each hazard described in this section will refer to the percent of total population or percent of total assets similar to Volume 1. This provides the possible significance or vulnerability to people and assets for the natural hazard event and the estimated damage and losses expected during a "worst case scenario" event for each hazard. Sections below provide a description of the total population, critical facilities, and parcel exposure inputs.

3.4.4.1 Population

In order to develop hazard-specific vulnerability assessments, population near natural hazard risks has been determined to understand the total "at risk" population. We can understand how geographically defined hazards may affect the City by analyzing the extent of the hazard in relation to the location of population. For purposes of the vulnerability assessment approximately 432[3] (100%) of the City's population is exposed to one or more hazards within or near the City boundaries. Each natural hazard scenario affects the City residents differently depending on the location of the hazard and the population density of where the hazard could occur. Vulnerability assessment sections presented later in this section summarize the population exposure for each natural hazard.

3.4.4.2 Vulnerable Populations

The severity of a disaster depends on both the physical nature of the extreme event and the socioeconomic nature of the populations affected by the event. Important socioeconomic factors tend to influence disaster severity. A core concept in a vulnerability analysis is that different people, even within the same region, have a different vulnerability to natural hazards.

3.4.4.2.1 Income and Housing Condition

Income or wealth is one of the most important factors in natural hazard vulnerability. This economic factor affects vulnerability of low income populations in several ways. Lower income populations are less able to afford housing and other infrastructure that can withstand extreme events. Low income populations are less able to purchase resources needed for disaster response and are less likely to have insurance policies that can contribute to recovery efforts. Lower income elderly populations are less likely to have access to medical care due to financial hardship. Because of these and other factors, when disaster strikes, low income residences are far more likely to be injured or left without food and shelter during and after natural disasters.

[3] According to the 2010 U.S. Census Block pre-joined TIGER spatial data, the total population for the City in 2011 was 432.

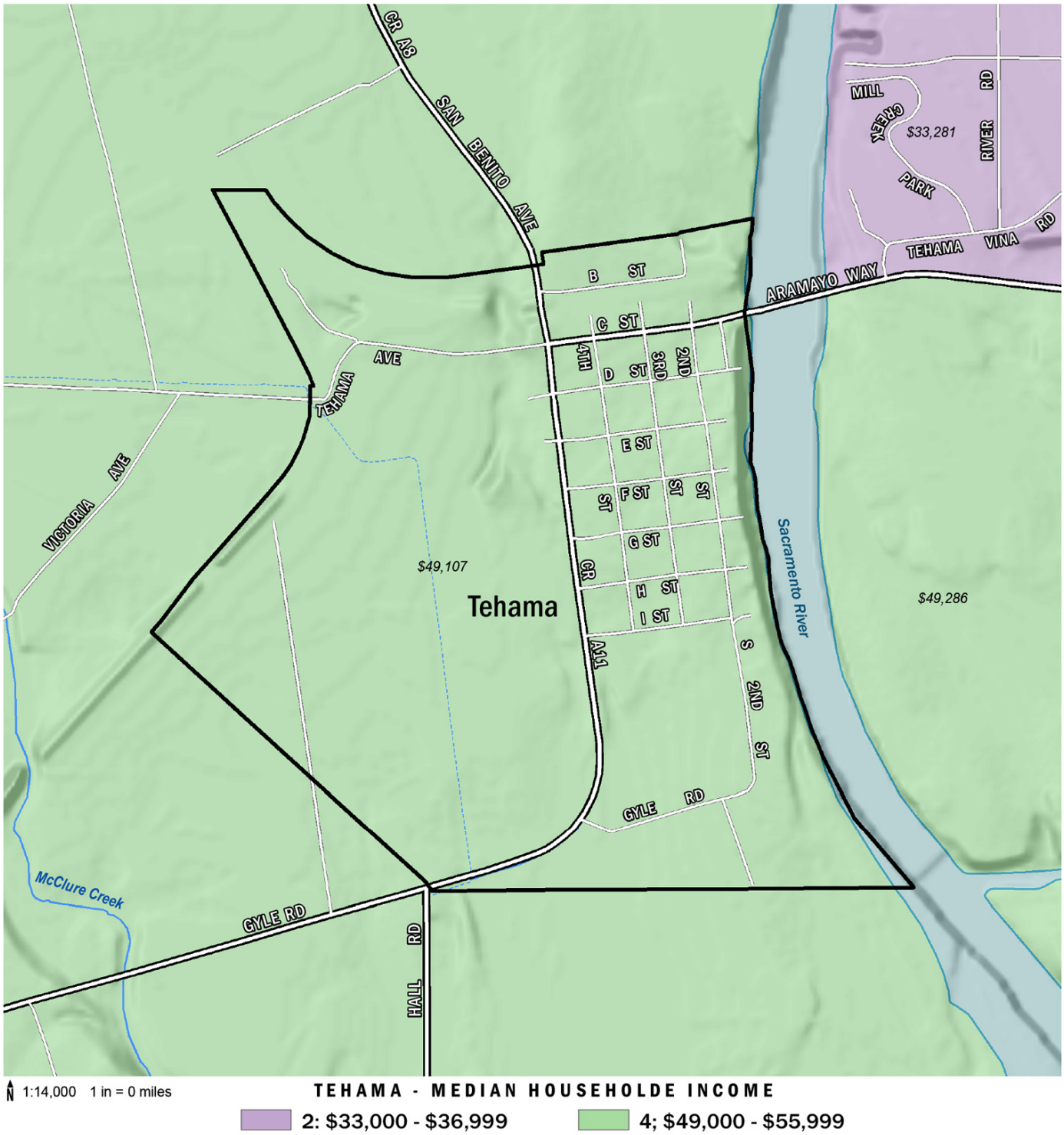
Figure 3-6 shows the median household income distribution for the City of Tehama in 2015. The "median" is the value that divides the distribution of household income into two equal parts (e.g., the middle). The median household income in the City of Tehama in 2015 was estimated to be $49,107. In the United States during the same period, the median house household income was $53,889 (Bureau U. S., 2015). There are no populations within the City that are more or less vulnerable due to income or housing conditions.

3.4.4.2.2 Age

Children and the elderly tend to be more vulnerable during an extreme natural disaster. They have less physical strength to survive disasters and are often more susceptible to certain diseases. The elderly often have declining vision and hearing and often miss reports of upcoming natural hazard events. Children, especially young children, have the inability to provide for themselves. In many cases, both children and the elderly depend on others to care for them during day to day life.

Finally, both children and the elderly have fewer financial resources and are frequently dependent on others for survival. In order for these populations to remain resilient before and after a natural hazard event, it may be necessary to augment city residents with resources provided by the City, state and federal emergency management agencies and organizations.

As seen in Figure 3-7, 18% of the population in the City is under the age of 18. Figure 3-8 shows that 20% of the population is over the age of 65.



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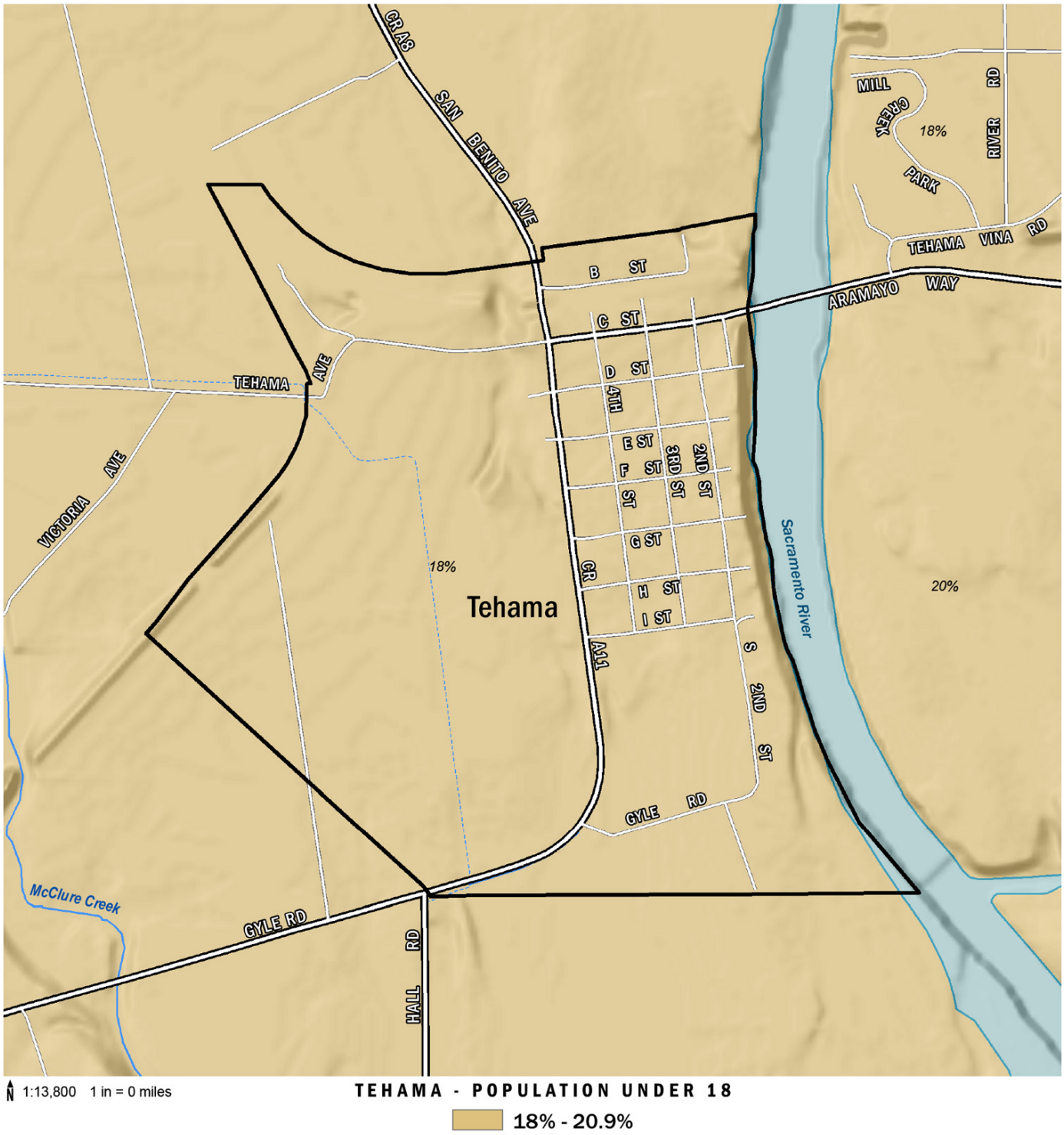
TEHAMA - MEDIAN HOUSEHOLDE INCOME

2: $33,000 - $36,999 4; $49,000 - $55,999

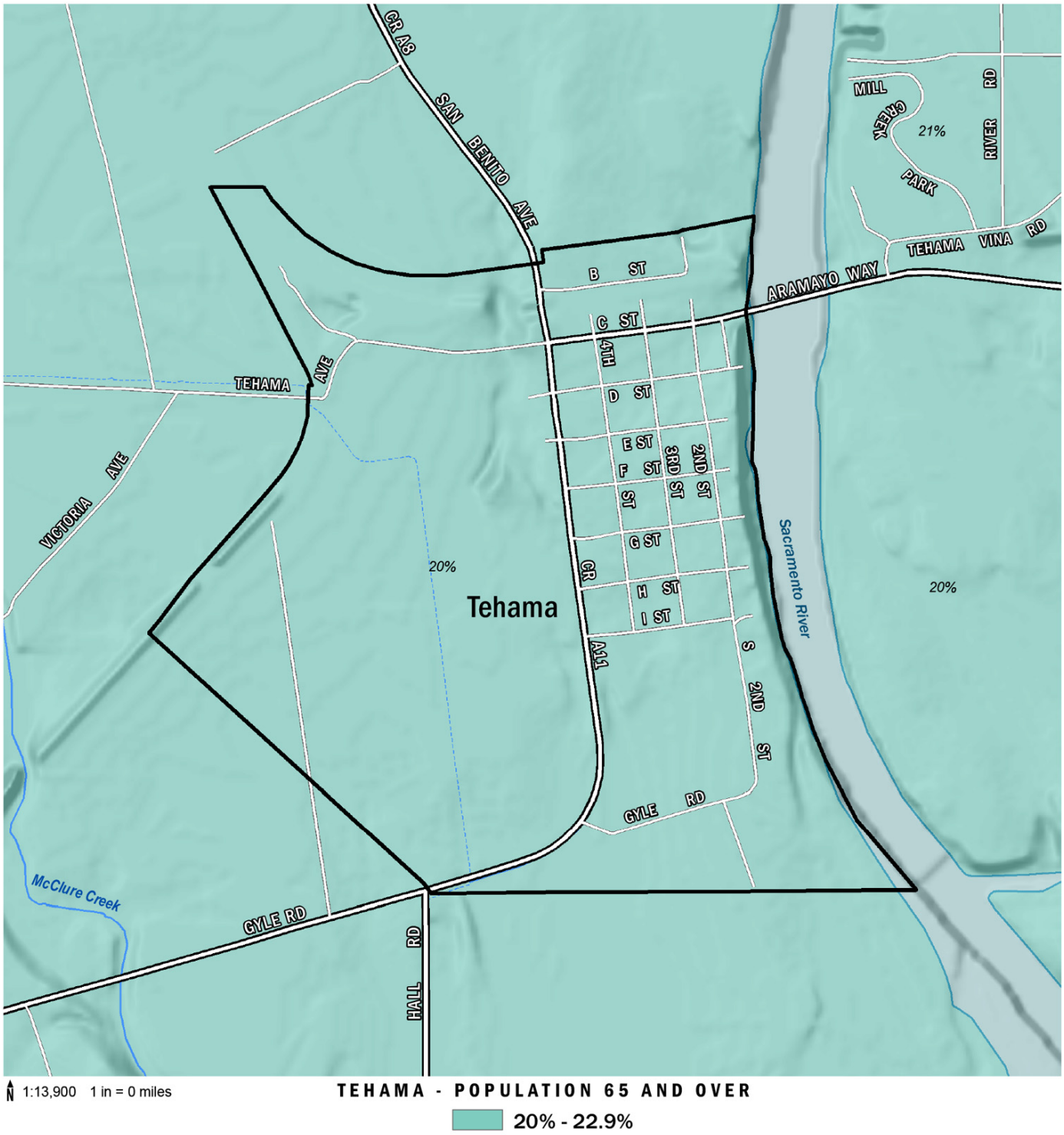
Data Source: Census ACS 2015 3-year estimates, median income in last 12 mo., quantile classification from countywide sampling

Figure 3-6: Median Household Income Distribution in the City of Tehama



Data Source: Census ACS 2015 3-year estimates, percentage of total population, quantile classification from countywide sampling

Figure 3-7: Population Under Age 18 in the City of Tehama



Data Source: Census ACS 2015 3-year estimates, percentage of total population, quantile classification from countywide sampling

Figure 3-8: Population Age 65 Years and Over in the City of Tehama

3.4.5 Critical Facilities Inventory

Critical facilities are of concern when conducting hazard mitigation planning. Critical facilities are defined as essential services, and if damaged, would result in severe consequences to the health, safety, and welfare of the public.

An inventory of critical facilities based on data from the City of Tehama, Tehama County and other publicly sourced information were used to develop a comprehensive inventory of facility points and lifelines for the City. Critical facility points include fire stations, schools, transportation, utilities, and government buildings. Lifelines include communication, electric power, liquid fuel, natural gas, and transportation routes. A current representation of the critical facilities and lifelines in the City of Tehama are provided in Table 3-4 and Table 3-5. Some critical facility information has been omitted from documentation due to national security purposes.

Table 3-4: City of Tehama - Critical Facility Counts

Infrastructure Type	Total Feature Count
Essential Facility	4
EOC	-
Fire Station	-
Government Facility	3
Hospital	-
Police Station	-
School	1
High Potential Loss	-
Residential Child Care	-
Adult Residential Care	-
Child Care	-
Foster/Home Care	-
Home Care	-
Foster Care	-
Elder Care	-
Dam	-
Hotel	-
Transportation and Lifeline	2
Bridge	2
Bus Facility	-
FCC AM Tower	-
FCC Cell Tower	-
FCC FM Tower	-
Natural Gas Station	-
Substation	-
Waste Water Facility	-
Grand Total	**6**

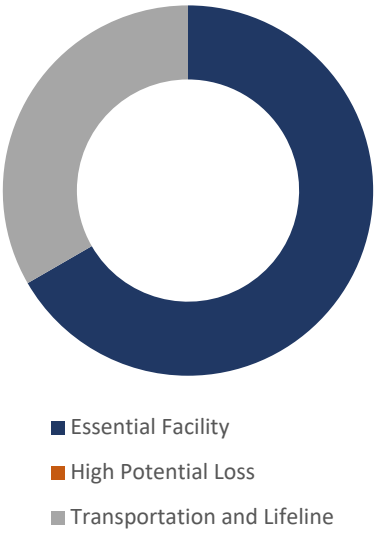


Table 3-5: City of Tehama - Linear Utilities

Infrastructure Type (Linear)	Total Linear Mileage
Transportation and Lifeline	**11.1**
FEMA Levee	-
USACE Levee	-
Natural Gas Pipeline*	-
Transmission Line	1.3
Railroad	1.9
Street	7.0
-Interstate	-
-Primary Highway	-
-State/County Highway	1.4
-Local Road	5.2
-Other Road	0.4
-4WD Road	-
Grand Total	**11.1**

Note: There are approximately 4 miles of natural gas pipeline in the City of Tehama. Due to available data, natural gas pipelines are not counted towards linear utilities.

3.4.6 Parcel Value Inventory

Total count and value of parcels within the City of Tehama which could be exposed to a hazard event is referred to as parcel exposure in this annex. A standardized hazard overlay was conducted to develop hazard exposure results for improved city parcels presented later in this section. For more information on this exposure method see Volume 1, Section 4. In the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a total loss and structures can be rebuilt. The Tehama County Assessor's data is pivotal to developing parcel values exposed to each hazard and includes current fair market value of assets at risk. City of Tehama parcel information is summed and provided in Table 3-6. Both the market value and content value are the total value in the community at risk to a particular hazard.

Table 3-6: City of Tehama - Parcel Counts and Value

	Total Parcels	Total Market Value Exposure ($)	Total Content Value Exposure ($)	Total Value ($)
City of Tehama Totals	279	$ 19,653,639	$ 10,805,618	$ 30,459,257

3.4.7 Hazus Structure and Content Value Inventory

FEMA's loss estimation software, Hazus-MH 4.0, was used to analyze the City's building risk to flood and earthquake hazards. A Hazus level II assessment was performed leveraging county-wide assessor's data in lieu of default Hazus data aggregated to the Census Block or Tract level. Hazus software operates on structure square footage, structure replacement, and content replacement costs to estimate potential losses specific to a modeled flood or earthquake scenario. Table 3-7 and Figure 1-9 provide value data for building categories at the census block and census tract levels for the City of Tehama. Census block and census tracts are used to provide input information for the Hazus analysis presented in this City annex. It is important to note that the full inventory basis within the Hazus software is different than the sum of values from the assessor's data due to a variance in replacement cost calculations. If a parcel has no market value or assessment value, Hazus calculates a default value based on construction type and year built.

Note: Data Source: Tehama County Assessor. Building values reflect fair market value where available. If no fair market value is available, this value reflects the assessed improvement value. Content replacement costs are calculated based on assessor's use codes translated to Hazus occupancy classes. Each HAZUS occupancy class prescribes a specific content cost multiplier used to calculate the content cost values shown above. Use codes including a "vacant" description have been removed along with agricultural use codes with no improvement value.

Table 3-7: Parcel-Based Hazus Input Values (Total Community – City of Tehama)

Building Type	Building Value ($)	Building Value (% of grand total)	Content Value ($)	Content Value (% of grand total *)	Total Value ($)	Proportion of Value (%)
Agricultural	$ 409,580	1.4%	$ 409,580	1.4%	$ 819,160	3%
Commercial	$ 348,359	1.2%	$ 348,359	1.2%	$ 696,718	2%
Education	$ -	0.0%	$ -	0.0%	$ -	0%
Governmental	$ 412,055	1.4%	$ 412,055	1.4%	$ 824,110	3%
Industrial	$ -	0.0%	$ -	0.0%	$ -	0%
Religion	$ 84,676	0.3%	$ 84,676	0.3%	$ 169,352	1%
Residential	$ 17,278,596	60.8%	$ 8,639,292	30.4%	$ 25,917,888	91%
Total	**$ 18,533,266**	**65%**	**$ 9,893,962**	**35%**	**$ 28,427,228**	

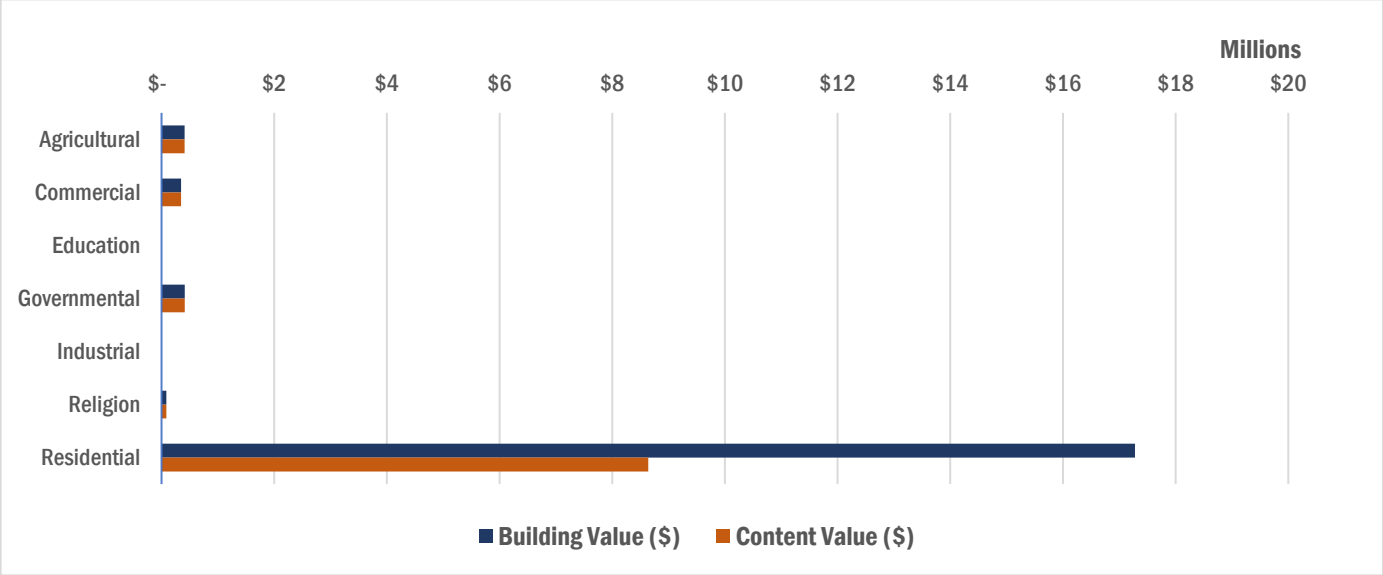


Figure 3-9: Hazus Inventory (Parcel-based) Building and Content Exposure Values

3.4.8 Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified as high or medium significance hazards within the City Limits. Impacts of past events and vulnerability of the City to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the base plan for more detailed information about these hazards and their impacts on the Tehama County planning area).

Methodologies for calculating loss estimates are the same as those described in Section 3.4 of the base plan. In general, the most vulnerable structures are those located within the flood risk areas, wildfire risk areas, and vulnerable buildings within violent earthquake shake zones. An estimate of the vulnerability of the City to each identified priority hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow.

This Annex provides an explanation of prevalent hazards within the City and how hazards may affect population and property within the jurisdiction. Most importantly the mitigation strategy presented in this plan responds to the particular vulnerabilities and provides prescriptions or actions to achieve the greatest reduction of vulnerability, which results in saved lives, reduced injuries, reduced property damage, and protection for the environment in the event of a natural hazard. This City Annex provides information for the following natural hazard threats:

Flooding
SECTION 3.4.9

Severe Weather
SECTION 3.4.10

Earthquake
SECTION 3.4.11

Dam Failure
SECTION 3.4.12

Wildfire
SECTION 3.4.11

Drought
SECTION 3.4.12

3.4.9 Flood Hazard

The City of Tehama is generally the first area in the county to flood during the rainy season, although flooding is now controlled by releases from Shasta Dam. The entire City is in the FEMA 100-YR flood plain. This gives Tehama a distinctive appearance, since by city ordinance new houses must be raised above the 100-YR flood level. The city also has had several programs to assist homeowners who would like to elevate their existing homes; so many homes have high foundations and tall stairways to the front door.

Monitoring the peak flows and elevation of the Sacramento River near the City of Tehama is critical to document historic flood levels and give residents early warning of flood conditions in the City. The magnitude of the flood is measured in terms of its "peak" discharge, which is the maximum volume of water (in cubic feet) is passing a point on the channel. Floods are usually referred to in terms of their frequency of occurrence, which is related to the discharge; for example, the "100-YR flood" for a particular channel is the size flood selected by a government agency for planning purposes (usually a 50-year or 100- year) is referred to as the "selected or regulatory flood".

Peak flows are only part of the flood problem within the City. Duration of flooding has become a more important part of the flooding since construction of Shasta Dam. Erosion of levees and riverbanks has become more prominent due to longer periods of high flows.

For general information regarding flooding, see Volume 1, Section 9: Flood Hazard Profile in the Base Plan.

Past Planning efforts

Under Section 205 of the Flood Control Act of 1948 (Public Law 80-858), as amended, a detailed project report was prepared by the U. S. Army Corps of Engineers in 1996. The report presents results of feasibility studies to reduce flood damages that affect the residents of Tehama. It assesses an array of alternative plans to reduce flood damages, and selects the recommended plan that is economically justified, environmentally acceptable, and fully supported by State and City officials as well as Tehama homeowners and residents.

As result of the report findings, home elevations were conducted throughout the City of Tehama. The Army Corps 205 Program in conjunction with the California Reclamation Board paid for 89.5% of the cost of elevating houses. The homeowner paid 10.5% of the cost plus the cost of any home improvements. This was a reimbursement program.

In addition, the following planning efforts have taken place to reduce flood risk in the City of Tehama:

- U.S. Army Corps of Engineers Flood Damage Reduction Project, Tehama, CA (Dec. 2001)
- U.S. Army Corps of Engineers Section 205 Reconnaissance Investigation, City of Tehama, CA (Aug. 1992)
- U.S. Army Corps of Engineers Flood Plain Management Study (June 1996)
- Borcalli & Associates Tehama Feasibility Study developed for the U.S. Army Corps of Engineers (Nov. 1997)

3.4.9.1 Regulatory Oversight

The city participates in the National Flood Insurance Program (NFIP) and Community Rating System (CRS) and has various floodplain ordinances each are summarized below.

3.4.9.1.1 National Flood Insurance Program (NFIP)

The City of Tehama has participated in the NFIP since 1980. See Table 3-8 for more information on the City's policies and historic flood insurance claims. The City of Tehama is currently in good standing with the provisions of the NFIP. Compliance is monitored by FEMA regional staff and by the California Department of Water Resources under a contract with FEMA. Maintaining compliance under the NFIP is an important component of flood risk reduction. See the Base Plan for general information on the NFIP.

Table 3-8: NFIP Status Table (City of Tehama)

NFIP Status	Participating since 09/17/1980
Policies in Force	101
Policies in SFHA	101
Policies in non-SFHA	-
Total Claims Paid	32
Paid Losses	$386,813
Repetitive Loss Properties	3
Severe Repetitive Loss Properties	0
Repetitive Loss Payment by NFIP on Building	$ 0
Repetitive Loss Payment by NFIP on Contents	$ 0

See Volume 1, Section 9.2.1 of the Base Plan for more information on the NFIP.

The City of Tehama has ongoing and historical incidences of flooding, which affects all of the City's land area and homes. Flood losses have not been accurately recorded, primarily due to a lack of claims requests by residents for the full cost of recovery from flood damage. Homes that were elevated after the floods of 1937 and 1940 (prior to the building of Shasta Dam) did not receive damage in later floods. As a result of those experiences, the City has actively pursued funding to elevate homes that are below the 100-YR flood level. 146 of the 195 homes are now above the FEMA 100-YR flood level.

3.4.9.1.2 Community Rating System

The City of Tehama has been participating in the CRS program since October 1st, 2003. The city's CRS status is as follows:

- **NFIP Community #: 060400**
- **CRS Entry Date: 10/1/2003**
- **Current CRS Classification: 5**
- **Premium Discount, SFHA/non-SFHA: 25%**

Certificate of Elevation documents affect the cost of Flood Insurance. New insurance is based on the height of the foundation, venting and other related requirements. Elevation grants from FEMA are 75%-25% match by the claimant, whereas the Community Development Block Grant is 100% government funding for low income only elevations. Elevation done under an Army Corps/ Reclamation Board project had 89.5% of elevation costs reimbursed. A more recent Army Corps study established higher 100-YR flood levels; only 88 homes are above those levels. As of October 2017, 146 residents have completed elevation projects or have been built above the 100-YR flood level and 46 more require elevations.

The CRS Repetitive Loss Program provides all of the different activities that FEMA tracks and credits as part of normal City planning. One of the benefits listed in obtaining a rating in the CRS Program is that every Flood Insurance Policyholder in the City then receives a discount on a portion of their annual flood insurance policy premium. This discount is 5% for every Class rating that is achieved. The City currently qualifies for a Class 5 rating which results in a 25% discount. The City has 101 flood insurance policies in effect and has had 32 total claims paid equaling $386,813. There are 3 repetitive loss properties.

The CRS data for Tehama is reviewed by the following agencies:

- FEMA Regional CRS Coordinator
- California State National Flood Insurance Program NFIP Coordinator
- Insurance Services Office
- The City of Tehama Flood Plain Manager and the Tehama City Council

3.4.9.1.3 Floodplain Management

City of Tehama Code of Ordinances Title 15 Chapter 15.08: Floodplain Management establishes regulations for reducing flood losses including standards for construction, utilities, subdivisions, manufactured homes, recreational vehicles and floodways.

3.4.9.2 Past Events

The City of Tehama occasionally experiences localized flooding due to its location along the Sacramento River. The City of Tehama has a long history of flooding during high flows, with recent major flooding in 1940, 1970, 197 4, 1983, 1986, 1995, and 1997, 2012, 2014 and 2017. The highest flood stages since construction of Shasta Dam occurred in 1970, 197 4, and 1983. During 1983, floodwaters measured 2 to 4.5 feet inside some homes, causing significant property damage. Flooding has occurred along Tehama Slough from floodwaters from the Sacramento River entering the Pacific Farms north levee. Some flood-fighting activities along the Pacific Farms east levee just north of the UP/SP railroad were required in 1995 due to floodwaters behind the levee. In town, Tehama Slough flooding blocked access roads and flooded about a dozen structures (City of Tehama Flood hazard Mitigation Plan, 2011).

Figure 3-10: Photo of Sacramento River during high peak flows in 1996

Source: Local Tehama Resident. Thank you Fred Hanael!

Shasta Dam, which is located about 80 miles upstream from Tehama, has regulated the Sacramento River since 1945. Since many unregulated streams contribute to the flow in the Sacramento River, flooding at Tehama is a combination of flows released from Shasta Dam and concurrent local drainage runoff below the dam. Flooding is due to a combination of snow melt and rain during the winter to early spring season (City of Tehama Flood hazard Mitigation Plan, 2011).

2005 Flood Event

After heavy rainfall over several days, the creeks and the Sacramento River rose to flood levels in many areas of Tehama County. It was predicted that the Sacramento River at Tehama was expected to crest at 219' on Wednesday (December 28, 2005) evening but the river crested at 217' and continued to drop. On Thursday December 29, 2005, five persons were rescued from a flooded island in Red Bluff in preparation for the upcoming weather.

December 30's forecast as of 0745 hours stated, "Heavy rainfall forecast for the next 36 hours is expected to produce near record flows on the upper Sacramento River." The forecast for the Sacramento River at Tehama predicted that the river was to rise above flood stage (213') Friday evening then forecasted to rise near 222' Saturday morning with continued rise expected. The forecast predicted 2' -4' of rain through the following Monday. The following flooding occurred at the stages listed measured at the Tehama Bridge:

- 219' - Water on streets south of town, trailers at Pelham's Bay began to flood. Many area roads were closed, Gyle at 5th, Gyle at the railroad tracks, and Tehama-Vina Road at Park.
- 220' - Three homes on the west side of the river were flooded; Second Street south of I Street was flooded. Fourth Street at I flooded; 5th Street flooded from Gyle curve to F Street, San Benito at the railroad tracks flooded.
- 220'6" -Water flowed over B Street levee at Pacific Farms north of town. This water flowed south into the northwest section of town. San Benito Avenue was closed. Most sections of Tehama were flooded and had water over the roads. On the east side of the river, Mill Creek Park, the trailer parks and Pelham's Bay were flooded.

Figure 3-11 shows inundation levels for this event.

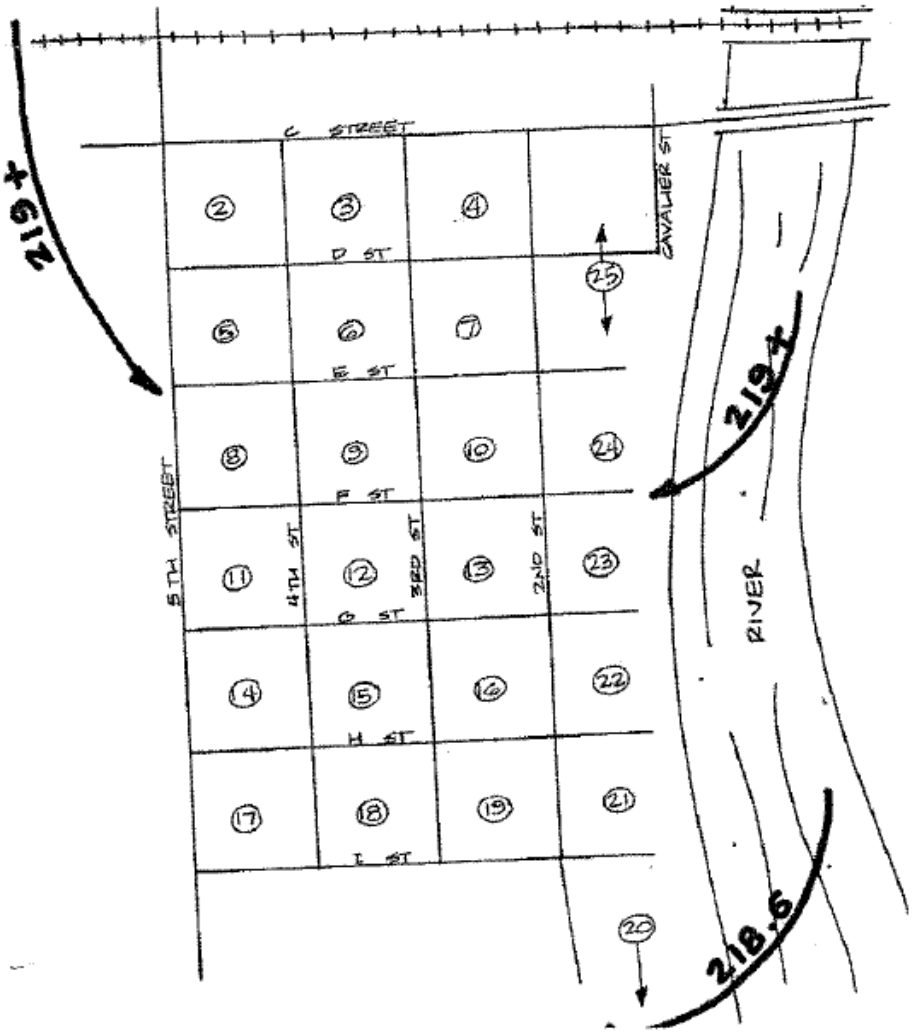


Figure 3-11: Inundation Mapping from 2005 Flood Event

3.4.9.3 Location

Tehama is generally the first area in the county to flood during the rainy season, although flooding is now controlled by releases from Shasta Dam. The entire City is in the FEMA 100-YR flood plain. McClure Creek (to the north) and Rodeo Creek (to the south) run parallel from the west to the east and meet in a confluence at the northwest corner of the city limits of Tehama. From there, they empty into a drainage area that flows SE into the Sacramento River. As shown in Figure 3-12, other small drainages and seasonal creeks lie within very close proximity to the City Tehama. Figure 3-13 shows the location of FEMA identified flood zones. Table 3-9 provides a summary of FEMA identified 100-YR and 500-YR flood hazard areas and Table 3-10 shows the peak discharge estimates for the City of Tehama.

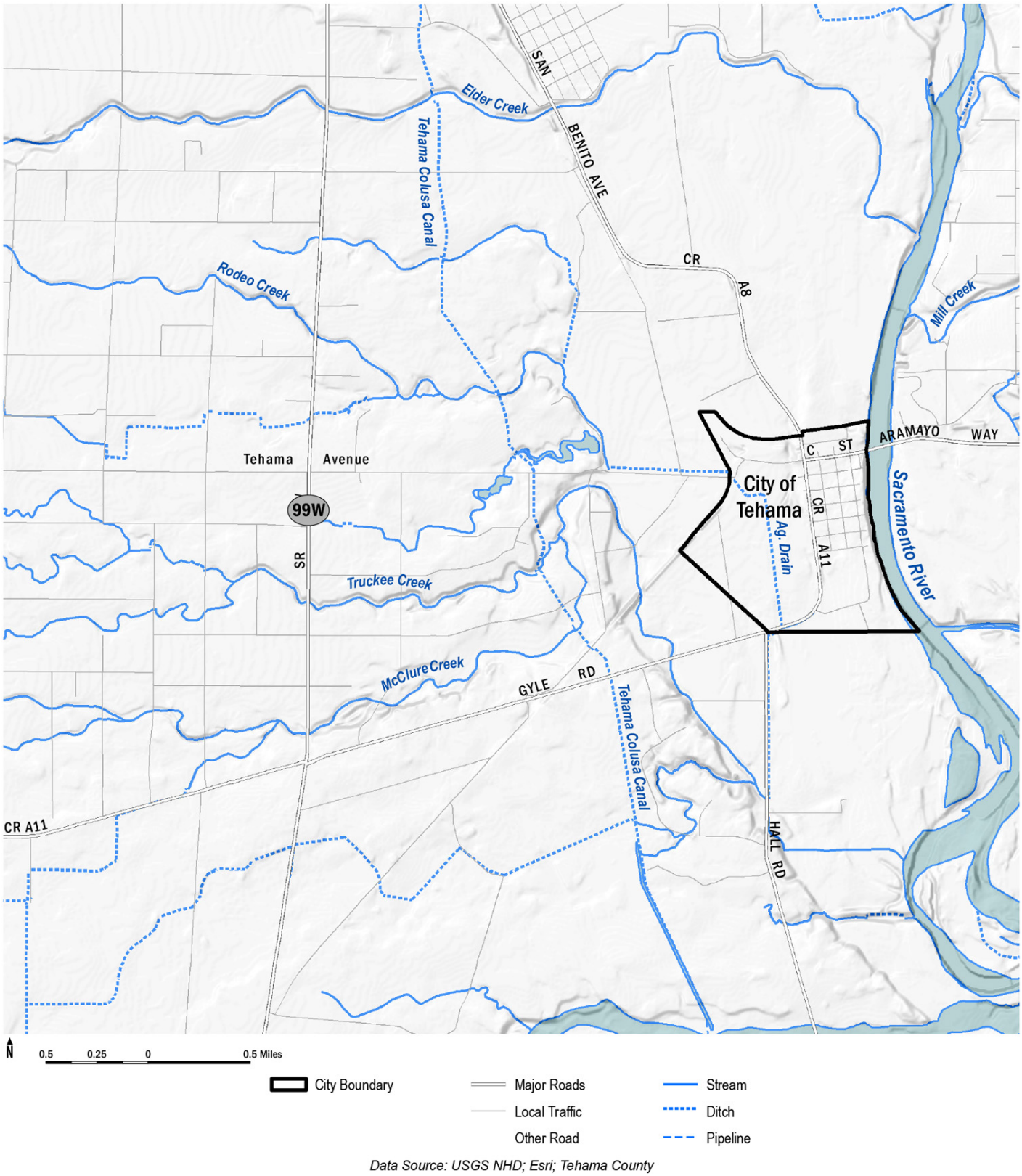
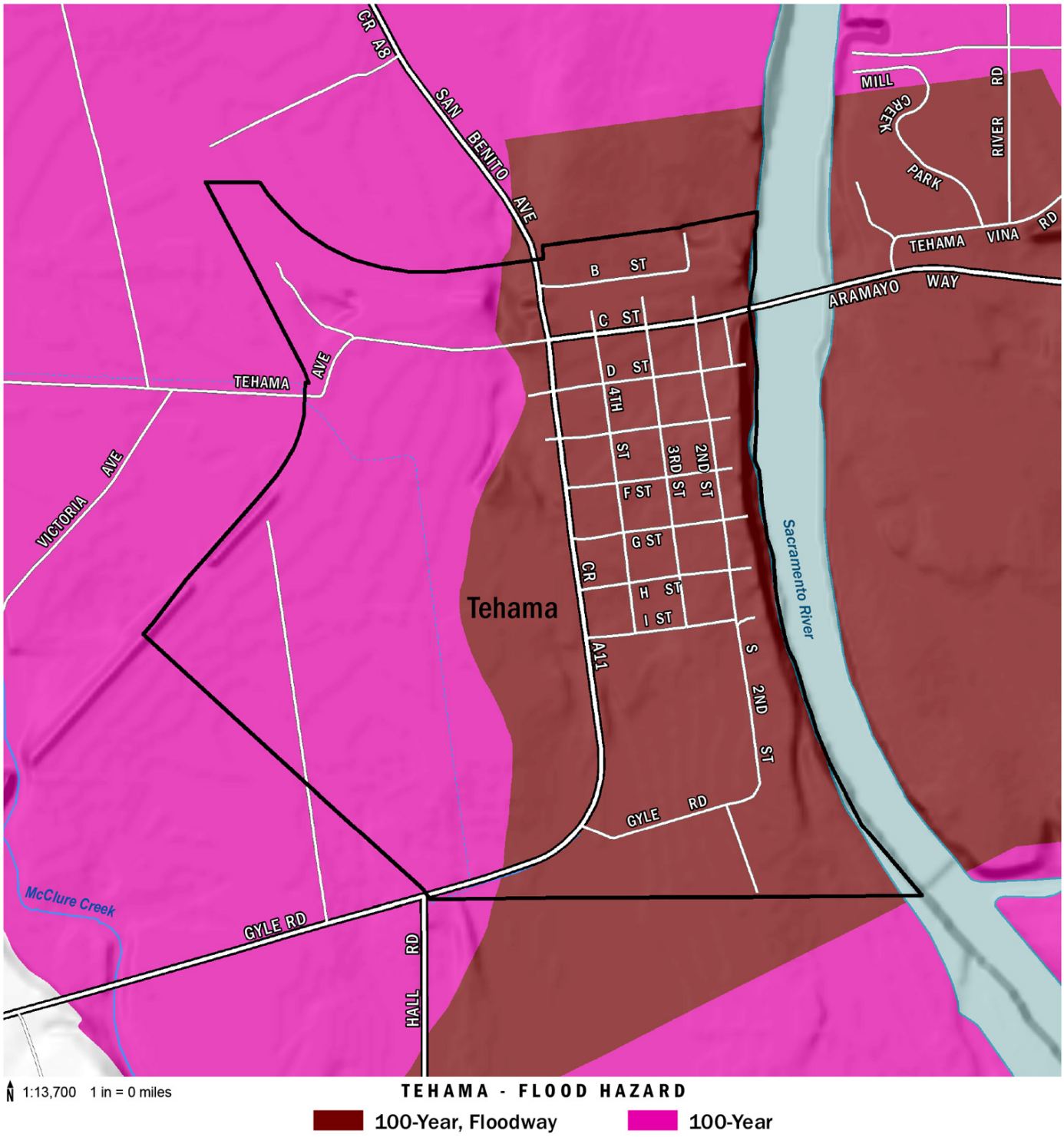


Figure 3-12: Regional Tributaries near City of Tehama



Data Source: FEMA National Flood Hazard Layer

Figure 3-13: City of Tehama Flood Zones

Table 3-9: Flood Hazard Area Summary – City of Tehama

Flood Hazard Type	Sum of Acres	Sum of Square Miles
100-YR Flood	216.8	0.3
100-YR Flood, Floodway	285.7	0.4
500-YR Flood	-	-
Total	**502.4**	**0.8**

Table 3-10: Peak Discharge Estimates – City of Tehama

	Drainage (SQ. MI.)	Discharge (cubic feet/second)			
Source/Location	**Area**	**10-Year**	**50-Year**	**100-YR**	**500-YR**
Sacramento River					
Below confluence with Mill and Elder Creeks	8.1	800	1,200	2,300	3,350

Source: Table 5 Summary of Discharges from FEMA FIS Text, 2011

3.4.9.3.1 Principal Flooding Sources

Sacramento River

The Sacramento River is the primary source of flooding for Tehama. Floodwaters from the Sacramento River enter the city when overflow passes under the UP Railroad bridge and enters Tehama Slough. Flood water from the river also enters the city of Tehama by overlapping the right bank downstream of the UP Railroad bridge (City of Tehama Flood hazard Mitigation Plan, 2011).

The HEC-2 model of the Sacramento River developed in 1997 indicates that overflow from the Sacramento River encroaches into the 3-foot uncertainty allowance for the Pacific Farms levee during potential future events at recurrence intervals greater than 2 years. The levee can be overtopped during events greater than 4 years. The Pacific Farms levee could potentially fail when the water surface elevation encroached into the uncertainty allowance. The Sacramento River could potentially begin to overtop the right bank between the railroad bridge and the Aramayo Way Bridge for discharges having about a 9-year recurrence interval.

Figure 3-14 shows historic flooding of the Sacramento River.

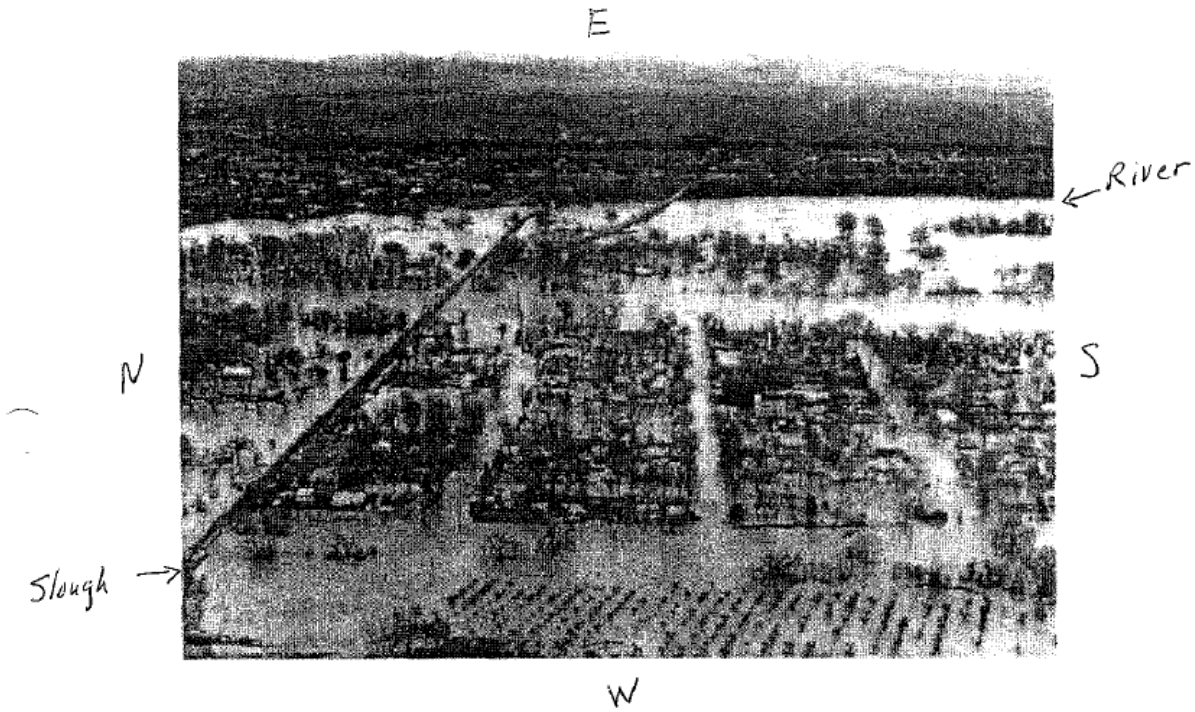


Figure 3-14: Sacramento Historic River Flooding

McClure Creek

McClure Creek flows north towards Tehama Avenue, where it bends and flows south, crosses Gyle Road and Hall Road, and discharges into the agricultural drain east of Hall Road. The channel capacity of McClure Creek was estimated using normal depth calculations at a field-surveyed cross section near the cemetery. The channel capacity was estimated to be 770 cfs. The channel capacity of McClure Creek is limited to less than the two-year peak discharge. Flows in excess of the capacity spill toward the east into Rodeo Creek (City of Tehama Flood hazard Mitigation Plan, 2011).

Rodeo Creek

Rodeo Creek originates from the west and flows east and parallel to Tehama Avenue until it crosses the UP Railroad bridge. At the railroad tracks, Rodeo Creek flows south parallel to Tehama Slough, crosses Gyle Road, and discharges into the agricultural drain. Rodeo Creek has limited channel capacity. Flow in Rodeo Creek overtops the left bank between the railroad bridge crossing and Gyle Road. This flow travels east where it enters Tehama Slough. The Rodeo Creek overflow into Tehama Slough was estimated using a HEC-2 model developed using surveyed cross-sectional data. Tehama Slough receives floodwater from the Sacramento River and from McClure and Rodeo Creeks. The channel capacity of Rodeo Creek is limited to less than the 2-year peak discharge (City of Tehama Flood hazard Mitigation Plan, 2011).

Tehama Slough

Tehama Slough receives floodwater from the Sacramento River and from McClure and Rodeo Creeks. The peak discharges were estimated using the regional regression equations documented in the report entitled "Magnitude and Frequency of Floods in California" by the USGS (1977). Flooding along Tehama Slough occurs when it receives overflow because the slough terminates in the vicinity of I Street. The combined overflow from McClure and Rodeo Creeks into the Tehama Slough ranges from 300 cfs to 4,500 cfs for recurrence intervals between 2 years and 100 years, respectively (City of Tehama Flood hazard Mitigation Plan, 2011).

3.4.9.4 Frequency

The city has been flooded, or threatened by flooding, on an almost regular basis and can expect flooding from storm events as low as or lower than a 10-year event There is annual flooding on the south side of town where 5th Street turns into Gyle Road and the Tehama Slough runs across the road. Cars are unable to drive through this flooded area during periods of heavy rain. (City of Tehama Flood hazard Mitigation Plan, 2011)

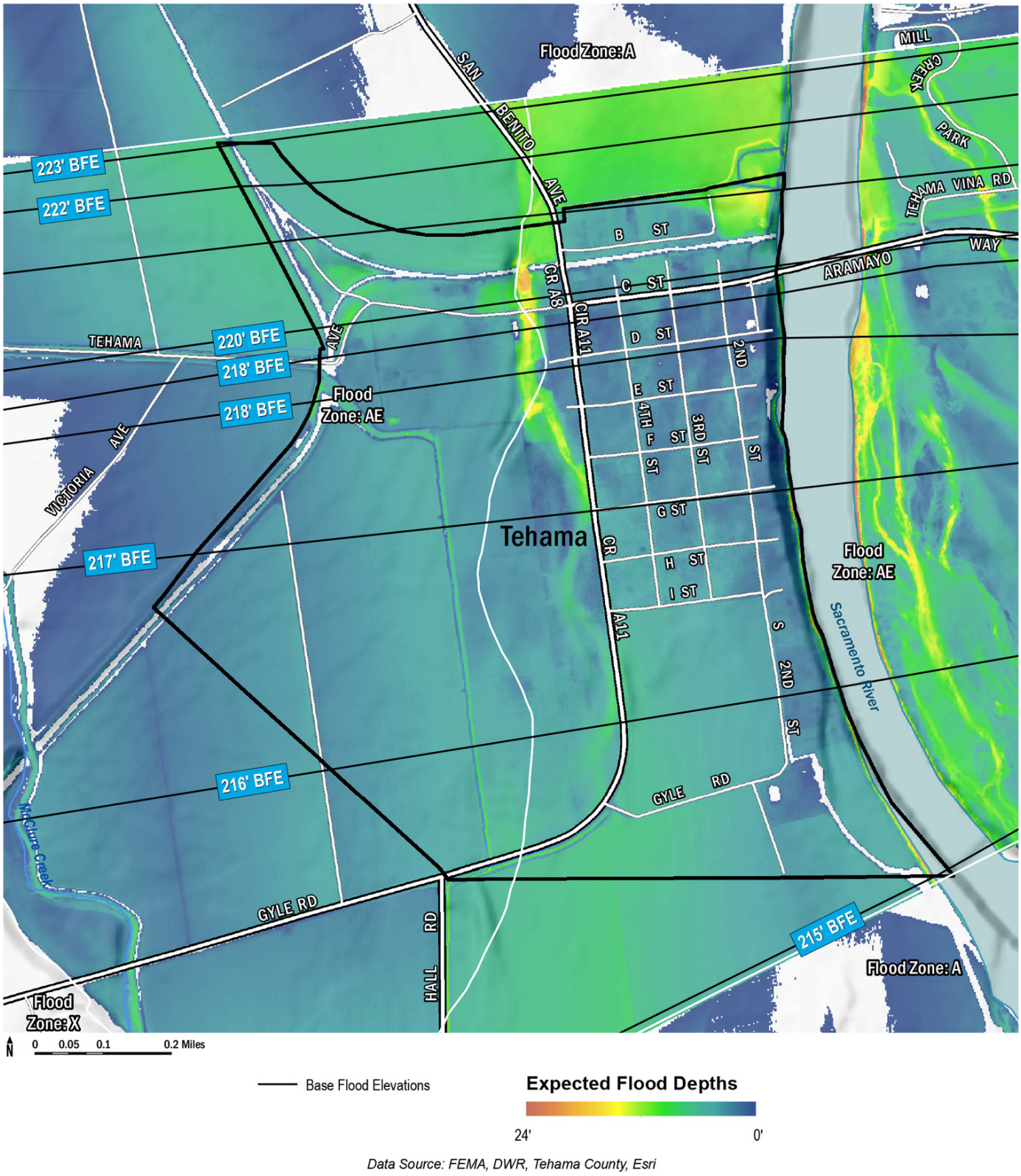
3.4.9.5 Severity

Socioeconomic effects of flooding occur on both a short-term and a long-term basis. Short-term losses include damage to municipal facilities. Some of these losses are recovered by flood insurance payments, emergency funds, and subsidized loans. Long-term losses include those associated with loss of business and occupation taxes, deterioration of municipal facilities, and reductions in the population and number of businesses that follow each flood. These losses seriously lessen the ability of a municipal government to function efficiently. The continuing deterioration of both residential and commercial properties in the flood prone area is an ongoing degradation of normal urban and suburban processes.

Physical damages caused by inundation and flood fighting costs are the main types of flood damages within the flood plain. Since the entire City is vulnerable to flood events, a major flood could be catastrophic. Figure 3-15 shows the Base Flood Elevations (BFEs) and the expected flood depths for a 100-YR event.

Physical damages are to buildings and their contents, raw materials, goods in process, and finished products awaiting distribution. Other physical damages are to improvements such as to roads, utilities and bridges, and associated cleanup costs. Additional costs are incurred during flood emergencies for evacuation, flood-fighting, and disaster relief. Loss of life or impairment of health and living conditions are intangible damages that cannot be evaluated in monetary terms. Each historical year that flooding has occurred, thousands and millions of dollars were spent to repair the damages.

In addition to physical damages, experiencing a flood has a profound effect on the psychological health of people and their long-range ability to be fully productive members of the community. The constant fear of flooding is an energy drain and a distraction from pursuing normal activities. Human resource costs of flooding have frequently exceeded property damages.



Data Source: FEMA, DWR, Tehama County, Esri

Figure 3-15: Expected Flood Depths for a 100-YR Event

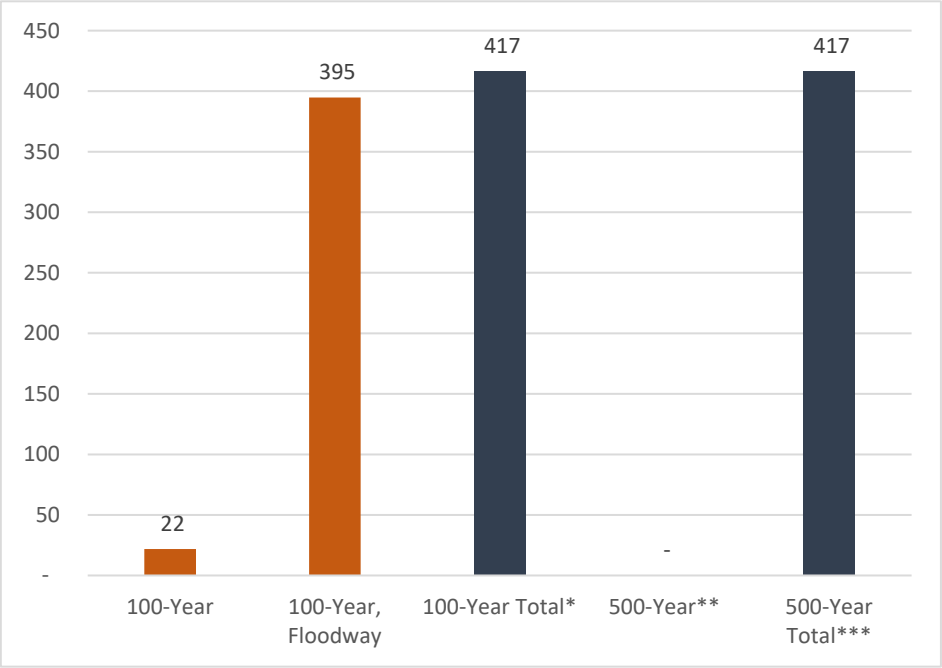
3.4.9.6 Flood Hazard Vulnerability

3.4.9.6.1 Population

Population counts of those living in the floodplain were generated by analyzing County assessor and parcel data that intersect with the 100-YR floodplains identified on FIRMs within the City of Tehama. Using GIS, U.S. Census Bureau information was used to intersect the FEMA identified floodplains within the City limits. An estimate of population was calculated by weighting the population within each census block. The exposure results indicate the percentage of total population living within a flood risk area. Using this approach, it was estimated that 100% of the population (417 people) are exposed to flood risk from the 100-YR and 500-YR floodplain as shown in **Error! Reference source not found.**.

Population Exposure

Population Count in the 100-Year and 500-YR Floodplains



**Total 100-year floodplain*
***Includes only additional area outside of 100-year floodplain*
****Total 500-YR floodplain, includes 100-year floodplain*

Figure 3-16: Population Exposure to Flood

3.4.9.6.2 Property

GIS was used to determine the possible impacts of flooding within the City of Tehama. The methodology described in Section 4.7.6.2 of the base plan was followed in determining structures and values at risk to the FEMA identified 1% (100-YR) annual chance flood event. Table 3-11 summarizes the number of parcels and property value within the City of Tehama's FEMA identified floodplains. GIS models determined that there are 19 parcels within the 100-YR floodplain and 260 parcels within the 100-YR floodway. This methodology also estimated $2,885,677 worth of building-and-contents exposure to the 100-YR flood, representing 9.5 percent of the total assessed value within the City of Tehama, and $27,573,580 worth of building-and-contents exposure to the 100-YR floodway, representing 90.5 percent of the total assessed value within the City of Tehama.

Table 3-11: Parcels Exposed to NFIP Flood Zones (City of Tehama)

	Total Parcels	Total Market Value Exposure ($)	Total Content Value Exposure ($)	Total Value ($)
Tehama	279	$ 19,653,639	$ 10,805,618	$ 30,459,257

Flood Hazard Zone	Improved Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
100-YR Flood	19	*6.8%*	$ 1,580,579	$ 1,305,098	$ 2,885,677	*9.5%*
100-YR Flood, Floodway	260	*93.2%*	$ 18,073,060	$ 9,500,520	$ 27,573,580	*90.5%*
100-YR Total*	**279**	**100.0%**	**$ 19,653,639**	**$ 10,805,618**	**$ 30,459,257**	**100.0%**
500-YR Flood**	-	*0.0%*	$ -	$ -	$ -	*0.0%*
500-YR Total***	**279**	**100.0%**	**$ 19,653,639**	**$ 10,805,618**	**$ 30,459,257**	**100.0%**

**Total 100-year floodplain*
***Includes only additional area outside of 100-year floodplain*
****Total 500-YR floodplain, includes 100-year floodplain*

Note: The table above does not display loss estimation results; the table exhibits total value at risk based upon the hazard overlay and Tehama County Assessor data.

3.4.9.6.3 Flood Damage Estimation

FEMA's HAZUS-MH software models the possible damage of flooding within the City of Tehama. The methodology described in Volume 1, Section 4.7.6.3 of the base plan was followed in determining potential damage associates with the 1% (100-YR) and 0.2% (500-YR) annual chance flood event.

The HAZUS-MH software calculates losses to structures from flooding by analyzing the depth of flooding and type of structure. Using historical flood insurance claim data, HAZUS-MH estimates the percentage of damage to structures and their contents by applying established damage functions to an inventory. For this analysis, all non-vacant parcels with current market values were used instead of the default inventory data provided with HAZUS-MH software. The analysis for the City of Tehama is summarized in Table 3-12 and Figure 3-17 for the 100-YR flood event. It is estimated that there "could" be up to $2,094,464 of flood loss (6.9% of total 100-YR flood exposed value) from a 100-YR flood event in the planning area. This modeled loss is assuming all tributaries in the region collect 100-YR event precipitation levels in the watershed. Table 3-13 shows the flood loss estimation for City-owned facilities. The grand total for potential damage to City-owned facilities is $131,976.

Table 3-12: 100-YR Flood Loss Estimation (Based on Depth) in NFIP Flood Zones by Occupancy Type

Building Type	Building Damage ($)	Building Damage (% of grand total)	Content Damage ($)	Content Damage (% of grand total)	Total Damage ($)	Proportion of Loss (%)
Agricultural	$ 3,372	0.2%	$ 25,039	1.2%	$ 28,411	1%
Commercial	$ 29,246	1.4%	$ 87,345	4.2%	$ 116,592	6%
Education	$ -	0.0%	$ -	0.0%	$ -	0%
Governmental	$ -	0.0%	$ -	0.0%	$ -	0%
Industrial	$ -	0.0%	$ -	0.0%	$ -	0%
Religion	$ 510	0.0%	$ 3,953	0.2%	$ 4,463	0%
Residential	$ 1,245,232	59.5%	$ 699,767	33.4%	$ 1,944,999	93%
Total	**$ 1,278,360**	**61%**	**$ 816,104**	**39%**	**$ 2,094,464**	

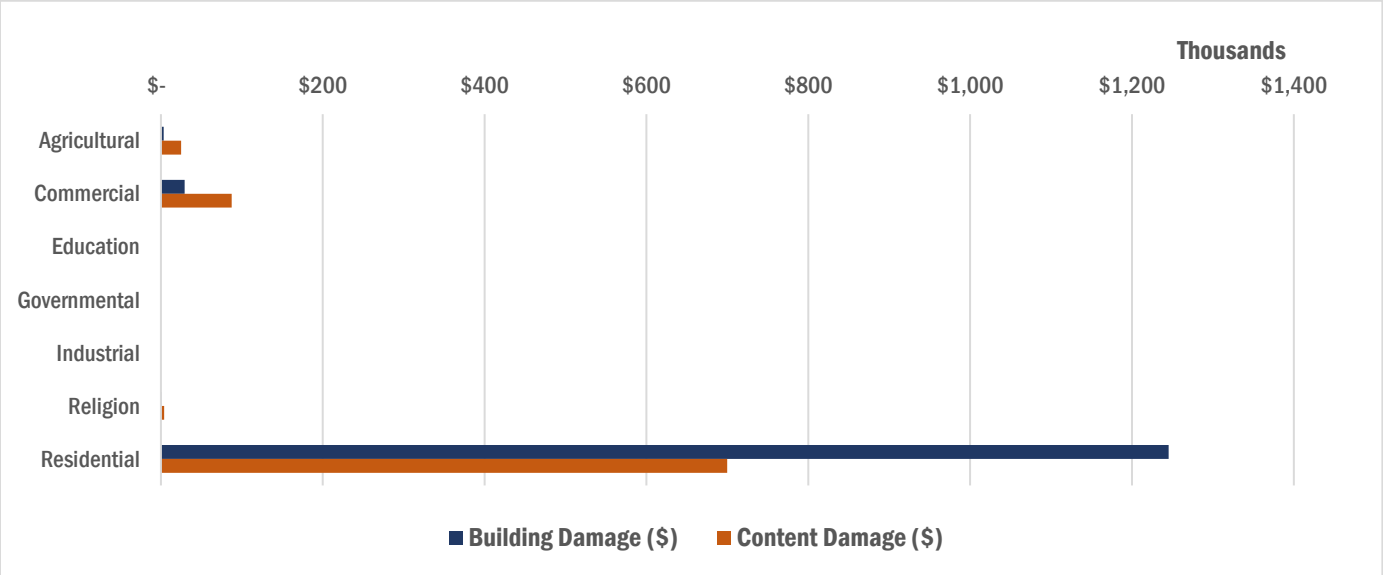


Figure 3-17: Estimated Building and Content Loss in the 100-YR floodplain by Occupancy Type

Table 3-13: Tehama City-Owned Facilities 100-YR Flood Loss

City-Owned Facility	Building Value	Content Value	Potential Building Damage ($)	Potential Content Damage ($)	Total Damage ($)
City Hall	**$148,034**	**$29,303**	**$10,032**	**$13,824**	**$23,855**
250 Cavalier Dr	$148,034	$29,303	$10,032	$13,824	$23,855
Headstart Tehama	**$459,110**	**$12,319**	**$0**	**$0**	**$0**
650 3rd St	$459,110	$12,319	$0	$0	$0
Museum Annex	**$0**	**$0**	**$0**	**$0**	**$0**
125 2nd St	$0	$0	$0	$0	$0
Pump house	**$50,000**	**$228,676**	**$1,961**	**$65,718**	**$67,679**
350 C St	$25,000	$114,338	$1,961	$65,718	$67,679
4th & G	$25,000	$114,338	$0	$0	$0
Rental Property	**$606,149**	**$1,987**	**$40,354**	**$88**	**$40,441**
105 Cavalier Dr	$107,474	$0	$14,971	$0	$14,971
125 2nd St	$147,802	$0	$18,197	$0	$18,197
180 Cavalier Dr	$80,551	$0	$6,327	$0	$6,327
260 Cavalier Dr	$153,319	$0	$0	$0	$0
760 4th St	$117,003	$1,987	$859	$88	$947
Grand Total	**$1,263,293**	**$272,285**	**$52,346**	**$79,630**	**$131,976**

3.4.9.6.4 Critical Facilities and Infrastructure

It is important to determine who may be at risk if infrastructure is damaged by flooding. The following sections describe specific types of critical infrastructure. Table 3-14 summarizes the critical facilities and infrastructure at risk to the 100-YR, 100-YR floodway within the City of Tehama.

Table 3-14: Critical Facility Points in the Floodplain

Infrastructure Type	100-YR Flood Zone	Floodway	100-YR Total	500-YR, Outside 100-YR	500-YR Total
Essential Facility	0	4	4	0	4
EOC	0	0	0	0	0
Fire Station	0	0	0	0	0
Government Facility	0	3	3	0	3
Hospital	0	0	0	0	0
Police Station	0	0	0	0	0
School	0	1	1	0	1
High Potential Loss	0	0	0	0	0
Residential Child Care	0	0	0	0	0
Adult Residential Care	0	0	0	0	0

Infrastructure Type	100-YR Flood Zone	Floodway	100-YR Total	500-YR, Outside 100-YR	500-YR Total
Essential Facility	0	4	4	0	4
Child Care	0	0	0	0	0
Foster/Home Care	0	0	0	0	0
Home Care	0	0	0	0	0
Other Care Facility	0	0	0	0	0
Elder Care	0	0	0	0	0
Dam	0	0	0	0	0
Hotel	0	0	0	0	0
Transportation and Lifeline	1	1	2	0	2
Airport	0	0	0	0	0
Bridge	1	1	2	0	2
Bus Facility	0	0	0	0	0
FCC AM Tower	0	0	0	0	0
FCC Cell Tower	0	0	0	0	0
FCC FM Tower	0	0	0	0	0
Natural Gas Station	0	0	0	0	0
Power Plant	0	0	0	0	0
Substation	0	0	0	0	0
Waste Water Facility	0	0	0	0	0
Grand Total	**1**	**5**	**6**	**-**	**6**

Critical Facilities Damage Estimates

As mentioned previously, FEMA's HAZUS-MH software was used to estimate the flood loss potential to critical facilities exposed to the flood risk. If information pertaining to structure value was made available for City identified critical facilities, potential building and content damage has been estimated. The City of Tehama has not established building values for City Owned facilities for purposes of this effort.

Linear Utilities

It is important to determine who may be at risk if infrastructure is damaged by flooding. Roads or railroads that are blocked or damaged can isolate residents and can prevent access throughout the county, including for emergency service providers needing to get to vulnerable populations or to make repairs. Bridges washed out or blocked by floods or debris also can cause isolation. Water and sewer systems can be flooded or backed up, causing health problems. Underground utilities can be damaged. Table 3-15 shows the linear critical facilities in the floodplain.

Table 3-15: Critical Facilities (Linear) in the Floodplain – City of Tehama

Infrastructure Type (Linear)	100-YR, Non-Floodway	100-YR, Floodway	500-YR	Total Mileage
Transportation and Lifeline	**2.7**	**8.5**	**-**	**11.1**
FEMA Levee	-	-	-	-
USACE Levee	-	-	-	-
Natural Gas Pipeline	-	-	-	-
Transmission Line	0.1	1.2	-	1.3
Railroad	1.5	0.4	-	1.9
Street	1.1	5.8	-	7.0
-Interstate	-	-	-	-
-Primary Highway	-	-	-	-
-State/County Highway	0.1	1.3	-	1.4
-Local Road	0.9	4.3	-	5.2
-Other Road	0.4	-	-	0.4
-4WD Road	-	-	-	-
Grand Total	**2.7**	**7.5**	**-**	**10.1**

Note: There are approximately 4 miles of natural gas pipeline in the City of Tehama. Due to available data, natural gas pipelines are not counted towards linear utilities.

3.4.9.6.5 Future Trends in Development

Because Tehama is located entirely in a floodplain, it is mostly agriculture and residential. Little additional development is planned. Tehama doesn't claim a sphere of influence. The focus has been on maintaining, rehabilitation and elevation of existing housing.

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3.4.10 Severe Weather

Severe weather refers to any dangerous meteorological phenomena with the potential to cause damage, serious social disruption, or loss of human life. It includes thunderstorms, downbursts, tornadoes, waterspouts, snowstorms, ice storms, and dust storms. Three types of severe weather events typically impact Tehama County and the City of Tehama: thunderstorms, damaging winds and hail storms.

3.4.10.1 Regulatory Oversight

The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. The City of Tehama has adopted the International Building Code in response to California mandates. This code is equipped to deal with the impacts of severe weather events. Land use policies identified in the general plan also address many of the secondary impacts (flood and landslide) of the severe weather hazard. With these tools, the City of Tehama is equipped to deal with future growth and the associated impacts of severe weather.

3.4.10.2 Past Events

The City of Tehama often experiences severe weather events that affect the entire County. According to the National Oceanic and Atmospheric Administration, no severe weather events outside of flash flooding have occurred exclusively within the City of Tehama. For a list of severe weather events affecting Tehama County, see Section 4.9.5.1 in the Base Plan.

3.4.10.3 Location

Generally, the entire planning area for the City of Tehama can be affected by a Severe Weather Hazard. Areas with trees, power and light poles, large signs, communications towers and other structures with exposed surface areas are all vulnerable to the effects of severe weather. Severe weather events have the potential to happen anywhere in the City. Wind events are most damaging to areas that are heavily treed, such as the residential areas in the City of Tehama which has many oak and black walnut trees that were planted in the 1870's.

3.4.10.4 Frequency

The planning area can expect to experience exposure to some type of severe weather event at least annually. Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century. The number of weather-related disasters during the 1990s was four times that of the 1950s, and cost 14 times as much in economic losses. Historical data shows that the probability for severe weather events increases in a warmer climate. The changing hydrograph caused by climate change could have a significant impact on the intensity, duration and frequency of storm events. All of these impacts could have significant economic consequences.

3.4.10.5 Severity

The many large trees within the City are vulnerable to damage from storms, especially high winds. Falling tree limbs can cause significant damage to property and utilities. The predicted wind speed given in wind warnings issued by the National Weather Service is for a one-minute average; gusts may be 25 to 30 percent higher. Aging building stock, communications infrastructure and power supply may be affected by severe weather.

3.4.10.6 Warning Time

Meteorologists can often predict the likelihood of a severe storm within a region. This can give several days of warning time to City of Tehama staff. However, meteorologists cannot predict the exact time of onset or severity of the storm. Some storms may come on more quickly and have only a few hours of warning time.

The Tehama County Sheriff's Office uses the Tehama Alert system to notify residents of a potential fire, gas leak, flood or other natural or man-caused incident in the County that would prompt an immediate evacuation or shelter in place protocols.

3.4.10.7 Severe Weather Vulnerability

The most common problems associated with severe storms are immobility and loss of utilities. Fatalities are uncommon, but can occur. Roads may become impassable due to flooding, downed trees, ice or snow, or a landslide. Power lines may be downed due to high winds or ice accumulation, and services such as water or phone may not be able to operate without power. Lightning can cause severe damage and injury.

The most significant secondary hazards associated with severe local storms are floods, falling and downed trees and downed power lines. Rapidly melting snow combined with heavy rain can overwhelm both natural and man-made drainage systems, causing overflow and property destruction.

3.4.10.7.1 Population

It can be assumed that the entire City is exposed to some extent to severe weather events. Certain areas are more exposed due to geographic location and local weather patterns. Vulnerable populations are the elderly, low income or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life threatening to those dependent on electricity for life support. Isolation of these populations is a significant concern. These populations face isolation and exposure during severe weather events and could suffer more secondary effects of the hazard.

3.4.10.7.2 Property

All property is vulnerable during severe weather events, but older building stock in the planning area that does not meet code standard are the most vulnerable to severe weather events such as windstorms. Properties that are located under or near overhead lines or near large trees may be vulnerable to falling ice or may be damaged in the event of a collapse. The frequency and degree of damage will depend on specific locations.

3.4.10.7.3 Critical Facilities and Infrastructure

All critical facilities are exposed to severe weather. The most common critical facilities problems associated with severe weather are loss of utilities. Downed power lines can cause blackouts, leaving large areas isolated. Phone, water and sewer systems may not function. Roads may become impassable due to ice or snow or from secondary hazards such as landslides.

Incapacity and loss of roads are the primary transportation failures resulting from severe weather, mostly associated with secondary hazards. Landslides caused by heavy prolonged rains can block roads. High winds can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, isolating population, and disrupting ingress and egress.

Severe windstorms, downed trees, and ice can create serious impacts on power and above-ground communication lines. Freezing of power and communication lines can cause them to break, disrupting electricity and communication. Loss of electricity and phone connection would leave certain populations isolated because residents would be unable to call for assistance.

3.4.10.8 Future Trends

All future development will be affected by severe storms. The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. The City of Tehama has adopted the International Building Code in response to California mandates. This code is equipped to deal with the impacts of severe weather events. Land use policies identified in the general plan also address many of the secondary impacts (flood and landslide) of the severe weather hazard. With these tools, the City of Tehama is equipped to deal with future growth and the associated impacts of severe weather.

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3.4.11 Earthquake

According to FEMA, an earthquake is "a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface." Earthquakes can be one of the earth's most damaging hazards because the shaking of the earthquake may cause buildings and bridges to collapse; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, and structure fires as result of ruptured gas lines. See Volume 1, Section 4.6: Earthquake Hazard Profile in the Base Plan for more information on earthquakes and vulnerabilities to utilities.

3.4.11.1 Regulatory Oversight

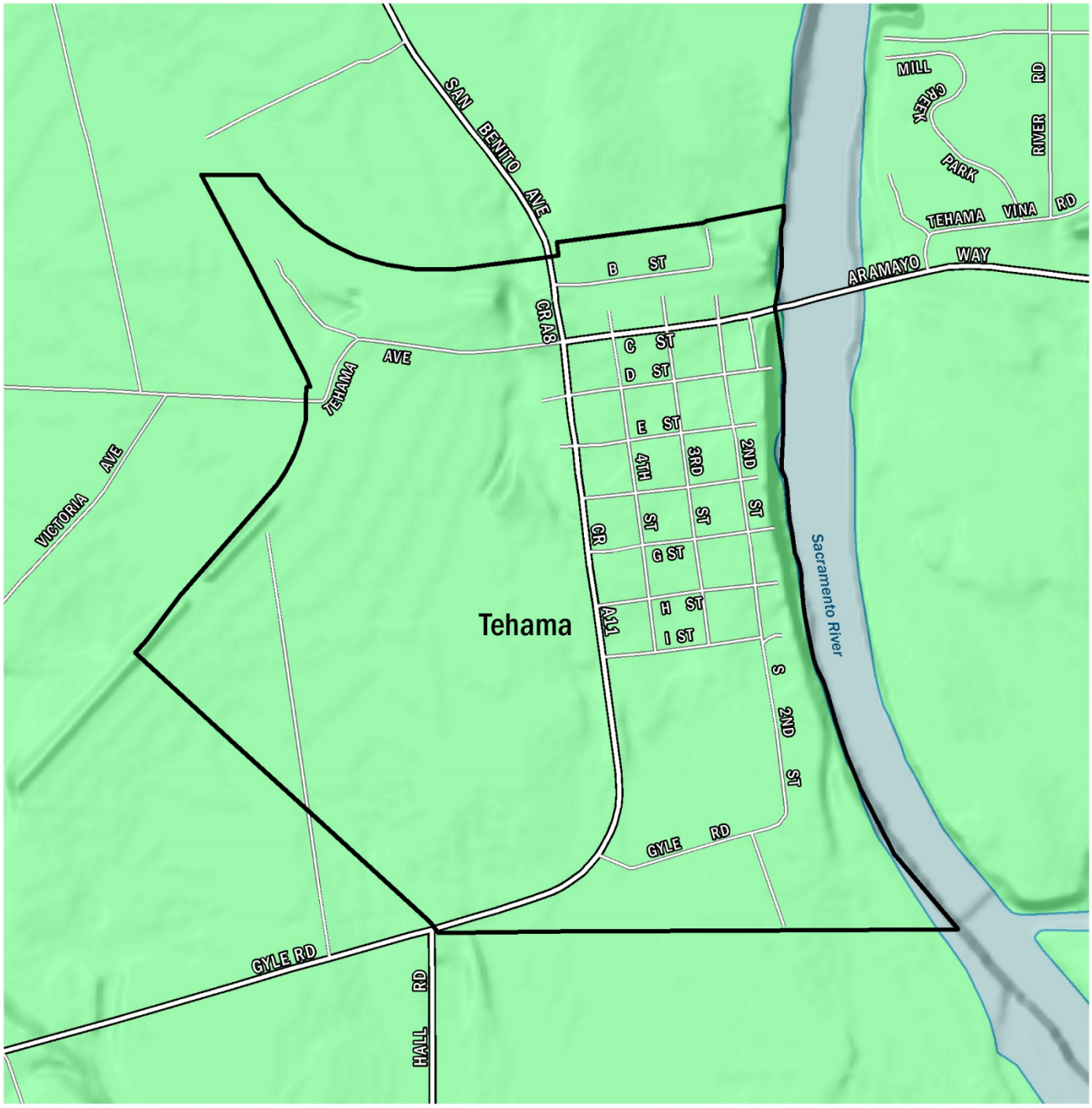
Numerous building and zoning codes exist at a state and local level to decrease the impact of an earthquake event and resulting liquefaction on residents and infrastructure. The City of Tehama's building codes are the same as Tehama County's (California Building Codes). Detail about the County/ State's building codes can be found in Volume 1, Section 4.6.1 of the Base Plan.

3.4.11.2 Past Events

The City of Tehama does not have an extensive earthquake history. According to the California State Hazard Mitigation Plan, Tehama County had only one occurrence of earthquake activity that caused any measurable damage from 1800 to 2007. The only known seismic activity in the planning area occurred in concurrence with the volcanic eruption of Lassen Peak in 1914. There has been no declared disaster activity for earthquake within the planning area since 1950.

3.4.11.3 Location

A shake map shows the extent and variation of ground shaking in a region immediately following significant earthquakes. A probabilistic seismic hazard map shows the hazard from earthquakes that geologists and seismologists agree could occur. The maps are expressed in terms of probability of exceeding a certain ground motion, such as the 10-percent probability of exceedance in 50 years. This level of ground shaking has been used for designing buildings in high seismic areas. Figure 3-18 and Figure 3-19 show the estimated ground motion for the Battle Creek Scenario in the City of Tehama and Tehama County. As shown in Figure 3-17, the entire City would be in the Moderate shake zone in the Battle Creek Earthquake Scenario.



N 1:13,300 1 in = 0 miles

TEHAMA - EARTHQUAKE HAZARD

V (Moderate)

Data Source: USGS ShakeMap, Battle Creek 6.7 M Scenario

Figure 3-18: Earthquake Hazard Map for the City of Tehama

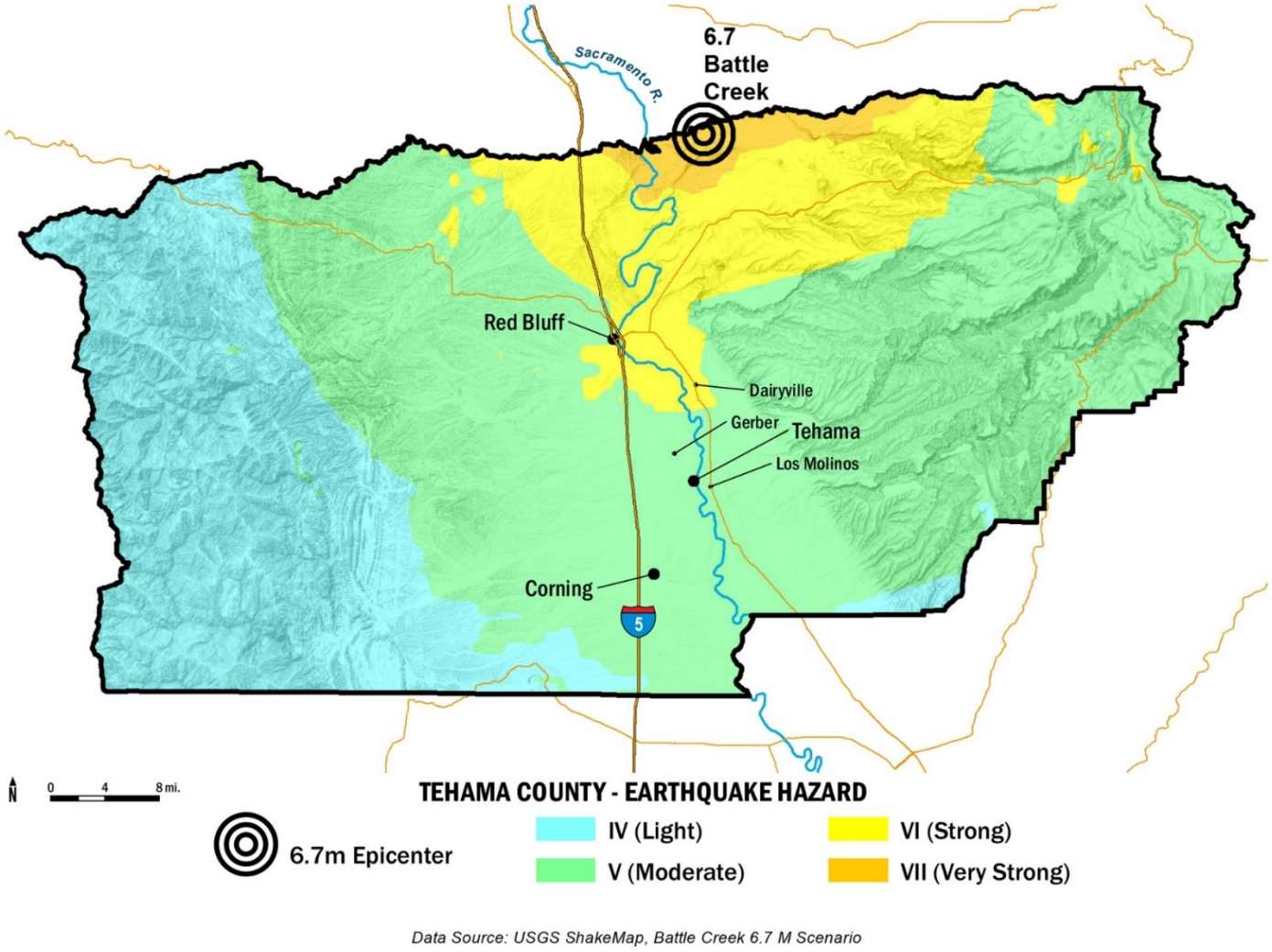


Figure 3-19: Tehama County Earthquake Shake Map

3.4.11.4 Frequency

While earthquake activity in California is frequent, the activity in Tehama County is not. Although no active faults are mapped in the county, there exists the potential for minor, localized earth shaking events as precursors to eruptive activity of Mount Lassen. For more information on the frequency of earthquakes in Tehama County, see Section 4.6.2.3 of the Base Plan.

3.4.11.5 Severity

If a 6.7 magnitude earthquake were to occur along the Battle Creek fault, the City of Tehama would experience at least moderate shaking, as shown in Figure 3-18. For more information on magnitude, see Section 4.6.2.4 in the Base Plan.

3.4.11.6 Earthquake Vulnerability

3.4.11.6.1 Population

Earthquake Exposure

As shown in **Error! Reference source not found.**, the entire population of the City of Tehama is potentially exposed to direct and indirect impacts from earthquakes. The degree of exposure is dependent on many factors, including the age and construction type of the structures people live in, the soil type their homes are constructed on, their proximity to fault location, etc. Whether directly or indirectly impacted, the entire population will have to deal with the consequences of earthquakes to some degree. Business interruption could keep people from working, road closures could isolate populations, and loss of utilities could impact populations that suffered no direct damage from an event itself.

Table 3-16: Population Exposure to Battle Creek Scenario (City of Tehama)

	Total Population
City of Tehama Population	417

Shake Severity Zone	Population Count	% of Total
V - Moderate	417	100.00%
VI - Strong	-	0.00%
VII - Very Strong	-	0.00%
Total	**417**	**100.00%**

3.4.11.6.2 Property

Earthquake

The county Assessor's parcel data was used as the basis for the inventory of current market values and content value summaries. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The centroids were then overlaid with the shaking severity zones of the Battle Creek 6.7 magnitude earthquake severity zones to determine the at-risk structures. This methodology assumed that every parcel with a current net value or assessed value was an improved parcel. Building exposure was calculated based on current net values or when absent, assessor's values as provided by the assessor's office. Building content exposure was calculated based on occupancy type multipliers and improvement value. Table 3-17 shows the count of at-risk parcels and their associated building and content exposure values to earthquake.

Table 3-17: Parcel Value Exposure from Battle Creek Scenario (City of Tehama)

	Total Parcels	Total Market Value Exposure ($)	Total Content Value Exposure ($)	Total Value ($)
Tehama	279	$ 19,653,639	$ 10,805,618	$ 30,459,257

Shake Severity Zone	Improved Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
V - Moderate	279	100.0%	$ 19,653,639	$ 10,805,618	$ 30,459,257	100.000%
VI - Strong	-	0.0%	$ -	$ -	$ -	0.000%
VII - Very Strong	-	0.0%	$ -	$ -	$ -	0.000%
Total	**279**	**100.0%**	**$ 19,653,639**	**$ 10,805,618**	**$ 30,459,257**	**100.0%**

Earthquake Damage Estimation

Table 3-18 and Figure 3-20 demonstrates building loss estimation results from the Battle Creek 6.7 magnitude earthquake scenario. If the modeled earthquake were to occur, damages are estimated at approximately $886,998 or 3.1% percent of the total modeled value improvements within the City. FEMA's HAZUS-MH software classifies potential damage in five categories: no damage, slight damage, moderate damage, extensive damage, or complete damage. FEMA's software also predicts the possibility of exceedance for particular damage categories. As demonstrated in the table, the probability of extensive damage is minimal based upon the Battle Creek Earthquake Scenario. Table 3-19 shows the estimated damage that could happen to City- owned facilities. The sum of economic loss could equal $58,594. For further explanation of the earthquake damage estimation, please refer to Volume 1, Section 4.6.5.2.4 in the Base Plan.

Table 3-18: EQ Damage Estimates (City of Tehama)

Building Type	Average of Potential Damage to Exceed "Slight"	Average of Potential Damage to Exceed "Moderate"	Average of Potential Damage to Exceed "Extensive"	Average Economic Loss for Each Building Category	Sum of Economic Loss	Proportion of Loss (%)
Agricultural	20%	7%	1%	$ 9,443	$ 18,886	2%
Commercial	20%	7%	1%	$ 2,366	$ 16,561	2%
Education	0%	0%	0%	$ -	$ -	0%
Governmental	20%	7%	1%	$ 19,589	$ 19,589	2%
Industrial	0%	0%	0%	$ -	$ -	0%
Religion	20%	7%	1%	$ 1,342	$ 4,025	0%
Residential	20%	7%	1%	$ 4,549	$ 827,937	93%
Total	**20%**	**7%**	**1%**	**$ 4,549**	**$ 886,998**	

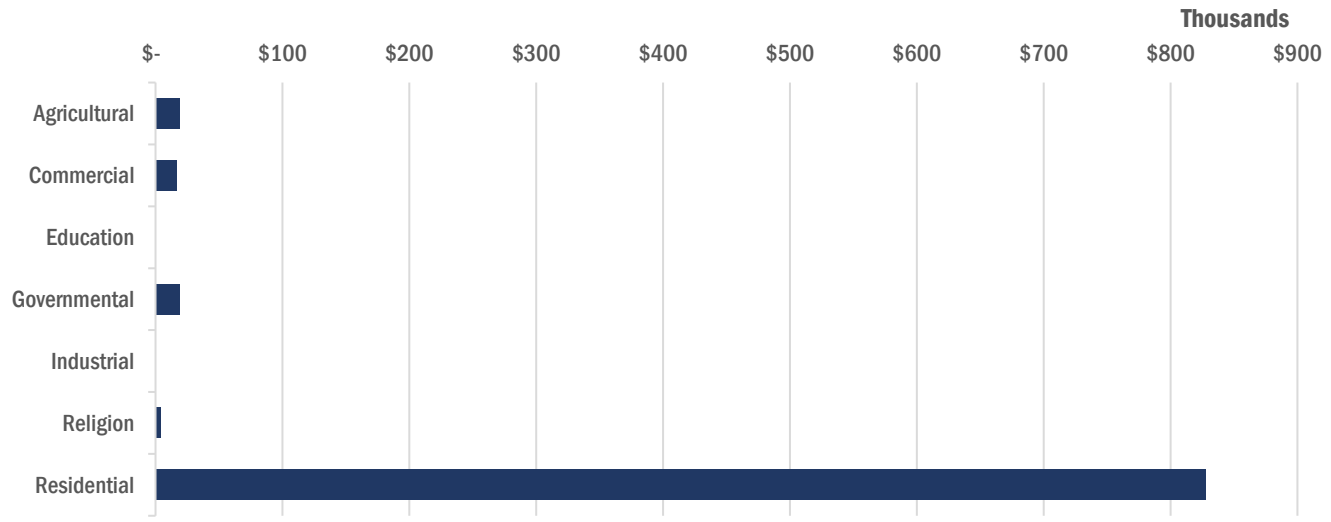


Figure 3-20: Economic Loss by Occupancy

Table 3-19: Estimated Earthquake Loss for City- Owned Facilities

	Average Probability of Potential Damage Exceedance			
Infrastructure Type	Slight	Moderate	Extensive	Sum of Economic Loss
City Hall	***20%***	***7%***	***1%***	***$ 7,038***
250 Cavalier Dr	*20%*	*7%*	*1%*	*$ 7,038*
Headstart Tehama	***19%***	***7%***	***1%***	***$ 20,660***
650 3rd St	*19%*	*7%*	*1%*	*$ 20,660*
Museum Annex	***20%***	***7%***	***1%***	***$ 0***
125 2nd St	*20%*	*7%*	*1%*	*$ 0*
Pump house	***20%***	***7%***	***1%***	***$ 2,377***
350 C St	*20%*	*7%*	*1%*	*$ 1,189*
4th & G	*20%*	*7%*	*1%*	*$ 1,189*
Rental Property	***20%***	***7%***	***1%***	***$ 28,519***
105 Cavalier Dr	*20%*	*7%*	*1%*	*$ 5,109*
125 2nd St	*20%*	*7%*	*1%*	*$ 7,027*
180 Cavalier Dr	*20%*	*7%*	*1%*	*$ 3,829*
260 Cavalier Dr	*20%*	*7%*	*1%*	*$ 7,289*
760 4th St	*19%*	*7%*	*1%*	*$ 5,265*
Grand Total	***20%***	***7%***	***1%***	***$ 58,594***

3.4.11.6.3 Critical Facilities and Infrastructure

All critical facilities in the City of Tehama are exposed to the earthquake hazard. Hazardous materials releases can occur during an earthquake from fixed facilities or transportation-related incidents. Transportation corridors can be disrupted during an earthquake, leading to the release of materials to the surrounding environment. Facilities holding hazardous materials are of particular concern because of possible isolation of neighborhoods surrounding them. During an earthquake, structures storing these materials could rupture and leak into the surrounding area or an adjacent waterway, having a disastrous effect on the environment.

Earthquake Damage Estimation

As mentioned previously, FEMA's HAZUS-MH software was used to estimate the earthquake damage potential to critical facilities exposed to the chosen earthquake scenario. If information pertaining to structure value was made available for City identified critical facilities, potential building and content damage has been estimated. The City of Tehama has not established building values for City Owned facilities for purposes of this effort.

3.4.11.7 Future Trends

Land use in Tehama will be directed by the City of Tehama General Plan adopted under California's General Planning Law. The safety element of the general plan establishes standards and plans for the protection of the community from hazards. The information in this plan provides the city a tool to ensure that there is no increase in exposure in areas of seismic risk. Development in the City of Tehama will be regulated through building standards and performance measures so that the degree of risk will be reduced. The geologic hazard portions of the area are heavily regulated under California's General Planning Law. The International Building Code establishes provisions to address seismic risk.

3.4.12 Dam Failure

Dam failure in the United State is typically caused by either overtopping of the dam structure, foundation defects, piping or seepage issues or problems with conduits and valves. The most likely disaster-related causes of dam failure in Tehama County are earthquakes, excessive rainfall and landslides. For more information on Dam Failure, see Section 4.4 in the Base Plan.

3.4.12.1 Regulatory Oversight

The potential for catastrophic flooding due to dam failures led to passage of the National Dam Safety Act (Public Law 92-367). The National Dam Safety Program requires a periodic engineering analysis of every major dam in the country. The goal of this FEMA-monitored effort is to identify and mitigate the risk of dam failure so as to protect the lives and property of the public.

For more information on State and Federal regulations pertaining to dam safety, including the California Division of Safety of Dams, US Army Corps of Engineers Dam Safety Program and Federal Energy Regulatory Commission Dam Safety Program, see Section 4.4.1 in the Base Plan.

3.4.12.2 Past Events

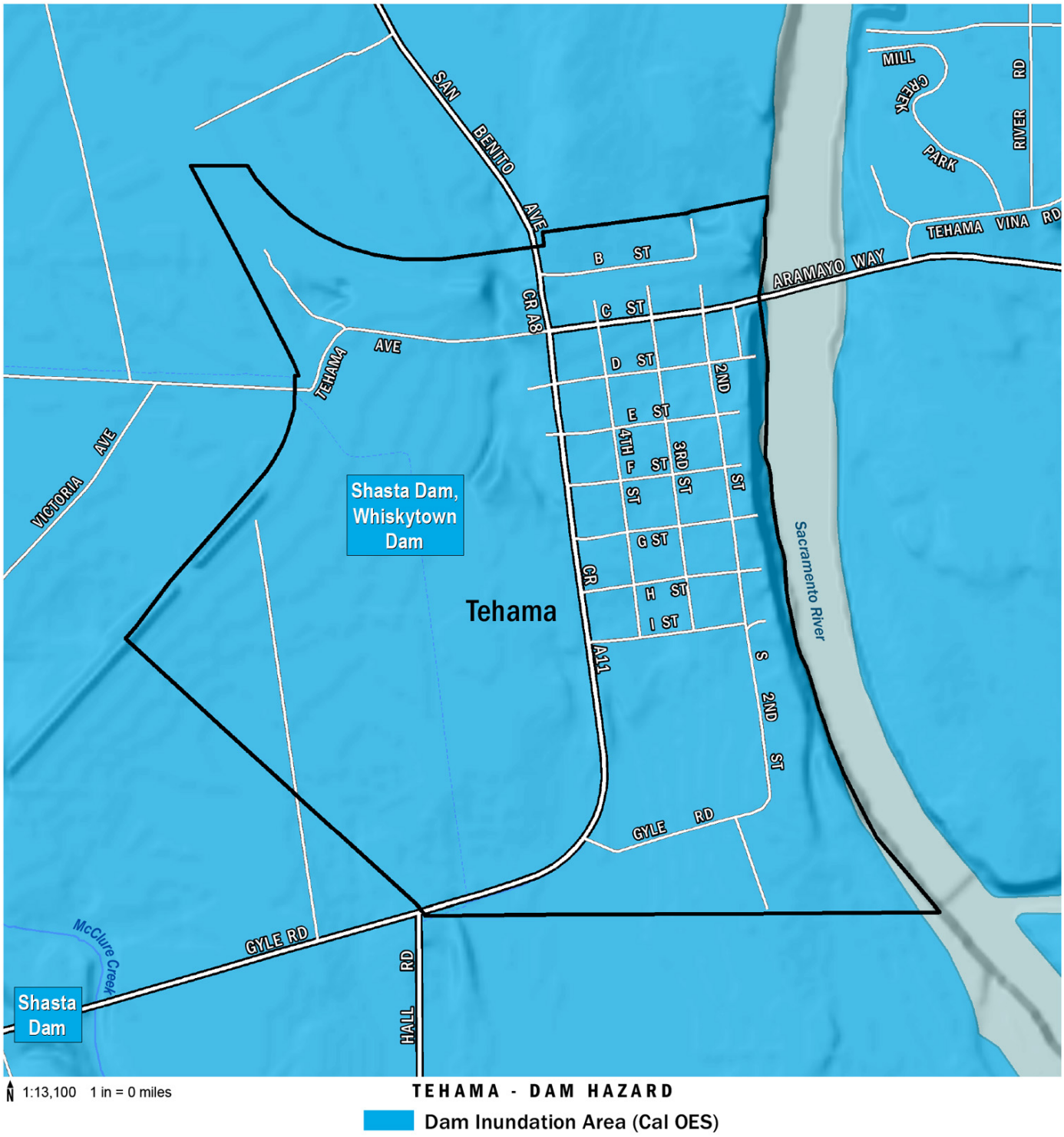
While areas of Tehama County recently experienced flooding due to levee failures, the City of Tehama has not been affected by dam failures in recent history.

3.4.12.3 Location

Although there are no dams within the City limits, two dams have inundation areas that reach into the City of Tehama (Shasta Dam and Whiskeytown Dam). Figure 3-21 shows the inundation zones for the Shasta and Whiskeytown dams, which are located outside of Tehama County but affect areas along the Sacramento River corridor.

3.4.12.4 Frequency

Dams are constructed with safety features known as “spillways” that allow water to overtop the dam if the reservoir fills too quickly. Spillway overflow events, often referred to as “design failures,” result in increased discharges downstream and increased flooding potential. The “residual risk” associated with dams is the risk beyond that for which safeguards have been implemented. However, the probability of any type of dam failure is low in today’s regulatory and dam safety oversight environment. Dam failure events usually coincide with events such as earthquakes, landslides and excessive rainfall and snowmelt.



Data Source: California Office of Emergency Services

Figure 3-21: Dam Inundation Zones in the City of Tehama

3.4.12.5 Severity

The entire City and surrounding area lies in the dam inundation zone for Shasta and Whiskeytown dams. Dam failure could be catastrophic to all life and property in the City. FEMA has developed a classification system for the hazard potential of dams. This can be seen in Section 4.4.2.4 of the Base plan.

3.4.12.6 Dam Failure Vulnerability Analysis

The primary danger associated with dam failure is the high velocity flooding downstream of the dam and limited warning times for evacuation. Vulnerability varies by community and depends on the particular dam profile and the nature and extent of the failure. Vulnerable population is present directly below downstream elements of the dam, especially those incapable of escaping the area within the allowable time frame. This population includes the elderly and young who may be unable to self-evacuate from the inundation area. The vulnerable population also includes those who would not have adequate warning from a television or radio emergency warning system. Dam inundation zones created by Cal OES were used to develop at risk populations and loss estimations for dam failure.

Dam failure exposure numbers were generated using Tehama County Assessor and parcel data. County assessor data does not include tax exempt structures, such as federal and local government buildings. All data sources have a level of accuracy acceptable for planning purposes.

3.4.12.6.1 Population

Vulnerable populations are all populations downstream from dam failures that are incapable of escaping the area within the allowable time frame. This population includes the elderly and young who may be unable to get themselves out of the inundation area. The vulnerable population also includes those who would not have adequate warning from a television or radio emergency warning system. The potential for loss of life is affected by the capacity and number of evacuation routes available to populations living in areas of potential inundation. The entire population in a dam failure inundation zone is exposed to the risk of a dam failure. The estimated population living in the inundation area mapped for this risk assessment is 100%, summarized in Figure 3-22.

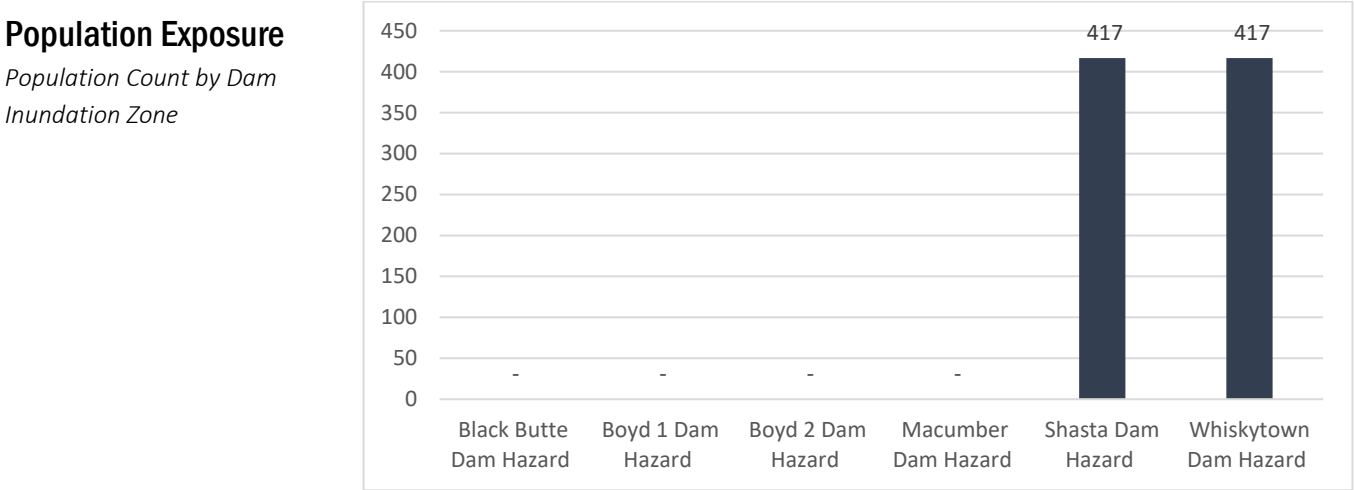


Figure 3-22: Population Exposure to Dam Failure

3.4.12.6.2 Property

The entire City of Tehama and surrounding areas are in the dam inundation zone, which is the most vulnerable area. These properties would experience the largest, Low-lying areas are also vulnerable since they are where the dam waters would collect. Transportation routes are vulnerable to dam inundation and have the potential to be wiped out, creating isolation issues. This includes all roads, railroads and bridges in the path of the dam inundation. Those that are most vulnerable are those that are already in poor condition and would not be able to withstand a large water surge. Utilities such as overhead power lines, cable and phone lines could also be vulnerable. Loss of these utilities could create additional isolation issues for the inundation areas.

The county Assessor's parcel data was used as the basis for the inventory of current market values and content value summaries. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The centroids were then overlaid with the inundation zones to determine the at-risk structures. This methodology assumed that every parcel with a current net value or assessed value was an improved parcel. Building exposure was calculated based on current net values or when absent, assessor's values as provided by the assessor's office. Building content exposure was calculated based on occupancy type multipliers and improvement value. Table 3-20 shows the count of at-risk parcels and their associated building and content exposure values to dam failure.

A total of $30,459,257 worth of buildings and contents are exposed to dam failure hazards within the City Boundaries representing 100% of the total value in the City.

Table 3-20: Parcel Values at Risk from Dam Inundation

	Total Parcels	Total Market Value Exposure ($)	Total Content Value Exposure ($)	Total Value ($)
Tehama	279	$ 19,653,639	$10,805,618	$30,459,257

Dam Inundation Zone	Improved Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
Black Butte Dam Hazard	-	0%	$-	$ -	$ -	0%
Boyd 1 Dam Hazard	-	0%	$ -	$ -	$ -	0%
Boyd 2 Dam Hazard	-	0%	$ -	$ -	$ -	0%
Macumber Dam Hazard	-	0%	$ -	$-	$ -	0%
Shasta Dam Hazard	279	100%	$19,653,639.00	$10,805,618	$30,459,257	100%
Whiskytown Dam Hazard	279	100%	$19,653,639.00	$10,805,618	$30,459,257	100%
Cal OES Dam Inundation Area*	**279**	**100%**	**$19,653,639**	**$10,805,618**	**$30,459,257**	**100%**

*total area is not equal to sum of all dam inundation zones due to dissolved overlapping inundation areas.

3.4.12.6.3 Critical Facilities

Critical Facilities at risk to dam inundation are on file with the County and for national security purposes can only be accessed through Tehama County's Public Works Department. The most vulnerable critical facilities in the City are those in poor condition that would have difficulty withstanding a large surge of water. Utilities such as overhead power lines and communication lines could also be vulnerable. Loss of these utilities could create additional compounding issues for emergency management officials attempting to conduct evacuation and response actions. GIS analysis determined that 5 of the planning area's critical facilities are in the mapped dam inundation area, as summarized in Table 3-21 and Table 3-22.

Table 3-21: Critical Infrastructure Points in Dam Inundation Zones

Infrastructure Type	CalOES Dam Inundation Area*	Black Butte Dam	Boyd 1 Dam	Boyd 2 Dam	Macumber Dam	Shasta Dam	Whiskytown Dam
Essential Facility	4	0	0	0	0	9	17
EOC	0	0	0	0	0	0	0
Fire Station	0	0	0	0	0	0	1
Government Facility	3	0	0	0	0	7	14
Hospital	0	0	0	0	0	1	0
Police Station	0	0	0	0	0	0	1
School	1	0	0	0	0	1	1
High Potential Loss	0	0	0	0	0	29	19
Residential Child Care	0	0	0	0	0	1	1
Adult Residential Care	0	0	0	0	0	6	2
Child Care	0	0	0	0	0	4	4
Foster/Home Care	0	0	0	0	0	1	1
Home Care	0	0	0	0	0	1	0
Other Care Facility	0	0	0	0	0	3	2
Elder Care	0	0	0	0	0	3	2
Dam	0	0	0	0	0	0	0
Hotel	0	0	0	0	0	10	7
Transportation and Lifeline	2	0	0	0	0	18	15
Airport	0	0	0	0	0	0	0
Bridge	2	0	0	0	0	16	12
Bus Facility	0	0	0	0	0	0	0
FCC AM Tower	0	0	0	0	0	0	0
FCC Cell Tower	0	0	0	0	0	0	0
FCC FM Tower	0	0	0	0	0	1	1
Natural Gas Station	0	0	0	0	0	0	1
Power Plant	0	0	0	0	0	0	0

Infrastructure Type	CalOES Dam Inundation Area*	Black Butte Dam	Boyd 1 Dam	Boyd 2 Dam	Macumber Dam	Shasta Dam	Whiskytown Dam
Substation	0	0	0	0	0	0	0
Waste Water Facility	0	0	0	0	0	1	1
Grand Total	**6**	**-**	**-**	**-**	**-**	**56**	**51**

Table 3-22: Critical Infrastructure (Linear) in Dam Inundation Zones

Infrastructure Type (Linear)	CalOES Dam Inundation Area*	Black Butte Dam	Boyd 1 Dam	Boyd 2 Dam	Macumber Dam	Shasta Dam	Whiskytown Dam
Transportation and Lifeline	**11.0**	**-**	**-**	**-**	**-**	**11.1**	**11.1**
FEMA Levee	-	-	-	-	-	-	-
USACE Levee	-	-	-	-	-	-	-
Natural Gas Pipeline	-	-	-	-	-	-	-
Transmission Line	1.3	-	-	-	-	1.3	1.3
Railroad	1.9	-	-	-	-	1.9	1.9
Street	7.0	-	-	-	-	7.0	7.0
-Interstate	-	-	-	-	-	-	-
-Primary Hwy	-	-	-	-	-	-	-
-State/County Hwy	1.4	-	-	-	-	1.4	1.4
-Local Road	5.2	-	-	-	-	5.2	5.2
-Other Road	0.4	-	-	-	-	0.4	0.4
-4WD Road	-	-	-	-	-	-	-
Grand Total	**10.1**	**-**	**-**	**-**	**-**	**10.1**	**10.1**

3.4.12.7 Future Trends in Development

Land use in the City will be directed by the City of Tehama General Plan adopted under California's General Planning Law. The safety elements of the general plan establish standards and plans for the protection of the community from hazards. Dam failure is currently not addressed as a standalone hazard in the safety elements, but flooding is. Flood-related policies in the General Plan will help to reduce the risk associated with the dam failure hazard for all future development in the City.

3.4.13 Wildfire

A wildfire is any uncontrolled fire occurring on undeveloped land that requires fire suppression. Wildfires can be ignited by lightning or by human activity such as smoking, campfires, equipment use, and arson.

Wildfires are costly, compromising watersheds, open space, timber, range, recreational opportunities, wildlife habitats, endangered species, historic and cultural assets, wild and scenic rivers, other scenic assets and local economies, as well as putting lives and property at risk.

The City of Tehama has many mature trees as well as orchards and agricultural lands that may be vulnerable to fires.

3.4.13.1 Regulatory Oversight

3.4.13.1.1 General Plan Safety Element

The City of Tehama General Plan Safety Element provides goals, policies and implementation measures to reduce fire hazards whenever possible.

3.4.13.1.2 California Building Code (CBC) Fire-Resistant Fire Requirements

See Section 12: Wildfire Hazard Profile of the base plan for the County/ CBC requirements for fire clearance, setbacks, residential burn permits and residential development.

3.4.13.2 Past Events

According to Cal Fire, no wildfire events have occurred within the City in recent history. No structural damage from wildland fire events has been reported. For information regarding wildfire events that have taken place in Tehama County, see Section 4.10.2.1 in the Base Plan.

3.4.13.3 Location

CAL FIRE adopted Fire Hazard Severity Zone maps for the Local Responsibility Area (LRA) in June 2008. Fire hazard mapping is a way to measure the physical fire behavior to predict the damage a fire is likely to cause. Fire hazard measurement includes vegetative fuels, probability of speed at which a wildfire moves the amount of heat the fire produces, and most importantly, the burning fire brands that the fire sends ahead of the flaming front.

The model used to develop the information in accounts for topography, especially the steepness of the slopes (fires burn faster as they burn up-slope.). Weather (temperature, humidity, and wind) also has a significant influence on fire behavior. The areas depicted as moderate, high and very high are of particular concern and potential fire risk in these areas are constantly increasing as human development and the wildland urban interface areas expand.

Approximately .8 square miles of the land area in Tehama is at moderate risk from wildland fires. Figure 3-23 shows the areas of moderate risk within the City. Table 3-23 shows the sum of acres and square miles in each wildfire hazard severity zone. Moderate Fire Hazard Severity Zones have been identified along Tehama Avenue in the northwestern portion of the City which contains orchards and agricultural land that are highly susceptible to wildfire. Construction in the Moderate Fire Hazard Severity Zone will be required to meet the requirements of Chapter 7A of the California Building Code relating to fire resistant rated construction.

Table 3-23: Total Area with Wildfire Risk

Wildfire Hazard Severity Zone	Sum of Acres	Sum of Square Miles
Very High	-	-
High	-	-
Moderate	37.2	0.1
Non-Wildland/Non-Urban	322.3	0.5
Urban Unzoned	142.9	0.2
Total	**502.4**	**0.8**

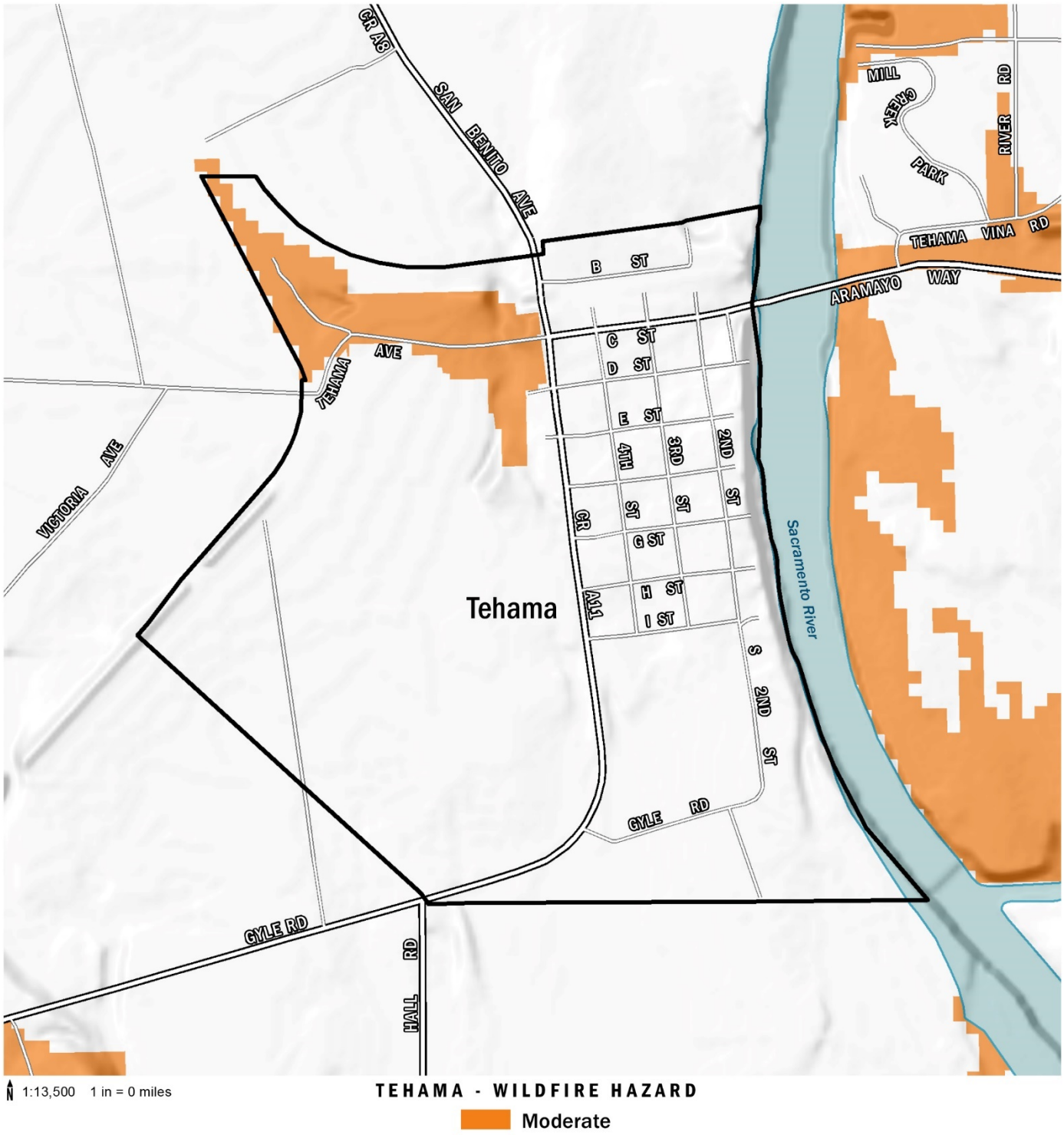
3.4.13.4 Frequency

Data suggests a trend toward increasing acres burned statewide, with particular increases in conifer vegetation types. This trend is supported in part by the fact that the three largest fire years since 1950 have all occurred within the last 10 years. However, the potential of having a wild land fire affecting the City is small. Although the City has mature vegetation, the Tehama County CDF Fire Department acknowledges that the water supply within the City is adequate for firefighting purposes, with a fire hydrant existing on every comer in the residential area. The closest station is located just to the east of the city in Los Molinos at 7930 Sherwood Blvd. The response time to Tehama is approximately 4 minutes.

USGS LANDFIRE (Landscape Fire and Resource Management Planning Tools), is a shared program between the wildland fire management programs of the U.S. Department of Agriculture Forest Service and U.S. Department of the Interior, providing landscape scale geo-spatial products to support cross-boundary planning, management, and operations. Historical fire regimes, intervals, and vegetation conditions are mapped using the Vegetation Dynamics Development Tool (VDDT). This USGS data supports fire and landscape management planning goals in the National Cohesive Wildland Fire Management Strategy, the Federal Wildland Fire Management Policy, and the Healthy Forests Restoration Act.

As part of the USGS Landfire data sets, the Mean Fire Return Interval (MFRI) layer quantifies the average period between fires under the presumed historical fire regime. MFRI is intended to describe one component of historical fire regime characteristics in the context of the broader historical time period represented by the LANDFIRE Biophysical Settings (BPS) layer and BPS Model documentation.

MFRI is derived from the vegetation and disturbance dynamics model VDDT (Vegetation Dynamics Development Tool) (LF_1.0.0 CONUS only used the vegetation and disturbance dynamics model LANDSUM). This layer is created by linking the BpS Group attribute in the BpS layer with the Refresh Model Tracker (RMT) data and assigning the MFRI attribute. This geospatial product should display a reasonable approximation of MFRI, as documented in the RMT. See Figure 3-24 for predicted fire return interval for the City.



Data Source: CAL FIRE, Fire Hazard Severity Zones

Figure 3-23: Wildfire Hazard Map for the City of Tehama

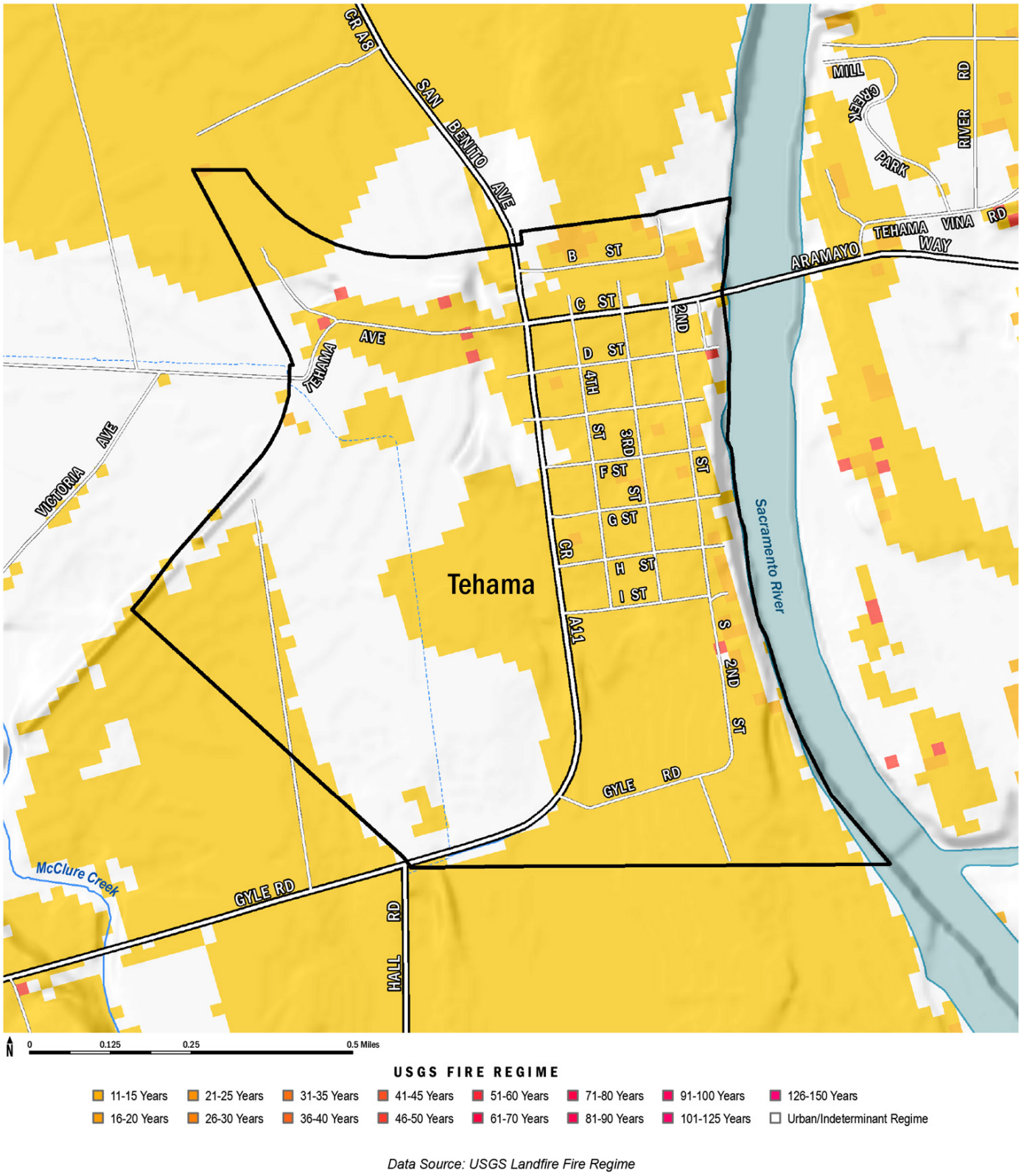


Figure 3-24: USGS Fire Regime for the City of Tehama

3.4.13.5 Severity

Although the City does not have a high risk of wildfire in the City itself, citizens may be affected by wildfires in the County or region. Smoke and air pollution from wildfires can be a health hazard, especially for sensitive populations including children, the elderly and those with respiratory and cardiovascular diseases. Wildfire may also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke. In addition, wildfire can lead to ancillary impacts such as landslides in steep ravine areas and flooding due to the impacts of silt in local watersheds.

3.4.13.6 Wildfire Hazard Vulnerability

3.4.13.6.1 Population

Wildfire is of greatest concern to populations residing in the moderate, high and very high fire hazard severity zones. U.S. Census Bureau block data was used to estimate populations within the Cal Fire identified hazard zones. As seen in Figure 3-25, 10 residents (2.46% of the total population) live in areas considered to be of moderate risk to wildfires. There are no high or very high fire hazard severity zones in the City of Tehama.

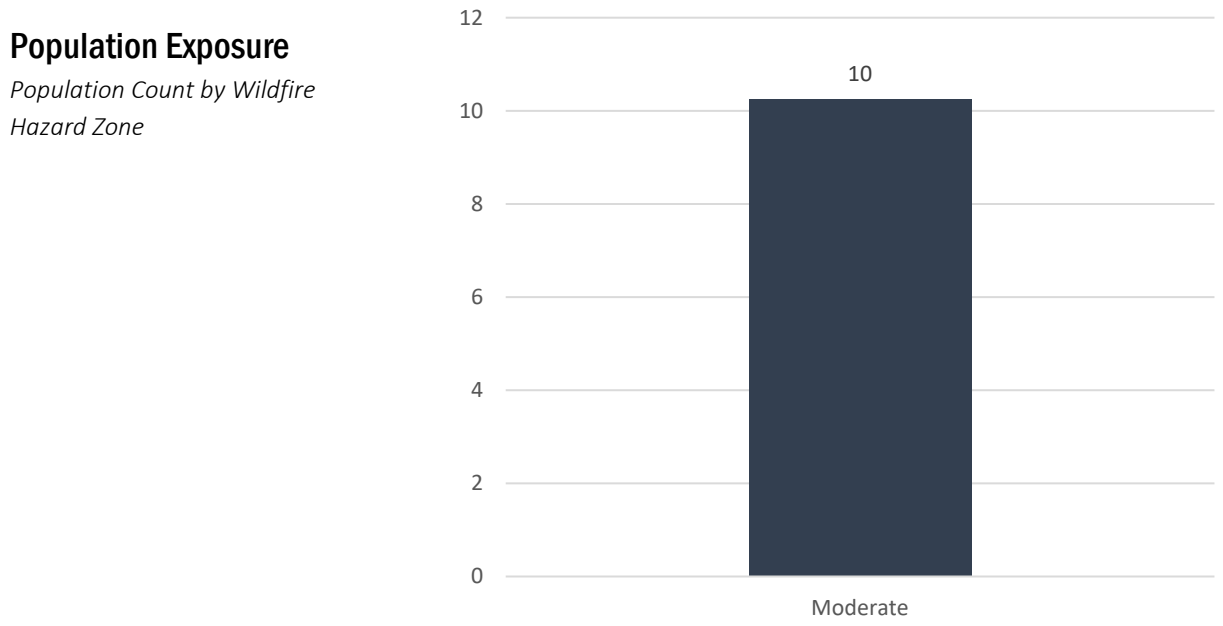


Figure 3-25: Population at risk from wildfire hazards

3.4.13.6.2 Property

The County's parcel layer was used as the basis for the inventory of improved residential parcels for the City of Tehama. In some cases, a parcel will be within in multiple fire threat zones. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The centroids were then overlaid with the fire threat layer to determine the risk for each structure. The fire threat zone in which the centroid was located was assigned to the entire parcel. This methodology assumed that every parcel with a square footage value greater than zero was developed in some way. Only improved parcels were analyzed.

Table 3-24 displays the number of homes in the very high, high and moderate wildfire hazard zones within the City of Tehama jurisdictional boundaries and values for each. Only 2.9% of the City of Tehama lies within the designated "Moderate" Fire Hazard Severity Zone (FHSZ).

Table 3-24: Residential Buildings and Content within Cal Fire Wildfire Severity Zones

	Total Parcels	Total Market Value Exposure ($)	Total Content Value Exposure ($)	Total Value ($)
Tehama	279	$ 19,653,639	$ 10,805,618	$ 30,459,257

Fire Hazard Severity Hazard Zone	Improved Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
Very High	-	*0.0%*	$ -	$ -	$ -	*0.0000%*
High	-	*0.0%*	$ -	$ -	$ -	*0.0000%*
Moderate	14	*5.0%*	$ 560,614	$ 330,909	$ 891,523	*2.9269%*
Total	**14**	**5%**	**$ 560,614**	**$ 330,909**	**$ 891,523**	**3%**

3.4.13.6.3 Critical Facilities and Infrastructure

Critical facilities data was superimposed with fire hazard severity zone data to determine the type and number of facilities within each risk classification. Table 3-25 and Table 3-26 list the critical facilities in the moderate, high and very high wildfire hazard zones for Tehama. As demonstrated in the tables, a very small portion of critical facilities are within moderate wildfire risk areas.

Table 3-25: Critical Facility Exposure to Wildfire

Infrastructure Type	Moderate	High	Very High	Total Feature Count
Essential Facility	0	0	0	0
EOC	0	0	0	0
Fire Station	0	0	0	0
Government Facility	0	0	0	0
Hospital	0	0	0	0
Police Station	0	0	0	0
School	0	0	0	0
High Potential Loss	0	0	0	0
Residential Child Care	0	0	0	0
Adult Residential Care	0	0	0	0
Child Care	0	0	0	0
Foster/Home Care	0	0	0	0
Home Care	0	0	0	0
Other Care Facility	0	0	0	0
Elder Care	0	0	0	0
Dam	0	0	0	0
Hotel	0	0	0	0

Infrastructure Type	Moderate	High	Very High	Total Feature Count
Transportation and Lifeline	1	0	0	1
Airport	0	0	0	0
Bridge	1	0	0	0
Bus Facility	0	0	0	0
FCC AM Tower	0	0	0	0
FCC Cell Tower	0	0	0	0
FCC FM Tower	0	0	0	0
Natural Gas Station	0	0	0	0
Power Plant	0	0	0	0
Substation	0	0	0	0
Waste Water Facility	0	0	0	0
Grand Total	**1**	**-**	**-**	**1**

Table 3-26: Lifelines with Wildfire Risk

Infrastructure Type (Linear)	Moderate	High	Very High	Total Mileage
Transportation and Lifeline	**1.7**	**-**	**-**	**1.7**
FEMA Levee	-	-	-	-
USACE Levee	-	-	-	-
Natural Gas Pipeline*	-	-	-	-
Transmission Line	0.2	-	-	0.2
Railroad	1.0	-	-	1.0
Street	0.5	-	-	0.5
-Interstate	-	-	-	-
-Primary Highway	-	-	-	-
-State/County Highway	-	-	-	-
-Local Road	0.5	-	-	0.5
-Other Road	0.0	-	-	0.0
-4WD Road	-	-	-	-
Grand Total	**1.7**	**-**	**-**	**1.7**

Note: There are approximately 4 miles of natural gas pipeline in the City of Tehama. Due to available data, natural gas pipelines are not counted towards linear utilities.

3.4.13.7 Future Trends

The “urbanized” areas of the City of Tehama have little risk to wildfire, however urban fires can still be an issue. Several potential fire hazards exist within the city including residential burning, house or auxiliary building fires, dry grass or brush fires, and flammable products ignition.

A few opportunities exist. Due to the City of Tehama's close proximity to the Sacramento River, vegetation in the City stays moist through the dry season reducing the fire hazard level in the area. Also, the existing siren in the city could potentially be used as a community fire alarm system. (City of Tehama General Plan)

3.4.14 Drought

The gap between water supply and demand in California is predicted to total 2.4 million-acre feet during drought years and up to 6.2 million-acre feet in drought years by 2020. (It can take 20 years or longer to develop and finance a supplemental water supply for new developments. About 894 gallons of water are needed to grow the food for the daily diet of an average person. On an annual basis, an individual's water use is about 326 gallons.

For more information on drought and its potential impacts, see Section 4.5 in the Base Plan.

3.4.14.1 Regulatory Oversight

3.4.14.1.1 General Plan Safety Element

The City of Tehama General Plan Safety Element establishes goals, policies and implementation measures to provide a clean, safe water supply for its residents.

3.4.14.1.2 Statewide Emergency Water Conservation Regulations

Adopted May 18th, 2016 by the State Water Resources Control Board (Water Board) adjusted emergency water conservation regulations through the end of January 2017 in recognition of the differing water supply conditions across the state. Executive Order B-37-16 Making Water Conservation a California Way of Life updates temporary emergency water restrictions and transitions to permanent, long-term improvements in water use by taking the following actions.

- Use water more wisely
- Eliminate water waste
- Strengthen local drought resilience
- Improve agricultural water use efficiency and drought planning

The Executive Order can be read in its entirety at
http://www.tehamacountypublicworks.ca.gov/Flood/drought/exec%20order%20b-37-16.pdf

3.4.14.1.3 Tehama County Flood Control and Water Conservation District Coordinated AB 3030 Groundwater Management Plan

The primary purpose of the 2012 Tehama County Groundwater Management Plan is to sustain groundwater levels that balance long-term extraction and replenishment. Annual recovery of spring groundwater levels after the previous summer season of more intensive groundwater extraction and following each winter season will be used to assess annual groundwater recharge. Long-term trends of annual groundwater recharge shall be the primary basis for evaluating the long-term balance between extraction and replenishment.

3.4.14.1.4 Sustainable Groundwater Management Act

On September 16, 2014, Governor Brown signed into law a package of bills (SB1168, AB1739 and SB1319) collectively called the Sustainable Groundwater Management Act. The Tehama County Flood Control and Water Conservation District was recognized by DWR as the Exclusive Groundwater Sustainability Agency on February 11, 2016, for the 11 groundwater subbasins or the portions of those subbasins located within Tehama County. The District also submitted a Basin Boundary Adjustment in March 2016 to incorporate the small portion of the Colusa Subbasin located within Tehama County into the Corning Subbasin. The District is currently in the process of forming a Groundwater Commission, that once formed, will start the process of developing a Groundwater Sustainability Plan as required by the legislation before the January 31, 2022 deadline.

3.4.14.1.5 California Water Plan

The California Water Plan presents strategic plan elements including a vision, mission, goals, guiding principles, and recommendations for current water conditions, challenges and activities. The plan includes future uncertainties and climate change impacts, scenarios for 2050, and a roadmap for improving data and analytical tools needed for integrated water management and sustainability. The California Water Plan Update 2018 is currently in development.

See: http://www.water.ca.gov/waterplan/

3.4.14.2 Past Events

On January 17, 2014 California State Governor, Jerry Brown, declared a drought state of emergency. On April 17, 2017, Brown issued Executive Order B-40-17, officially ending the drought state of emergency in all California counties except Fresno, Kings, Tulare, and Tuolumne.

Section 4.5.3.1 of the Base Plan explains past drought events affecting Tehama County. These events also affected the City of Tehama.

3.4.14.3 Location

The entire City could be affected by drought. Tehama sits atop a major groundwater recharge area. The City's water supply is pumped directly from the groundwater supplies beneath the City and requires no treatment. (City of Tehama General Plan)

3.4.14.4 Frequency

Historical data for the Tehama County region indicate numerous period of drought, the most significant being the period from 1987 through 1994. According to the California State Hazard Mitigation Plan, Tehama County was affected by two drought incidents from 1972 to 2009 as well as the 2014-2017 drought which affected the entire state.

3.4.14.5 Severity

A drought directly or indirectly impacts all people in affected areas. A drought can result in farmers not being able to plant crops or the failure of planted crops. This results in loss of work for farm workers and those in food processing jobs. Other water-dependent industries are commonly forced to shut down all or a portion of their facilities, resulting in further layoffs.

A drought can harm recreational companies that use water (e.g., swimming pools, water parks, and river rafting companies) as well as landscape and nursery businesses because people will not invest in new plants if water is not available to sustain them. Drought in the City of Tehama would bring drier conditions and significantly raise the risk of wildfires in agricultural areas as well as increase the risk of grass or brush fires in residential neighborhoods.

3.4.14.6 Drought Vulnerability

All people, property and environments in Tehama would be exposed to some degree to the impacts of moderate to extreme drought conditions. Drought produces a complex web of impacts that spans many sectors of the economy and reaches well beyond the area experiencing physical drought. This complexity exists because water is integral to the ability to produce goods and provide services. Drought can affect a wide range of economic, environmental and social activities. The vulnerability of an activity to the effects of drought usually depends on its water demand, how the demand is met, and what water supplies are available to meet the demand. California's 2013 Water Plan indicates that water demand in the state will increase through 2030. Although the Department of Water Resources predicts a modest decrease in agricultural water use, the agency anticipates that urban water use will increase by 1.5 to 5.8 million acre-feet per year.

3.4.14.6.1 Population

As in Tehama County as a whole, the planning partnership has the ability to minimize any impacts on residents and water consumers in the county should several consecutive dry years occur. No significant life or health impacts are anticipated as a result of drought within the planning area.

3.4.14.6.2 Property

As in Tehama County as a whole, no structures will be directly affected by drought conditions, though some structures may become vulnerable to wildfires, which are more likely following years of drought. Droughts can also have significant impacts on landscapes, which could cause a financial burden to property owners. However, these impacts are not considered critical in planning for impacts from the drought hazard.

3.4.14.6.3 Critical Facilities and Infrastructure

The City of Tehama owns 2 5,000-gallon pressurized tanks. The water system was first put into place in 1915 and meets the requirements for fire flow. The City's close proximity to the Sacramento River has helped keep water levels in the well system high, even during dry years.

The City's biggest concern during drought years is water supply for residential uses. Keeping this water free of contamination (mainly from nitrates and septic systems) is essential and is a concern both during dry years (the cone of depression could get larger, causing contamination) and during flood events which could also contaminate the groundwater.

3.4.14.7 Future Trends

Land use in the planning area will be directed by the City of Tehama General Plan adopted under California's General Planning Law. This document provides the capability at the local municipal level to protect future development from the impacts of drought. Deficiencies identified by these reviews can be identified as mitigation actions to increase the capability to deal with future trends in development.

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3.4.15 Slope Failure (Erosion)

Moving water is the major agent of erosion. Rain carries away bits of soil and slowly washes away rock fragments. Rushing streams and rivers wear away their banks, creating larger and larger valleys. (Geographic, n.d.) For purposes of this Annex, the City will focus on bank erosion along the Sacramento River Corridor.

For a complete profile of the slope failure hazard, see Volume 1 Section 4.8.

3.4.15.1 Slope Failure Hazard Vulnerability

Currently, there are no people, critical facilities, infrastructure or property directly at risk from slope failure in the City of Tehama. However, severe erosion continues to occur along the bank of the Sacramento River as shown in Figure 3-26.

Figure 3-26: Erosion on the Sacramento River in the City of Tehama

According to the City of Tehama's General Plan, the original system of roads included a 1st St. along the Sacramento River bank. Through the years the Sacramento River has almost completely eroded 1st St. away. This is the best evidence of the problem of bank erosion due to river channel migration.

Many bank protection studies have been completed by the Army Corps of Engineers as well as some erosion control. The west bank of the Sacramento River has been rocked along the entire length of the City. Also, constructed were "rip rap" areas in spots along the bank which have been badly eroded. Since the time of this work there has been little erosion. (City of Tehama General Plan)

3.4.16 Hazard Risk Ranking

The City of Tehama's Planning Team used the same hazard prioritization process as the Tehama County Planning Committee. This process is described in detail in Section 13 of the base plan. Table 3-27 shows the results of the hazard risk ranking exercise.

Table 3-27: City of Tehama Prioritized Hazard Assessment Matrix

		Impact			
		Catastrophic	Critical	Limited	Minor
Probability	Highly Likely		Severe Weather		
	Likely		Drought, Flood		
	Possible	Dam Failure		Earthquake	
	Unlikely				Wildfire

3.5 Mitigation Strategy

The intent of the mitigation strategy is to provide the City with a guidebook to future hazard mitigation administration. The mitigation strategy is intended to reduce vulnerabilities outlined in the previous section with a prescription of policies and physical projects. This will assist City staff to achieve compatibility with existing planning mechanisms, and ensures that mitigation activities provide specific roles and resources for implementation success.

The mitigation strategy represents the key outcomes of the MJHMP planning process. The hazard mitigation planning process conducted by the Planning Committee is a typical problem-solving methodology:

- **Estimate the impacts** (See Sections Vulnerability Assessment);
- **Describe the problem** (See Section Problem Statements);
- **Assess what resources exist to lessen impacts and problem** (See Capability Assessment,);
- **Develop Goals and Objectives to address the problems** (See Goals and Objectives)
- **Determine what can be done, and develop actions that are appropriate for the community** (See Mitigation Action Matrix).

3.5.1 Identifying the Problem

As part of the mitigation actions identification process, the City of Tehama Planning Committee identified issues and/or weaknesses as a result of the risk assessment and vulnerability analysis. By combining common issues and weaknesses developed by the Planning Committee, the realm of resources needed for mitigating each can be understood. Community issues and weaknesses are presented by individual hazard in Table 3-28. Projects or actions have been developed to mitigate each problem identified. To the degree possible the City of Tehama will support County Wide Initiatives. See Base Plan for related County Wide mitigation actions.

Table 3-28: Problem Statements by Hazard

Hazard	Problem No.	Problem Description	Mitigation Alternative	Mitigation Action No.	County Wide	City of Tehama
Dam Failure	DF-01	There is often limited warning time for dam failure. These events are frequently associated with construction methodology and or severe weather, which limits predictability of dam failure and compounds flood risk. Protocol for notification of downstream citizens of imminent failure needs to be tied to local emergency response planning.	ES, PE&A	TC-23-2018, RB-06-2018, CoT-24-2018	x	x

Hazard	Problem No.	Problem Description	Mitigation Alternative	Mitigation Action No.	County Wide	City of Tehama
Dam Failure	DF-02	Mapping that estimates inundation depths for federally regulated dams is already required and available; however, mapping for non-federal-regulated dams is needed to better assess the risk associated with failure of these facilities. Also, access to inundation zones is not readily available to residents area wide.	ES	TC-24-2018, TC-23-2018, RB-06-2018	x	x
Dam Failure	DF-04	Depending upon the scenario, a Shasta Dam uncontrolled release due to reservoir levels / reservoir would inundate the entire City of Tehama and beyond.	ES	CoT-24-2018, TC-23-2018		x
Drought	DR-03	The probability of increased drought frequencies and durations due to climate change.	PRV	CoT-25-2018, RB-07-2018, TC-27-2018, TC-28-2018, CC-23-2018	x	x
Drought	DR-04	The lack of promotion of active water conservation during drought and non-drought periods.	PRV, PE&A	TC-26-2018, CoT-18-2012, RB-08-2018	x	x
Earthquake	EQ-01	More information is needed on the exposure and performance of soft-story construction within the planning area. There are many undocumented unreinforced masonry buildings.	PPRO	CC-21-2018, CC-22-2018, CoT-16-2012, RB-04-2018, RB-05-2018		x
Earthquake	EQ-02	Gas fires after earthquake events.	PPRO	CoT-17-2012		x
Earthquake	EQ-03	Low probability of liquefaction within the planning area is evident from data collection efforts. Having this information developed would significantly enhance seismic risk assessment.	PPRO	TC-34-2018	x	x

Hazard	Problem No.	Problem Description	Mitigation Alternative	Mitigation Action No.	County Wide	City of Tehama
Flood	FL-02	Climate change impacts flood conditions in Tehama County. More severe weather events could compromise local drainage and flood control.	SP	CC-10-2012, CoT-06-2012, CoT-07-2012, CoT-08-2012, CoT-09-2012, CoT-20-2018, RB-03-2018, RB-09-2012, TC-22-2018, CC-08-2012, CC-09-2012, CC-12-2012, CC-16-2018	x	x
Flood	FL-04	Placing fill, constructing levees or berms, modifying drainage channels and streams, constructing and maintaining private and public roads, and grading property without regard or the understanding of the potential impact to drainage or the risk from flooding can create problems where none existed previously.	PPRO, NRC	TC-12-2018, CC-04-2018, CoT-01-2018	x	x
Flood	FL-06	Lack of well head protection plans for private wells or single individual wells providing domestic supply to single family resident.	NRP	TC-14-2018, CoT-22-2018	x	x
Flood	FL-25	Breaches of levees near Gerber and private levees on a farm north of the City have flooded areas of the city in the past. Gerber levees are constructed as 50 year levees but are currently at 50% capacity due to silt.	SP	CoT-05-2012		x
Flood	FL-26	Only 50% of the homes carry flood insurance. The City needs help developing a strategy/ crafting a message to expand the base of flood insurance.	PRV	CoT-02-2012		x
Flood	FL-27	Local drainage issues damage roadways. Roadway construction and design needs to address sheet flooding within the City.	SP	CoT-20-2018		x
Flood	FL-28	Critical infrastructure in the City faces flood risk, including City Hall, the Head Start School Facility and others.	PPRO (Non-Structural)	CoT-13-2012		x

Hazard	Problem No.	Problem Description	Mitigation Alternative	Mitigation Action No.	County Wide	City of Tehama
Flood	FL-29	The greatest concentration of repetitive-loss properties is within the City of Tehama; however, this community was involved in an "elevation" project sponsored by the USACE and State Reclamation Board. Within the city there were 125 houses below the USACE 100-YR BFE for the Sacramento River. The cost to elevate homes in the city has ranged from $60,000 to $100,000. (2006 Tehama County Flood Mitigation Plan)	PPRO, PRV	CoT-10-2012		x
Flood	FL-03	Residents need more education about flood preparedness, flood insurance and the resources available during and after floods on a continual basis.	PEA	TC-06-2018, CC-02-2012, CoT-03-2012, CoT-04-2012, CoT-11-2012, CoT-12-2012, CoT-14-2012, RB-03-2012	x	x
Flood	FL-30	Many small tributaries in the watersheds have high levels of siltation and diminished flood-carrying capacity due to vegetation (due to Arundo and Tamarisk) overgrowth. Debris-clearing is a challenge due to environmental permitting restrictions from Fish and Game/Fish and Wildlife. The establishment of Arundo in the streams in Tehama County has seriously limited their conveyance capacity.	PRV	TC-13-2018, CC-05-2018, CoT-06-2012, RB-02-2018	x	x
Severe Storm	SS-01	Older building stock in the planning area do not meet code standards. These structures could be highly vulnerable to severe weather events such as windstorms.	PPRO	TC-30-2018, TC-33-2018	x	x
Severe Storm	SS-02	Risk of power supply interruption due to severe storms.	ES	TC-19-2018, CC-18-2012, CC-19-2012, CoT-23-2018	x	x
Severe Storm	SS-03	Lack of backup power generation at critical facilities.	ES	TC-20-2018, CC-18-2012, CC-19-2012, CoT-23-2018	x	x
Severe Storm	SS-05	Communication issues occur during weather events such as the phones going down. Back-Up power at communication towers is needed.	ES	TC-19-2018, TC-20-2018, CoT-23-2018	x	x

Hazard	Problem No.	Problem Description	Mitigation Alternative	Mitigation Action No.	County Wide	City of Tehama
Severe Storm	SS-06	Many large trees result in damages from storms (high winds). There are currently issues with tree trimmer local capacities.	PRV	CC-20-2018, CoT-15-2012, RB-11-2018, TC-30-2018	x	x
Slope Failure	SF-01	There are existing homes and businesses along the west bank of the Sacramento River that are at risk to erosion and landslides due to river channel migration.	PPRO	CoT-26-2018, RB-02-2012		x
Wildfire	WF-02	Lack of vegetation management activities. Factors may include a lack of funding/ resources for property owners or an aging population who may be physically unable to perform mitigation actions.	PPRO	CoT-19-2012, TC-03-2018	x	X
Wildfire	WF-15	Heavy Vegetation on Railroad property near northside of City.	PPRO	CoT-21-2018		x

3.5.2 Capability Assessment

The City of Tehama identified current capabilities available for implementing hazard mitigation activities. The Capability Assessment portion of the hazard mitigation plan identifies administrative, technical, legal and fiscal capabilities. This includes a summary of departments and their responsibilities associated to hazard mitigation planning as well as codes, ordinances, and plans already in place associated to hazard mitigation planning. The second part of the assessment provides fiscal capabilities that may be applicable to providing financial resources to implement identified mitigation action items.

3.5.2.1 Existing Institutions, Plans, Policies and Ordinances

The following is (1) a summary of existing positions their responsibilities related to hazard mitigation planning and implementation; and (2) a list of existing planning documents and regulations related to mitigation efforts within the City. The administrative and technical capabilities the City, as shown in Table 1-32, provides an identification of the staff, personnel, and department resources available to implement the actions identified in the mitigation section of the Plan. Specific resources reviewed include those involving technical personnel such as planners/engineers with knowledge of land development and land management practices, engineers trained in construction practices related to building and infrastructure, planners and engineers with an understanding of natural or human-caused hazards, floodplain managers, surveyors, personnel with GIS skills and scientists familiar with hazards in the community.

3.5.2.2 Administrative and Technical Capacity

Table 3-29: City of Tehama's Administrative and Technical Ability

Staff/Personnel Resources	Available	Department/Agency Position
Planners or engineers with knowledge of land development and land management practices	Y	City has a contract Engineer
Engineers or professionals trained in building or infrastructure construction practices	Y	City contracts with Tehama County Building Dept.
Planners or engineers with an understanding of natural hazards	Y	Contract City Engineer / Contract Planner
Staff with training in benefit/cost analysis	Y	City Clerk/Administrator
Flood Plain Manager	Y	City Clerk/Admin is certified floodplain manager. This capability could be expanded by providing training to staff to provide outreach to communities on mitigation activities people can perform on their homes and businesses.
Surveyors	Y	Provided by Contract City Engineer
Personnel skilled or trained in GIS applications	Y	City Clerk – some training
Scientist familiar with natural hazards in local area	N	
Emergency Manager	Y	Provided by Tehama County Sheriff's Office
Grant Writers	Y	City Clerk/Administrator

3.5.2.2.1 Administration

The City of Tehama City Administrator is the chief administrator of the City and is appointed by City Council. Listed below are just a few of the responsibilities.

- Overseeing the performance of all City departments
- Implementing policies and ideas adopted by City Council
- Ensuring that all projects, operations, and functions of the City operate efficiently
- Ensuring all Local, State, and Federal laws are followed by the City
- Responding to citizen concerns
- Responding to requests for information from the public, other municipalities, state officials, or state and federal legislative offices.
- Serving as director of grants and projects.
- Planning and directing the maintenance, filing, safekeeping and computerization of municipal documents.
- Maintaining fiscal records and accounts; performing budgeting duties.

- Preparing ordinances, resolutions, or proclamations so that they can be executed, recorded, archived, or distributed.
- Maintaining and updating documents, such as municipal codes.
- Issuing various permits and licenses and collecting appropriate fees.
- Preparing reports.

The Administrator also works to develop the City's annual budget, works with other administrators and agencies in the region, and performs other duties assigned to the administrator per the request from City Council. (City of Tehama, 2017)

3.5.2.2.2 Planning Department

The City Council also serves as the Planning Commission that reviews proposed amendments to zoning ordinances, site plans and plat applications, and also makes decisions regarding the current and future development of City of Tehama. Building permits are approved for site plans and flood elevations requirements by the City Clerk and then are issued by the Tehama County Building Department. (City of Tehama, 2017)

3.5.2.2.3 Public Works Department

The City of Tehama has one part time maintenance worker. The City contracts with the County Public Works department for some maintenance and contracts out for larger projects.

3.5.2.2.4 Police Department

The City of Tehama contracts with the Tehama County Sheriff's Department to provide police services.

3.5.2.2.5 Fire Department

The City of Tehama receives its fire service from the Tehama County CDF Fire Department. The closest station is located just to the east of the city in Los Molinos at 7930 Sherwood Blvd. The response time to Tehama is approximately 4 minutes. The Los Molinos station supports I full time fireman twenty-four hours a day. At any given time there are 14 volunteer firemen on call. The department responds to approximately 4 fire emergency calls per year and about 24 medical emergency calls per year in Tehama. The most destructive fire in the City of Tehama occurred around the turn of the century and destroyed many of the city's original structures. Since then, no substantial fires have taken place. (City of Tehama General Plan)

3.5.2.3 Regulatory Tools

The legal and regulatory capabilities of local, state, and federal jurisdictions are shown in Table 3-30, which presents existing ordinances and codes that can regulate the physical or built environment of the City. Examples of legal and/or regulatory capabilities can include: building codes, zoning ordinances, subdivision ordnances, special purpose ordinances, growth management ordinances, site plan review, general plans, capital improvement plans, economic development plans, emergency response plans, and real estate disclosure plans. The City's General Plan is the constitution guiding new development and was attached as an addendum to the All-Hazard Mitigation Plan.

Table 3-30: City of Tehama's Land and Regulatory Capability

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated	Comments
Codes, Ordinances & Requirements					
Building Code	Y	N	N	Y	Title 15- Buildings and Construction
Zoning Code	Y	N	N	Y	Title 17- Zoning
Subdivisions	Y	N	N	N	Title 16- Subdivisions
Post Disaster Recovery	N	N	N	N	
Real Estate Disclosure	Y	N	N	Y	CA Civil Code 1102 requires disclosure on natural hazard exposure of all real property for sale
Growth Management	Y	N	N	Y	City of Tehama General Plan
Site Plan Review	Y	N	N	N	
Special Purpose (flood management, critical areas)	Y	N	N	N	Title 15 Section 15.08.040- Methods of reducing flood losses
Planning Documents					
General Plan	Y	N	N	Y	City of Tehama General Plan. During the next update cycle, the approved local hazard mitigation plan will be adopted into the Safety Element of the General Plan.
Capital Improvement Plan	Y	N	N	N	Financial Reports and Budgets
Economic Development Plan	N	N	N	N	
Flood Plain or Basin Plan	Y	Y	N	N	2011 City of Tehama Flood Hazard Mitigation Plan
Storm Water Plan	Y	N	N	N	Ordinance 171, adopted 3/11/2008
Habitat Conservation Plan	N	N	N	N	
Shoreline Management Plan	N	N	N	N	
Emergency Response Plan	Y	N	N	Y	
Continuity of Operations Plan	N	N	N	N	
Post Disaster Recovery Plan	N	N	N	N	
Terrorism Plan	N	N	N	N	
Other	Y	N	N	N	The City of Tehama has a Water Systems Plan, Ord. #174 adopted 10/13/2009

3.5.2.3.1 Fiscal Resources

Table 3-31 shows specific financial and budgetary tools available to the City such as community development block grants; capital improvements project funding; authority to levy taxes for specific purposes; fees for water, sewer, gas, or electric services; impact fees for homebuyers or developers for new development; ability to incur debt through general obligations bonds; and withholding spending in hazard-prone areas.

Table 3-31: City of Tehama's Fiscal Resources

Financial Resources	Accessible or Eligible to Use?
Community Development Block Grants	Y
Capital Improvements Project Funding	Y
Authority to Levy Taxes for Specific Purposes	Y-limited by Prop 218
User Fees for Water, Sewer, Gas or Electric Service	Y –Prop 218
Incur Debt through General Obligations Bonds	Y
Incur Debt through Special Tax Bonds	Y
Incur Debt through Private Activity Bonds	N
Withhold Public Expenditures in Hazard-Prone Areas	N
State Sponsored Grant Programs	Y
Development Impact Fees for Homebuyers or Developers	Y
Other	Y

3.5.2.3.2 Community Classifications

Table 3-32 summarizes classifications under various community mitigation programs.

Table 3-32: City of Tehama's Community Classifications

Program	Participating	Classification	Date Classified
Community Rating System	Y	5	2013
Building Code Effectiveness Grading Schedule	Y	9/9	--
Public Protection (ISO Class)	Y	04/4X	2015
Storm Ready	N	--	--
Firewise	N	--	--

3.5.3 Guiding Principle, Goals and Objectives

Hazard mitigation plans must identify goals for reducing long-term vulnerabilities to identified hazards (44 CFR Section 201.6(c)(3)(i)). Together with the County Planning Committee, the steering committee established a guiding principle, a set of goals and measurable objectives for this plan, based on data from the preliminary risk assessment and the results of the public involvement strategy. This information is located in Section 5.4 of Volume One.

3.5.4 Mitigation Action Plan

Based upon the City's planning committee priorities, risk assessment results, and mitigation alternatives, mitigation actions were developed. Most importantly, the newly developed mitigation actions acknowledge updated risk assessment information outlined in Section 3.4. Mitigation actions presented in Table 3-33 establish 26 possible mitigation actions. Some mitigation actions support ongoing City activities, while other actions are intended to be completed when funding is available. For this Plan, time frames are defined as follows:

- Short Term- 1-3 years
- Mid Term- 3-5 years
- Long Term- 5 years or more

Regardless, mitigation actions will be part of an annual review.

3.5.4.1 Benefit/ Cost Review

The City of Tehama Planning Team used the same benefit/cost parameters as described in Section 5.6, Volume 1 of the Base Plan. Cost ratings were defined as follows:

- **High**—Existing funding will not cover the cost of the project; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).
- **Medium**—The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
- **Low**—The project could be funded under the existing budget. The project is part of or can be part of an ongoing existing program.

Benefit ratings were defined as follows:

- **High**—Project will provide an immediate reduction of risk exposure for life and property.
- **Medium**—Project will have a long-term impact on the reduction of risk exposure for life and property, or project will provide an immediate reduction in the risk exposure for property.
- **Low**—Long-term benefits of the project are difficult to quantify in the short term.

3.5.4.2 Mitigation Actions Plan

The City of Tehama Planning Team used the same mitigation action prioritization method as described in the Section 5.8.3 of the Base Plan Volume 1. Based upon the City of Tehama Planning Committee consensus, Table 3-32 lists each priority mitigation action. For Priority mitigation actions Implementation plans are made available in the Action Planner Annex. Implementation plans in Action Planner Annex identify the responsible party, time frame, potential funding source, implementation steps and resources need to implementation. The detail in the Action Planners meet the regulatory requirements of FEMA and DMA 2000.

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Table 3-33: Mitigation Action Priority Tracker

Action No.	Hazard Type	Specific Mitigation Action	Mitigation Alternatives	Responsible Party	Potential Funding Source	Time Frame	Benefit Cost Rating	Planning Mechanism	Implementation Plan / Priority
CoT-01-2018	Flood	Refer development proposals that impact flood protection to other agencies as applicable, including Army Corps, FEMA. Require drainage plans.	PRV	City of Tehama City Clerk/ Admin	General Fund	Short Term	Low / Low	Water/ Flood Management Plans	
CoT-02-2012	Flood	Continue outreach program to provide information needed to increase awareness and modify actions to reduce flood damage, encourage flood insurance coverage and protect natural functions of floodplains. Seek CRS classification improvements i.e. better and more often outreach, Promotion of flood insurance to local residents and alert and warning of possible flood depths.	PE&A	City of Tehama City Clerk/ Admin	General Fund, Pre-Disaster Mitigation Grant Program (PDM)	Short Term	Low / Low	Implementation has been occurring for several years and this is an on-going action.	**Y**
CoT-03-2012	Flood	Continue to develop, implement, and expand the Flood Alert and Early Warning Program systems.	PRV	City of Tehama City Clerk/ Admin	General Fund	Short Term	Medium / Low	Implementation has been occurring for several years and this is an on-going action.	**Y**
CoT-04-2012	Flood	Identify special needs residents and stay-at-home children that may require special assistance in hazard situations.	ES, PRV	City of Tehama City Clerk/ Admin	General Fund	Short Term	Low / Low	Emergency Food and Shelter Program (EFSP) and Emergency Operations Plan (EOP)	
CoT-05-2012	All Hazard	Monitor and regularly update City hazard studies whenever information becomes available that would significantly modify previous date. Update GIS data as it relates to HMP documentation.	PRV	City of Tehama Contract Engineer	General Fund	Long Term	Low / Medium	Hazard Mitigation Plan Update	**Y**
CoT-06-2012	Flood	Implement a plan to keep brush & debris clear from Tehama Simpson Slough.	PRV, NRP	City of Tehama City Clerk/ Admin	General Fund	Short Term	Low / Medium	Water/ Flood Management Plans	
CoT-07-2012	Flood	Continue annual inspection and maintenance of City's storm drain systems.	PRV	City of Tehama Contract Engineer	General Fund	Short Term	Low / High	Implementation has been occurring for several years and this is an on-going action.	
CoT-08-2012	Flood	Construct flood mitigation measures for Gyle Rd.	PRV	City of Tehama Contract Engineer, Tehama County Public Works	Flood Mitigation Assistance Grant (FMA)	Mid Term	Medium / Medium	Water/ Flood Management Plans	**Y**
CoT-09-2012	Flood	Repair culvert on Gyle Rd for drainage of McClure Creek.	SP	City of Tehama Contract Engineer, Tehama County Public Works	Flood Mitigation Assistance Grant (FMA)	Short Term	Medium / High	Water/ Flood Management Plans	

Action No.	Hazard Type	Specific Mitigation Action	Mitigation Alternatives	Responsible Party	Potential Funding Source	Time Frame	Benefit Cost Rating	Planning Mechanism	Implementation Plan / Priority
CoT-10-2012	Flood	Continue to promote programs to elevate and retrofit structures to protect from future damage, with repetitive loss properties as priority.	SP, PRV	City of Tehama City Clerk/ Admin	General Fund	Short Term	Low / Low	Implementation has been occurring for several years and this is an on-going action.	Y
CoT-11-2012	Flood	Perform a dam failure analysis to determine probably impact of flooding within Tehama if Shasta Dam fails & create a dam failure element for City's emergency response plan.	PRV	City of Tehama Contract Engineer, Tehama County Public Works	Flood Mitigation Assistance Grant (FMA)	Long Term	High / Low	Water/ Flood Management Plans	
CoT-12-2012	Flood	Make readings readily available on water levels and educate public on readings i.e. what does gauge elevations mean in a localized area.	PRV, PPRO, PE&A	City of Tehama City Clerk/ Admin	General Fund	Short Term	Low / Low	Water/ Flood Management Plans	
CoT-13-2012	Flood	Analyze cost and benefit of flood protection measures for City Hall and School facility to lower risk of damage from flooding.	PRV	City of Tehama City Clerk/ Admin	General Fund	Short Term	Low / Medium	Water/ Flood Management Plans	
CoT-14-2012	Flood	Inform and educate public on hazard mitigation; develop web site; annual dissemination of information.	PE&A	City of Tehama City Clerk/ Admin	General Fund, Pre-Disaster Mitigation Grant Program (PDM)	Short Term	Low / Low	Water/ Flood Management Plans	
CoT-15-2012	Severe Storm	Continue hazard tree maintenance and replacement program for aging street trees.	PRV, NRP	City of Tehama City Clerk/ Admin	General Fund	Short Term	Medium / High	General Plan Update	Y
CoT-16-2012	Earthquake	Undertake Earthquake Study for all critical facilities and non-reinforced masonry buildings. Seismic retrofit of identified buildings.	PRV	City of Tehama Contract Engineer, Tehama County Public Works	Hazard Mitigation Grant Program (HMGP)	Long Term	High/ Low	Building/ Development Codes and Zoning Ordinances	
CoT-17-2012	Earthquake	Implement an automatic gas shut off valve install program.	PRV, PPRO	City of Tehama Contract Engineer	General Fund	Mid Term	Medium / Low	Building/ Development Codes and Zoning Ordinances	
CoT-18-2012	Drought	Develop and promote water conservation programs.	NRP, PRV	City of Tehama City Clerk/ Admin	General Fund	Short Term	Low / Medium	Water/ Flood Management Plans	
CoT-19-2012	Wildfire	Continue weed abatement program.	PRV, PPRO	City of Tehama City Clerk/ Admin	General Fund	Short Term	Low / Medium	Implementation has been occurring for several years and this is an on-going action.	Y
CoT-20-2018	Flood	Improve south shoulder of East Gyle Rd. to prevent continual damage during flooding events.	SP	City of Tehama Contract Engineer, Tehama County Public Works	Flood Mitigation Assistance Grant (FMA)	Short Term	High / Medium	Water/ Flood Management Plans	Y
CoT-21-2018	Wildfire	Conduct fuel reduction efforts on Railroad property.	PRV	Tehama County CDF Fire Department	Hazard Mitigation Grant Program (HMGP)	Short Term	Low / Medium	Community Wildfire Protection Plans (CWPPs).	
CoT-22-2018	Flood	Wellhead protection plans for active and abandoned wells within city.	PRV, NRP	City of Tehama City Clerk/ Admin	Flood Mitigation Assistance Grant (FMA)	Short Term	Low / Low	Water/ Flood Management Plans	Y

Action No.	Hazard Type	Specific Mitigation Action	Mitigation Alternatives	Responsible Party	Potential Funding Source	Time Frame	Benefit Cost Rating	Planning Mechanism	Implementation Plan / Priority
CoT-23-2018	Severe Storm	Construct back-up power generation / comms for City Hall or other community service infrastructure / essential facilities.	SP, PRV	City of Tehama Contract Engineer, Tehama County Public Works	General Fund	Short Term	High / Low	Emergency Food and Shelter Program (EFSP) and Emergency Operations Plan (EOP)	
CoT-24-2018	Dam Failure	Educate public on evacuation procedures for dam failure and other hazards.	PE&A	City of Tehama City Clerk/ Admin	General Fund	Short Term	Low / Low	Water/ Flood Management Plans	**Y**
CoT-25-2018	Drought	Developed water supply contingency planning.	PRV, NRP	City of Tehama City Clerk/ Admin	General Fund	Mid Term	Medium / Medium	Water/ Flood Management Plans	
CoT-26-2018	Slope Failure	Continue bank stabilization efforts along the west bank of the Sacramento River including the use of rip rap and other slope stabilization methods.	SP	City of Tehama Contract Engineer, Tehama County Public Works	General Fund, Hazard Mitigation Grant Program (HMGP)	Short Term	High/ Medium	Implementation has been occurring for several years and this is an on-going action.	
CoT-27-2018	All Hazard	Integrate the Hazard Mitigation Plan into the Safety Element of the General Plan.	PRV	City of Tehama Planning Department/ City Council	Hazard Mitigation Grant Program (HMGP)	Short Term	Medium/ Low	General Plan Update	

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3.6 Plan Implementation and Maintenance

The City of Tehama Planning Team will follow the same implementation and maintenance strategy as Tehama County. This strategy is described in detail in Section 6 of the Base Plan.

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